



TEST REPORT

TEST OF A HYBRID WOOD STOVE FOR EMISSIONS AND EFFICIENCY

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

Client:

Hearthstone
317 Stafford ave.
Morrisville, Vt 05661

Model name: Green Mountain 40

Attention: Rafaël Sanchez

TESTED BY:

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

TEST DATES: May 19th to 26th 2017

REPORT DATE: June 9th 2017

Project number: PI-20149

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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: May 19th to 26th 2017
- Test methods used:
 - Particulate emissions: ASTM E2780-10 ; ASTM E2515-11 methods 28R as referred into 40 CFR Part 60 Subpart AAA
 - Efficiency: CSA B415.1-10

1.2 TEST UNIT INFORMATION

General

- Manufacturer: Hearthstone
- Product type: Hybrid wood stove
- Combustion system: catalytic, with post combustion
- Unit tested: GM 40
- Option : optional convection fan can be installed on the wood stove

1.3 RESULTS

Emission results obtained

- Average emission rate: 0.90 grams/hour
- Average Efficiency : 77.3%

Conformity: NSPS Phase 2020

1.4 PRETEST INFORMATION

Unit condition: The unit was received by carrier first week of May 2017. The 50hrs of aging is made 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 4), and one confirmation test is done without any convection fan (test #5).

Break in period

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

2 SUMMARY OF TEST RESULTS

2.1 EMISSIONS

Run Number	Test Date (AAA-MM-DD)	Emission Rate (g/hr)	Burn Rate (kg/hr)	1st hour Emission Rate (g/hr)	CSA B415.1 CO emission Gr/hr	CSA B415.1 CO emission Gr/Kg dry
1	2017-05-19	2,08	1,734	4,07	69,89	40,30
2	2017-05-23	0,40	0,997	1,05	32,95	33,05
3	2017-05-24	0,35	0,934	0,94	17,37	18,60
4	2017-05-25	1,42	1,635	2,45	54,86	33,55
5	2017-05-26	0,37	0,958	0,75	13,63	14,22

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	1,734	2,08	73,4	23 935	1,165
2	0,997	0,40	77.5	14 520	0,549
3	0,934	0,35	80.6	14 142	0,290
4	1,635	1,42	76.1	23 389	0,9144
Weighted particulate emission average of 4 test runs: 0.9 grams per hour.					
Weighted average HHV efficiency of 4 test runs: 77.3%.					
Average Co 0.67 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	81	83	29,560	29,648	38,6	32	6	8
2	73	77	29,707	29,619	44	39	9	6
3	75	79	29,589	29,530	48,8	42,5	5	3
4	77	85	29,589	29,471	45,8	35,2	5	4
5	76	78	29,382	29,353	43	40,7	6	3

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	11,38	22,14	2,0	9,24	7,002	20,91	13	5	0	16
2	12,24	21,25	2,3	9,22	6,983	20,42	13,25	5	0	16
3	12,40	20,41	2,1	9,24	6,998	21,32	14,12	5	0	16
4	11,97	21,21	2,2	9,20	6,973	21,59	13,5	5	0	16
5	12,37	21,30	2,3	9,21	6,979	21,11	13,5	5	0	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	120	161,81	572,41	21,483	21,056	4,80	4,30
2	209	171,07	545,75	37,622	37,061	1,40	1,50
3	222	168,26	546,65	39,813	39,090	1,40	1,30
4	126	168,39	559,10	22,547	22,222	3,00	3,20
5	216	167,00	549,20	38,652	37,990	1,50	1,30

2.6 DILUTION TUNNEL DUAL TRAIN PRECISION

Run Number	Sample Ratio		Total Emission (g)		
	Train 1	Train 2	Train 1	Train 2	% Deviation
1	903,85	922,17	4,34	3,97	4,49%
2	950,35	964,73	1,33	1,45	4,20%
3	938,24	955,59	1,34	1,27	2,66%
4	941,00	954,76	2,86	3,09	3,95%
5	933,23	949,49	1,42	1,25	6,14%

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	1,734	451,02	-57,8	0,065	0,230	full open	120
2	0,997	352,55	-56,3	0,055	0,237	min	209
3	0,934	339,68	-20,8	0,047	0,234	min	222
4	1,635	402,86	-9,2	0,063	0,237	1/4 drill bit	126
5	0,958	387,94	-32,2	0,053	0,236	min	216

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: 2.5 inch X 15.5 inch at the front of the unit
- Dimensions: cover the hearth area minus the restriction at the front
- Material: Vermiculite 1 inch thick.

Bricks

- Inside firebox refractory brick 1¼ inch. thick cover all the sides and the back of the combustion chamber bottom covered by ½ thick refractory brick

Flue gas exhaust

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

Gasket

- Glass holder : 1/8 X ½ Flat
- Window : 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 : 23 inch wide x 23 inch deep x 28 ¾ inch high
- Usable volume : 1.31 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 fully gasketed on the top and bottom of the combustion chamber. Air intake on the middle-left side of the unit (if facing door of stove)
- Secondary air: secondary tube design with air intake coming from the bottom rear of unit, then up through a steel riser tube to the secondary air tube.

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) 0.205	(air control Slide) 1.614	yes	(Air Wash) 4.766
APPENDIX 14 SHARED and SA	Secondary	(Riser opening) 0.600	(Riser opening) 0.600	yes	(Secondary Tube holes) 1.804
Appendix 14 TA	Pilot	(Orifice) 0.049	(Orifice) 0.049	None	(Orifice) 0.096

* 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 May 19th 2017. It lasted 120 minutes and a 1.73 kg/hr burn rate was obtained & emission at 2.1 gr/hr. The optional convection fan Option was at on position during the entire test.

Run #2

This run was performed on May 23rd 2017. It lasted 209 minutes and a 0.99 kg/hr burn rate was obtained & emission at 0.4 gr/hr. The optional convection fan Option was at on position during the entire test.

Run #3

This run was performed on May 24th 2017. It lasted 222 minutes and a 0.93 kg/hr burn rate was obtained & emission at 0.35 gr/hr. The optional convection fan Option was at on position during the entire test.

Run #4

This run was performed on May 25th 2017. It lasted 126 minutes and a 1.64 kg/hr burn rate was obtained & emission at 1.4 gr/hr. The optional convection fan Option was at on position during the entire test.

Run #5

This run was performed on May 26th 2017. It lasted 216 minutes and a 0.96 kg/hr burn rate was obtained & emission at 0.37 gr/hr. The optional convection fan Option was at OFF position during the entire test.

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

Test fuel cribs

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

3.5 START-UP OPERATION

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

3.6 SAMPLING LOCATIONS

Particulate samples are collected from the dilution tunnel 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	19-05-2017
Technicien	M.M
Project #	PI 20149

Description de l'unité

Manufacturier	HEARTHSTONE	
Modèle	GM 40	
Combustion system	Cat	
Appliance type	WOOD STOVE	
Firebox volume	1,32	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	na	BTU/h Donnée fournie par le manfacturier
Targeted category	4	
Targeted output	na	BTU/h
Cp steel	na	BTU/lb-°F

Échantillonnage

Blank sampling rate	0,20	cuft/min
Internal probe diameter	0,18	in.
Calibration Factor (DGM #1):	0,987	Dimensionless
Equipment number (DGM #1):	EM-178	
Calibration Factor (DGM #2):	0,996	Dimensionless
Equipment number (DGM #2):	EM-179	
Calibration Factor (DGM #3):	0,986	Dimensionless
Equipment number (DGM #3):	EM-070	

Tunnel

Targeted tunnel flow rate	140	scfm
Tunnel diameter	6	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):	100,1	100,4
Barometer (in.Hg):	29,559519	29,648109
Dry Bulb (F):	79,52	83,3
Humidity (%):	38,6	32
Air velocity (ft/min)	6	8

DGM #1	Final: ##### cuft
	Initial: ##### cuft
DGM #2	Final: ##### cuft
	Initial: ##### cuft

DGM room	
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Final: 510176,060	Liter
Initial: 509517,440	Liter
Final: 430889,010	Liter
Initial: 430247,830	Liter

Final: 102,280	cuft
Initial: 75,060	cuft

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

185

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
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8,3	9,2	10,2
-----	-----	------

* 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

Load Density (wet): 30,6 lbs./ft3

Spacer weight: lbs

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	13	1,46	21,30	20,60	20,80	20,90	20,10	30,2804	68,25	20,7
1,5	3,5	13	1,41	20,90	20,10	20,60	20,30	19,90	28,78904	68,25	20,4
1,5	3,5	13	1,50	20,80	20,60	21,10	21,00	20,90	31,27824	68,25	20,9
1,5	3,5	13	1,48	21,00	21,80	21,30	21,60	21,30	31,7148	68,25	21,4
1,5	3,5	13	1,44	21,00	21,30	21,30	20,90	20,80	30,3264	68,25	21,1
1,5	0,75	5	0,12			22,10			2,5636	5,63	22,1
1,5	0,75	5	0,12			21,60			2,5056	5,63	21,6
1,5	0,75	5	0,13			20,80			2,7456	5,63	20,8
1,5	0,75	5	0,12			21,80			2,616	5,63	21,8
1,5	0,75	5	0,12			21,60			2,5056	5,63	21,6
1,5	0,75	5	0,12			20,80			2,4128	5,63	20,8
1,5	0,75	5	0,13			20,30			2,5984	5,63	20,3
1,5	0,75	5	0,12			21,60			2,6784	5,63	21,6
1,5	0,75	5	0,12			21,30			2,5986	5,63	21,3
1,5	0,75	5	0,12			20,80			2,5376	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			21,10			2,5742	5,63	21,1
1,5	0,75	5	0,11			20,80			2,3296	5,63	20,8
1,5	0,75	5	0,12			20,30			2,3954	5,63	20,3
1,5	0,75	5	0,14			20,10			2,814	5,63	20,1
1,5	0,75	5	0,124			20,00			2,48	5,63	20,0
										0,00	
										0,00	
										0,00	
										0,00	
										0,00	
										0,00	
										0,00	
										0,00	
										0,00	
										0,00	
									SUM MCx	193,21628	21,0 %

Test Load Weight: 9,24 lbs.

Dry Weight: 3,47 kg.

Average Moisture Content: %

Dry:	20,91	Dry(EPA)	20,91
		Dry(B415)	20,91

20,91
Must be 19-25

Wet: 17,29
must be 15,2-22

Coal Bed Range: lbs. to

2,3 lbs.

TEST CHARGE:

Coal bed weight: 2

lbs.

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Tunnel Traverse Worksheet (for velocity calculations)

Static Pressure: 0,22 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=
0,941

Pour un tunnel moins de 12", prendre 4 lectures

	TUNNEL VELOCITY	TUNNEL TEMP	SQUARE ROOT
	In. wc	°F	
A center	0,060	80,12	0,2449
B center	0,059	80,1	0,2429
A1	0,050	80,17	0,2236
A2	0,054	80,22	0,2324
A3	0,052	80,05	0,2280
A4	0,050	80,03	0,2236
B1	0,049	80,070	0,2214
B2	0,050	80,110	0,2236
B3	0,052	80,080	0,2280
B4	0,051	80,190	0,2258
AVERAGE	0,0527	80,1140	0,2294

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Filter set weight

Number	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			
Before (1)	30	362	700	5	38	703	705	30	40	707	708	52	711		
Before (2)															
Before (3)															
Before (4)															
Before (5)	110,2400	0,1264	0,1289	10,4602	110,4333	0,1273	0,1261	10,3136	110,1089	0,1253	0,1261	10,0721	0,1305	18/05/2017	18:00
Before (6)	110,2399	0,1266	0,1288	10,4603	110,4334	0,1273	0,1260	10,3135	110,1090	0,1251	0,1260	10,0721	0,1305	19/05/2017	08:30
After (1)	110,2403	0,1299	0,1285	10,4642	110,4336	0,1273	0,1257	10,3154	110,1094	0,1277	0,1252	10,0764	0,1305	19/05/2017	14:00
After (2)	110,2402	0,1296	0,1285	10,4620	110,4335	0,1273	0,1257	10,3140	110,1094	0,1273	0,1252	10,0746	0,1305	23/05/2017	08:00
After (3)	110,2402	0,1296	0,1285	10,4618	110,4335	0,1273	0,1257	10,3140	110,1094	0,1273	0,1252	10,0746	0,1305	29/05/2017	08:00
After (4)	110,2402	0,1296	0,1285	10,4618	110,4335	0,1273	0,1257	10,3140	110,1094	0,1273	0,1252	10,0746	0,1305	30/05/2017	08:00
After (5)															
After (6)	110,2402	0,1296	0,1285	10,4618	110,4335	0,1273	0,1257	10,3140	110,1094	0,1273	0,1252	10,0746	0,1305	30/05/2017	08:00
Difference	0,0003	0,0030	-0,0003	0,0015	0,0001	0,0000	-0,0003	0,0005	0,0004	0,0022	-0,0008	0,0025	0,0000		
Total (mg)		4,5				4,8				4,3					
Total ajusté (mg)		4,50				4,80				4,30					

Project nu. PI 20149

Date 19-05-2017

Technicien M.M

SFBA EPA EMISSION RESULTS

RESULTS

Average emission rate: 2,1 g/hr

Burn Rate : 1,734 Dry kg/hr

Test Duration: 120 min

PRESSURE FACTOR: DGM 1 0,96430
DGM 2 0,96250
DGM 3 0,98943

BAROMETRIC PRESSURE
Average: 29,603814 in Hg
Start: 29,559519 in Hg
End: 29,648109 in Hg

TEMPERATURE FACTORS DGM 1 0,97046
DGM 2 0,97003
DGM 3 0,97340

DGM CONTROLLER VALUES

DGM 1 Final: 18016,698 Cuft
Initial: 17993,439 Cuft

VOLUMES SAMPLED DGM 1 21,483 SCft
DGM 2 21,056 SCft
DGM 3 25,849 SCft

DGM 2 Final: 15216,702 Cuft
Initial: 15194,059 Cuft

DGM #3 Final: 102,280 Cuft
Initial: 75,060 Cuft

TOTAL TUNNEL VOLUME : 19418

TEMPERATURES

SAMPLE RATIOS
Sample Train 1: 903,846
Sample Train 2: 922,174

DGM 1 544,070 °R
DGM 2 544,313 °R

Paticulate concentration
Sample Train 1 0,000223 g/dscf
Sample Train 2 0,000204 g/dscf
Room 0,000000 g/dscf

CALIBRATION FACTORS

DGM 1 0,9870
DGM 2 0,9960
DGM #3 0,9860

TUNNEL FLOW RATE: 161,813 Dscfm

TOTAL EMISSIONS
Sample Train 1 4,34 g
Sample Train 2 3,97 g

PARTICULATE CATCH
Total Sample Train 1: 4,80 mg
Total Sample Train 2: 4,30 mg
Total Sample Train 1 1st hour: 4,50 mg

EMISSION RATES
Sample Train 1 2,17 g/hr
Sample Train 2 1,98 g/hr

1st hour emission rate 4,07 g/hr

DEVIATION: 4,49%

Cs Train 1 Train 2
0,0002234 0,000204215

		Average	0,28	9,46	#DIV/0!	419,37	82,43	112,41	561,29	370,61	453,17	447,39	422,62
*		*	*	*	*	*1	*2	*3	*4	*5	*6	*7	*8
Elapsed		Weight				Flue	Room	Tunnel	Unit	Unit	Unit	Unit	Unit
Time	Raw data row	Remaining	CO	CO ₂	O ₂	Gas	Temp	Dry Bulb	Top	Back	R.Side	L.Side	Bottom
min		lbs	%	%	%	%F	%F	%F	%F	%F	%F	%F	%F
0,00	185,00	9,2	0,0	5,7	0,0	413,6	80,7	130,9	563,8	338,0	427,0	417,1	534,0
1,0	186,0	9,1	0,0	2,4	0,0	395,2	80,3	123,5	549,7	341,5	427,4	417,7	536,8
2,0	187,0	9,0	0,0	4,7	0,0	407,8	80,6	115,7	539,5	345,1	427,9	417,8	537,1
3,0	188,0	8,9	0,0	7,1	0,0	424,6	80,8	115,1	532,9	347,4	428,8	418,0	535,1
4,0	189,0	8,8	0,0	9,6	0,0	440,5	80,9	116,1	536,5	348,0	428,2	418,2	531,1
5,0	190,0	8,6	0,3	12,1	0,0	452,0	80,9	116,8	547,8	348,2	427,2	417,6	526,7
6,0	191,0	8,4	0,1	12,9	0,0	459,1	81,1	117,4	558,1	347,2	426,2	417,0	521,5
7,0	192,0	8,3	0,3	13,2	0,0	466,4	81,0	117,7	568,1	345,8	424,8	416,1	515,3
8,0	193,0	8,1	0,2	13,0	0,0	472,5	81,4	118,7	580,3	345,0	424,0	415,7	509,5
9,0	194,0	7,8	0,1	12,7	0,0	475,0	81,5	119,0	590,4	344,2	422,8	414,9	503,8
10,0	195,0	7,7	0,2	13,1	0,0	479,7	81,4	119,2	600,1	343,1	421,9	414,2	498,0
11,0	196,0	7,5	0,2	13,1	0,0	484,1	81,6	120,3	607,8	341,9	420,6	413,3	492,2
12,0	197,0	7,4	0,2	13,3	0,0	488,8	81,6	120,7	616,6	341,2	419,5	412,9	486,4
13,0	198,0	7,2	0,2	13,5	0,0	493,2	81,5	120,4	624,3	341,1	419,1	412,8	480,8
14,0	199,0	7,0	0,3	13,6	0,0	495,6	81,4	121,3	632,3	340,1	418,2	412,6	475,3
15,0	200,0	6,8	0,3	13,8	0,0	499,2	81,8	122,1	639,2	340,2	418,1	412,7	470,1
16,0	201,0	6,6	0,2	13,7	0,0	501,2	81,6	122,0	646,6	340,2	417,9	412,7	465,1
17,0	202,0	6,4	0,2	13,7	0,0	503,1	82,1	121,4	651,7	340,7	417,9	412,8	460,4
18,0	203,0	6,2	0,3	13,9	0,0	503,7	82,1	122,3	657,8	341,1	418,2	413,3	455,8
19,0	204,0	6,0	0,3	14,0	0,0	505,0	82,1	122,8	663,3	341,7	418,2	413,9	451,2
20,0	205,0	5,8	0,4	14,2	0,0	507,2	82,2	123,0	668,1	342,7	418,9	414,4	447,1
21,0	206,0	5,7	0,5	14,4	0,0	510,2	82,2	123,0	673,1	343,7	419,0	415,5	442,4
22,0	207,0	5,5	0,7	14,6	0,0	512,5	82,5	122,8	677,2	345,4	419,8	416,5	438,6
23,0	208,0	5,3	0,8	14,9	0,0	514,8	82,5	123,8	681,0	347,4	420,7	417,6	434,7
24,0	209,0	5,1	1,1	15,4	0,0	515,9	82,3	123,5	683,6	348,6	422,2	418,6	431,3
25,0	210,0	4,9	1,2	15,4	0,0	516,9	82,5	124,0	687,1	350,6	423,5	420,3	427,8
26,0	211,0	4,7	1,5	15,5	0,0	517,0	82,7	124,9	690,0	352,4	425,0	421,5	424,6
27,0	212,0	4,6	1,7	15,5	0,0	516,8	82,7	124,8	692,2	355,0	426,6	423,2	421,6
28,0	213,0	4,4	2,0	15,4	0,0	516,5	82,8	124,6	695,2	357,1	428,9	425,1	418,9
29,0	214,0	4,2	2,3	15,3	0,0	514,5	82,8	124,7	697,4	359,9	431,3	427,0	416,2
30,0	215,0	4,0	2,5	15,3	0,0	513,1	82,7	124,8	699,2	362,2	433,4	429,4	413,6
31,0	216,0	3,8	2,5	15,2	0,0	512,5	82,8	124,1	700,7	366,0	435,9	431,2	411,4
32,0	217,0	3,6	2,2	15,2	0,0	510,7	83,3	124,7	703,1	368,2	439,0	434,7	408,8
33,0	218,0	3,4	2,0	15,2	0,0	508,3	83,2	123,8	706,0	371,0	442,5	437,7	406,6
34,0	219,0	3,3	1,8	15,2	0,0	507,5	83,0	123,0	709,6	373,4	445,8	440,5	404,9
35,0	220,0	3,1	1,5	15,2	0,0	504,2	83,4	122,6	711,4	376,9	449,6	443,8	403,0
36,0	221,0	3,0	1,1	15,3	0,0	502,2	83,4	122,4	713,9	379,5	453,3	446,7	401,2
37,0	222,0	2,9	0,7	15,2	0,0	501,5	83,4	122,4	715,4	382,3	456,2	449,5	399,5
38,0	223,0	2,7	0,5	15,0	0,0	500,9	83,3	121,8	717,0	385,0	460,5	452,8	397,9
39,0	224,0	2,6	0,2	14,4	0,0	498,5	83,3	121,1	717,3	388,0	463,9	455,7	396,3
40,0	225,0	2,5	0,0	13,6	0,0	494,2	83,4	120,9	715,6	390,6	467,3	459,3	395,0
41,0	226,0	2,4	0,0	13,2	0,0	488,1	83,6	120,4	712,1	393,6	470,8	462,4	393,7
42,0	227,0	2,3	0,0	12,7	0,0	482,9	83,5	119,3	710,2	396,7	473,5	465,1	392,4
43,0	228,0	2,2	0,0	12,3	0,0	478,4	83,7	119,3	706,1	400,6	476,9	468,1	391,8
44,0	229,0	2,1	0,0	12,0	0,0	472,6	83,8	119,0	700,6	402,9	479,8	470,5	390,7
45,0	230,0	2,0	0,0	11,7	0,0	468,3	83,8	118,6	694,3	405,1	482,3	473,5	390,1
46,0	231,0	2,0	0,0	11,4	0,0	463,9	83,8	117,1	688,5	406,3	484,3	476,1	389,2
47,0	232,0	1,9	0,0	10,9	0,0	458,3	83,7	117,5	681,0	407,9	486,9	478,3	388,7
48,0	233,0	1,8	0,0	10,4	0,0	454,1	83,7	116,2	674,4	409,5	489,1	480,9	388,2
49,0	234,0	1,8	0,0	10,1	0,0	448,3	83,5	115,0	667,0	410,0	491,4	483,5	387,8
50,0	235,0	1,7	0,0	9,8	0,0	444,0	83,4	114,1	657,1	411,2	493,4	485,5	387,7
51,0	236,0	1,7	0,0	9,4	0,0	439,1	83,3	113,9	650,3	412,1	495,1	487,1	387,7
52,0	237,0	1,6	0,0	9,3	0,0	434,6	83,5	113,6	642,2	413,0	496,0	488,8	387,6
53,0	238,0	1,5	0,0	9,1	0,0	431,0	83,1	113,4	634,7	413,1	497,0	489,8	387,5
54,0	239,0	1,5	0,0	9,0	0,0	426,3	83,3	112,7	627,0	413,5	498,5	491,1	387,8
55,0	240,0	1,5	0,0	8,9	0,0	422,6	83,2	112,5	620,1	413,6	499,4	491,6	388,5
56,0	241,0	1,4	0,0	8,9	0,0	418,9	83,3	112,0	613,5	413,5	499,3	492,2	388,7
57,0	242,0	1,4	0,0	8,6	0,0	415,7	82,8	111,8	605,6	413,5	500,5	492,4	389,7
58,0	243,0	1,4	0,0	8,6	0,0	412,7	83,2	111,0	599,5	413,3	501,3	492,2	390,7
59,0	244,0	1,3	0,0	8,4	0,0	410,4	83,1	111,0	593,5	412,3	501,6	492,3	391,3
60,0	245,0	1,3	0,0	8,1	0,0	406,5	82,5	110,3	586,1	411,3	501,1	491,7	391,9
61,0	246,0	1,3	0,0	7,8	0,0	403,1	83,1	110,3	579,0	409,3	501,1	491,8	392,5
62,0	247,0	1,3	0,0	7,8	0,0	399,8	82,8	109,3	571,3	408,9	501,0	491,0	393,6
63,0	248,0	1,2	0,0	7,7	0,0	396,9	82,9	109,4	564,8	407,1	500,6	490,0	394,6
64,0	249,0	1,2	0,0	7,7	0,0	395,0	82,9	108,9	558,1	405,8	500,2	489,3	395,5
65,0	250,0	1,1	0,0	7,7	0,0	392,9	82,9	109,1	552,0	404,0	499,2	488,0	396,3
66,0	251,0	1,2	0,0	7,7	0,0	392,0	83,0	108,6	547,3	402,0	498,0	487,8	396,4
67,0	252,0	1,1	0,0	7,5	0,0	389,7	82,9	108,5	541,7	400,4	497,2	486,6	397,5
68,0	253,0	1,1	0,0	7,5	0,0	387,2	82,8	107,9	536,5	397,9	495,6	485,9	397,8
69,0	254,0	1,1	0,0	7,1	0,0	384,6	82,6	108,1	531,1	397,2	493,7	483,4	399,1
70,0	255,0	1,0	0,0	7,0	0,0	382,7	82,7	107,5	526,5	395,4	492,4	483,1	399,7
71,0	256,0	1,0	0,0	7,0	0,0	381,0	82,7	107,3	521,3	394,0	491,0	482,0	400,1
72,0	257,0	1,0	0,0	7,1	0,0	379,1	82,5	106,8	516,5	391,6	489,6	480,7	400,7
73,0	258,0	0,9	0,0	7,0	0,0	377,6	82,5	107,0	511,9	389,7	487,7	479,7	401,2
74,0	259,0	1,0	0,0	7,0	0,0	375,6	82,5	106,7	507,0	387,8	485,1	478,7	401,6
75,0	260,0	0,9	0,0	6,9	0,0	373,9	82,4	106,5	502,8	387,5	483,5	476,4	402,5
76,0	261,0	0,9	0,0	6,9	0,0	372,5	82,7	106,4	498,1	384,4	481,2	475,4	402,7
77,0	262,0	0,9	0,0	7,0	0,0	370,9	82,7	106,0	494,9	383,3	479,6	473,9	403,5
78,0	263,0	0,9	0,0	7,0	0,0	369,4	82,7	106,1	491,0	381,1	477,9	472,7	403,8
79,0	264,0	0,8	0,0	7,1	0,0	367,8	82,5	106,1	487,3	379,3	475,5	470,8	404,5
80,0	265,0	0,8	0,0	7,1	0,0	366,1	82,6	105,7	484,6	378,0	473,2	469,4	404,9
81,0	266,0	0,8	0,0	7,1	0,0	365,2	82,4	105,5	481,1	376,6	471,3	467,9	405,7
82,0	267,0	0,8	0,0	7,1	0,0	364,1	82,3	104,8	477,6	375,3	470,0	466,2	406,0
83,0	268,0	0,8	0,0	7,1	0,0	363,4	82,6	105,3	475,3	374,6	468,0	464,7	406,5
84,0	269,0	0,7	0,0	7,2	0,0	363,2	82,4	105,5	472,0	373,2	466,2	463,3	406,9
85,0	270,0	0,7	0,0	7,1	0,0	363,0	82,5	104,9	469,8	372,4	464,6	461,4	407,3
86,0	271,0	0,7	0,0	7,1	0,0	362,5	82,5	105,0	466,9	371,0	463,1	460,1	407,9
87,0	272,0	0,6	0,0										

101,0	286,0	0,4	0,0	6,4	0,0	352,8	82,4	104,1	441,9	356,6	437,8	434,8	416,5
102,0	287,0	0,4	0,0	6,4	0,0	352,5	82,3	103,8	440,0	355,4	436,5	433,4	416,9
103,0	288,0	0,3	0,0	6,4	0,0	352,3	82,2	103,3	438,8	354,1	434,9	431,5	418,0
104,0	289,0	0,3	0,0	6,5	0,0	351,0	82,1	103,7	437,4	352,8	433,3	429,9	418,7
105,0	290,0	0,3	0,0	6,3	0,0	351,2	82,1	103,4	436,8	351,7	431,4	428,9	419,4
106,0	291,0	0,3	0,0	6,3	0,0	351,2	82,1	103,6	435,1	350,7	429,7	427,2	419,9
107,0	292,0	0,3	0,0	6,3	0,0	350,9	82,1	103,3	434,0	350,3	428,7	425,7	421,0
108,0	293,0	0,2	0,0	6,2	0,0	350,0	81,9	103,4	433,0	349,3	426,9	424,1	421,0
109,0	294,0	0,2	0,0	6,1	0,0	350,1	81,9	103,4	432,2	348,3	425,5	422,6	421,9
110,0	295,0	0,2	0,0	6,0	0,0	349,3	81,9	103,3	429,4	347,2	424,0	421,1	422,6
111,0	296,0	0,2	0,0	5,9	0,0	349,6	82,0	103,4	429,0	346,1	422,2	419,4	422,9
112,0	297,0	0,2	0,0	5,8	0,0	348,9	81,8	103,5	427,0	345,6	420,8	418,1	423,3
113,0	298,0	0,2	0,0	5,7	0,0	348,4	81,9	103,1	424,9	345,1	419,7	416,4	423,3
114,0	299,0	0,1	0,0	5,6	0,0	347,7	81,9	103,1	423,8	343,8	418,1	414,8	423,3
115,0	300,0	0,1	0,0	5,6	0,0	347,0	81,9	102,8	421,9	342,9	417,2	413,2	423,6
116,0	301,0	0,1	0,0	5,6	0,0	346,0	81,9	103,0	420,3	341,8	415,2	411,8	423,5
117,0	302,0	0,1	0,0	5,5	0,0	345,6	81,9	103,0	418,1	340,8	413,9	409,9	423,5
118,0	303,0	0,1	0,0	5,5	0,0	345,2	81,8	103,0	416,6	339,7	412,2	409,1	423,5
119,0	304,0	0,1	0,0	5,5	0,0	344,9	81,8	102,4	415,5	339,0	411,0	407,4	423,8
120,0	305,0	0,0	0,0	5,4	0,0	343,8	81,7	102,8	413,9	338,0	409,2	405,8	423,9

Manufacturer: HEARTHSTONE
Model: GM 40
Run: 1
Project #: PI 20149
Test Duration: 120 min

	HHV	LHV
Eff	73.45%	79.38%
Comb Eff	97.27%	97.27%
HT Eff	75.51%	81.61%
Output	25 231	kJ/h
Burn Rate	1.73	kg/h
Grams CO	140	g
Input	34 353	kJ/h
MC wet	17.29	

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

Overall Heating Efficiency:	73.45%	Air Fuel Ratio (A/F)	29.94
Combustion Efficiency:	97.27%	Dry Molecular Weight (M _d)	401.15
Heat Transfer Efficiency:	75.51%	Dry Moles Exhaust Gas (N ₂):	11.50

Heat Output:	23 935 Btu/h	25 231 kJ/h
Heat Input:	32 587 Btu/h	34 353 kJ/h
Burn Duration:	2.00 h	
Burn Rate:	3.82 lb/h	1.734 kg/h
Stack Temp:	419.4 Deg. F	215.2 Deg. C

CO_{2-ut} Ultimate CO₂
F₀ 19.64
1.062

Date: 2017-05-19 Manufacturer: Hearthstone Model: GM 40
Project #: PI 20149 Run: 1 Tech: MM Reviewer: DP

- 2.5 LBS kindling STAND FINE
- By pass open
- At 2.2 LBS close Door
- At 0.8 LBS instl preload
- At 11.3 LBS close Door
- At 10.00 LBS close bypass
- At 2.00 LBS instl load
- open By pass
- open Door
- instl load
- close Door
- close Bypass

TEST LOAD CONFIGURATION

Fan ON
LOW

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

Side view	Front view	Top view
		

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

	ADDITION		SUBTRACTION	
	ft3	Volume	ft3	Volume
V measure				
V ashlip				
%				
V usable				
Usable Firebox: _____				
Test load weight: _____				
Minimum: _____ Maximum: _____				
Déviation: _____				

D.P.

PRE / POST CHECKS

Date: 2017-05-19 Manufacturer: Hearthstone Model: GM40
 Project #: PI 20149 Run: 1 Tech: MM Reviewer: DO

Moisture Meter Calibration Check:

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

Pre-Test

Post-Test

Facility Conditions:

Air Velocity from less than 2 feet

Smoke Capture Check.....

Picture.....

6 (max50 Fpm)	8 (max50 Fpm)
ok	ok
4 sides	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%.....

2017-05-19
2017-05-19
ok
ok

ok

Temperature System:

Ambient (65°-90°F).....

Wood Heater Surface (±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
30	38	40
362	703	707
700	705	708
n	n	12
ok	ok	ok

SAMPLING EQUIPMENT CHECK OUT

 Date: 2017-05-19

 Manufacturer: Hearthstone

 Model: GM 40

 Project #: PI 20149

 Run: 1

 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)	509516.93	510176.86	509517.01	510176.95	430247.01	430889.8
Initial 1minute DGM (Liter)	509516.92	510176.86	509517.00	510176.95	430247.01	430889.80
Change © (Liter)	0.01	0	0.01	0	0	0.01
Allowable leakage .04 x Sample rate or 0.28Lpm CSA B415 (0.56)						
Check OK	01	01	01	01	01	01

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	0 h	0 h

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.)	0 h	0 h	0 h	0 h

PRE-TEST SCALE AUDIT

Date: 2017-05-19 Manufacturer: Hearth stone Model: GM 40
 Project #: PI 20149 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-129	200 g, Class S	200 g

LIMITS OF WEIGHT RANGES

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

Date: 2017-05-19 Manufacturer: Heathstone Model: GM 40
 Project #: PT 20149 Run: 1 Tech: MR Reviewer: BP

FOR TUNNELS < 12 in

Barometric pressure (P_{bar}) 100.1 (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	0.060	80.12
B - Centroid	3.00	3.50	4	0.059	80.10
A-1	0.40	0.50	0.50	0.050	80.17
A-2	1.50	1.75	2	0.054	80.22
A-3	4.50	5.25	6	0.052	80.05
A-4	5.60	6.5	7.5	0.050	80.03
B-1	0.40	0.50	0.50	0.049	80.07
B-2	1.50	1.75	2	0.050	80.11
B-3	4.50	5.25	6	0.052	80.08
B-4	5.60	6.5	7.5	0.051	80.19
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_p avg. = average of the square roots of the velocity heads (Δ_p) measured at each traverse point.

CONTINUOUS ANALYZERS

Date: 2017-05-19 Manufacturer: Hearth stone Model: GM 40
 Project #: PI 2019 Run: 1 Tech: mm Reviewer: SP

Pre-Test (Adjust and Record)

	ZERO		SPAN		CAL. (Record Only)	
CO	0	0	2952	2971	1002	100
Tolerance CO		+/- 0.02		+/- 0.15		+/- 0.05
CO ₂	0	0	1285	1287	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	0.001	2949	1003	0.001	0.02	0.003	0.15	0.001	0.05	✓	
CO ₂	0	1283	974	0	0.02	0.04	0.5	0	0.5	✓	
O ₂	na	na	na	—	na	—	na	—	na	✓	

TEST DATA LOG

Date: 2017-05-19 Manufacturer: Hearthstone Model: GM 40
 Project #: PI 20149 Run: 1 Tech: MR Reviewer: DP

RAW DRY GAS METER READINGS

	System 1	System 2	Blank
Final (Liter)	510126,06	430889,01	102,28
Initial (Liter)	509517,44	430247,83	075,06

AMBIENT CONDITIONS

	Before	After
Barometer (kPa):	100,1	100,4
Dry Bulb (F):	79,52	83,3
Humidity (%):	386	32

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: 2012-05-19 Manufacturer: Hearthstone Model: 6M40
 Project #: PI 20149 Run: 1 Tech: MM Reviewer: 88

FUEL DESCRIPTION:

Type of wood:

PRE-TEST LOAD

Piece Size	Weight	Meter Moisture Content (% dry)*				
1 1/2 x 3 1/2 x 8 in.	0 774 lbs.	235	221	216	21.9	220
1 1/2 x 3 1/2 x 8 in.	0 846 lbs.	226	223	220	21.6	220
1 1/2 x 3 1/2 x 8 in.	0 774 lbs.	231	231	230	22.8	22.6
1 1/2 x 3 1/2 x 8 in.	0 814 lbs.	223	231	228	22.5	22.3
1 1/2 x 3 1/2 x 8 in.	0 830 lbs.	221	221	226	22.1	21.9
1 1/2 x 3 1/2 x 8 in.	0 810 lbs.	226	223	222	21.8	21.7
1 1/2 x 3 1/2 x 8 in.	0 830 lbs.	221	226	223	21.8	21.6
1 1/2 x 3 1/2 x 8 in.	0 812 lbs.	222	218	218	21.6	21.5
1 1/2 x 3 1/2 x 8 in.	0 810 lbs.	216	221	226	22.3	22.6
1 1/2 x 3 1/2 x 8 in.	0 810 lbs.	218	216	218	21.3	21.8
1 1/2 x 3 1/2 x 8 in.	0 810 lbs.	213	221	220	21.8	21.7
1 1/2 x 3 1/2 x 8 in.	0 820 lbs.	213	226	216	230	220
1 1/2 x 3 1/2 x 8 in.	0 836 lbs.	226	223	221	216	213
1 1/2 x 3 1/2 x 8 in.	0 804 lbs.	223	231	223	21.8	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.					

TEST LOAD WEIGHT: 11,38 lbs

FUEL DATA

Date: 2017-05-19 Manufacturer: Hearthstone Model: GM 40
 Project #: PT 20149 Run: 1 Tech: MR Reviewer: DP

FUEL DESCRIPTION:

Type of wood :

TEST LOAD

Piece Size	Weight	Meter Moisture Content (% dry)*				
1 1/2" x 3 1/4" x 17 in.	146 lbs.	21.3	20.6	20.8	20.9	20.1
1 1/2" x 3 1/4" x 13 in.	144 lbs.	20.9	20.1	20.6	20.3	17.9
1 1/2" x 3 1/4" x 13 in.	1498 lbs.	20.8	20.6	21.1	21.0	20.9
1 1/2" x 3 1/4" x 13 in.	1482 lbs.	21.0	21.8	21.3	21.6	21.3
1 1/2" x 3 1/4" x 13 in.	144 lbs.	21	21.3	21.3	20.9	20.8
1.5" x 3/4" x 5 in.	0.116 lbs.			22.1		
1.5" x 3/4" x 5 in.	0.116 lbs.			21.6		
1.5" x 3/4" x 5 in.	0.132 lbs.			20.8		
1.5" x 3/4" x 5 in.	0.120 lbs.			21.8		
1.5" x 3/4" x 5 in.	0.116 lbs.			21.6		
1.5" x 3/4" x 5 in.	0.116 lbs.			20.8		
1.5" x 3/4" x 5 in.	0.128 lbs.			20.3		
1.5" x 3/4" x 5 in.	0.124 lbs.			21.6		
1.5" x 3/4" x 5 in.	0.122 lbs.			21.3		
1.5" x 3/4" x 5 in.	0.122 lbs.			20.8		
1.5" x 3/4" x 5 in.	0.120 lbs.			20.6		
1.5" x 3/4" x 5 in.	0.122 lbs.			21.1		
1.5" x 3/4" x 5 in.	0.112 lbs.			20.8		
1.5" x 3/4" x 5 in.	0.113 lbs.			20.3		
1.5" x 3/4" x 5 in.	0.120 lbs.			20.1		
1.5" x 3/4" x 5 in.	0.124 lbs.			20.0		
x x in.	lbs.					
x x in.	lbs.					
x x in.	lbs.					
x x in.	lbs.					
x x in.	lbs.					
x x in.	lbs.					

TEST LOAD WEIGHT: 924 lbs Min 20%: 185 Max 25%: 231

Date: 2017-05-18

Manufacturer: Hearthstone

Model: GM 40

Project #: PI 20149 Run: 1

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	Blank		
Date	Time	30	362	700	5	38	703	705	30	711	
2017-05-18	18:00	110, 2400	0, 1264	0, 1289	10, 4602	110, 4333	0, 1273	0, 1261	10, 3136	0, 1305	
2017-05-18	8:30	110, 2399	0, 1266	0, 1288	10, 4603	110, 4334	0, 1273	0, 1260	10, 3135	0, 1305	

		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	30	362	700	5	38	703	705	30	711	
2017-05-19	14:00	110, 2403	0, 1299	0, 1285	10, 4642	110, 4336	0, 1273	0, 1257	10, 3154	0, 1305	
2017-05-23	8:00	110, 2402	0, 1296	0, 1285	10, 4620	110, 4335	0, 1273	0, 1257	10, 3140	0, 1305	
2017-05-23	8:00	110, 2402	0, 1296	0, 1285	10, 4618	110, 4335	0, 1273	0, 1257	10, 3140	0, 1305	
2017-05-30	8:00	110, 2402	0, 1296	0, 1285	10, 4618	110, 4335	0, 1273	0, 1257	10, 3140	0, 1305	

DILUTION TUNNEL PARTICULATE SAMPLER DATA

Date: 2017-05-18 Manufacturer: Heath store Model: GM 40
 Project #: PI 20149 Run: 1 Tech: MM Reviewer: DR

SYSTEM 2					
Pre-test Weight Record		Probe & Housing Number	Front Filter Number	Back Filter Number	gaskets
Date	Time				
2017-05-18	18:00	110, 1089	0, 1253	0, 1261	10, 0721
2017-05-19	8:30	110, 1090	0, 1251	0, 1260	10, 0720

SYSTEM 2					
Post-test Weight Record		Probe & Housing Number	Front Filter Number	Back Filter Number	gaskets
Date	Time				
2017-05-19	14:00	110, 1094	0, 1277	0, 1252	10, 0764
2017-05-29	8:00	110, 1094	0, 1273	0, 1252	10, 0746
2017-05-29	7:00	110, 1094	0, 1273	0, 1252	10, 0746
2017-05-30	8:00	110, 1094	0, 1273	0, 1252	10, 0746

Paramètres

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

Code verrouillage: HEA

Description du test

Test standard	EPA
Run #	2
Date	23-05-2017
Technicien	M.M
Project #	PI 20149

Description de l'unité

Manufacturier	HEARTHSTONE	
Modèle	GM 40	
Combustion system	Cat	
Appliance type	WOOD STOVE	
Firebox volume	1,32	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	na	BTU/h Donnée fournie par le manfacturier
Targeted category	1	
Targeted output	na	BTU/h
Cp steel	na	BTU/lb-°F

Échantillonnage

Blank sampling rate	0,20	cuft/min
Internal probe diameter	0,18	in.
Calibration Factor (DGM #1):	0,987	Dimensionless
Equipment number (DGM #1):	EM-178	
Calibration Factor (DGM #2):	0,996	Dimensionless
Equipment number (DGM #2):	EM-179	
Calibration Factor (DGM #3):	0,986	Dimensionless
Equipment number (DGM #3):	EM-070	Dimensionless

Tunnel

Targeted tunnel flow rate	140	scfm
Tunnel diameter	6	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 20149
Date	23-05-2017
Technicien	M.M

Fuel data

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

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

	Start	End
Barometer (kPa):	100,6	100,3
Barometer (in.Hg):	29,707169	29,618579
Dry Bulb (F):	70,07	77,18
Humidity (%):	44	39
Air velocity (ft/min)	9	6

DGM #1	Final: ##### cuft
	Initial: ##### cuft
DGM #2	Final: ##### cuft
	Initial: ##### cuft

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

Final: 511314,040	Liter
Initial: 510178,050	Liter
Final: 431998,380	Liter
Initial: 430891,790	Liter

Final: 149,880	cuft
Initial: 102,280	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 20149
Date	23-05-2017
Technicien	M.M

FUEL LOAD DATA SHEET, CSA B415

Test Load Weight:

Lower	Ideal	Upper
-------	-------	-------

8,3	9,2	10,2
-----	-----	------

* 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):	30,2	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	13,25	1,38	20,00	20,10	20,20	20,30	20,80	27,9864	69,56	20,3
1,5	3,5	13,25	1,49	20,50	20,80	21,00	20,60	20,30	30,7536	69,56	20,6
1,5	3,5	13,25	1,46	20,60	20,30	20,40	20,40	20,10	29,76632	69,56	20,4
1,5	3,5	13,25	1,44	20,00	20,10	20,20	20,00	19,90	28,89768	69,56	20,0
1,5	3,5	13,25	1,45	20,80	20,60	20,10	20,50	20,20	29,638	69,56	20,4
1,5	0,75	5	0,12			20,60			2,472	5,63	20,6
1,5	0,75	5	0,12			20,10			2,3316	5,63	20,1
1,5	0,75	5	0,13			20,30			2,5578	5,63	20,3
1,5	0,75	5	0,14			20,30			2,842	5,63	20,3
1,5	0,75	5	0,13			20,50			2,583	5,63	20,5
1,5	0,75	5	0,12			21,00			2,52	5,63	21,0
1,5	0,75	5	0,11			21,10			2,4054	5,63	21,1
1,5	0,75	5	0,15			20,80			3,1616	5,63	20,8
1,5	0,75	5	0,11			20,50			2,337	5,63	20,5
1,5	0,75	5	0,12			20,40			2,4072	5,63	20,4
1,5	0,75	5	0,13			20,90			2,6334	5,63	20,9
1,5	0,75	5	0,12			21,30			2,4708	5,63	21,3
1,5	0,75	5	0,11			21,00			2,394	5,63	21,0
1,5	0,75	5	0,11			20,80			2,3296	5,63	20,8
1,5	0,75	5	0,136			20,60			2,8016	5,63	20,6
1,5	0,75	5	0,144			20,70			2,9808	5,63	20,7
										0,00	
										0,00	
										0,00	
										0,00	
										0,00	
										0,00	
										0,00	
										0,00	
								SUM MCx	188,2698		20,6 %

Test Load Weight: lbs.

Dry Weight: kg.

Average Moisture Content: %

Dry:	20,42	Dry(EPA)	20,42
		Dry(B415)	20,42

20,42
Must be 19-25

Wet:
must be 15,2-22

Coal Bed Range: 1,8 lbs. to

2,3 lbs.

TEST CHARGE:

Coal bed weight: 2,3

lbs.

Project nu.	PI 20149
Date	23-05-2017
Technicien	M.M

Tunnel Traverse Worksheet (for velocity calculations)

Static Pressure: 0,22 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=
0,939

Pour un tunnel moins de 12", prendre 4 lectures

	TUNNEL VELOCITY	TUNNEL TEMP	SQUARE ROOT
	In. wc	°F	
A center	0,057	70,13	0,2387
B center	0,057	70,11	0,2387
A1	0,046	70,1	0,2145
A2	0,048	70,12	0,2191
A3	0,051	70,11	0,2258
A4	0,047	70,07	0,2168
B1	0,050	70,090	0,2236
B2	0,051	70,130	0,2258
B3	0,050	70,160	0,2236
B4	0,046	70,180	0,2145
AVERAGE	0,0503	70,1200	0,2241

Project nu.	PI 20149
Date	23-05-2017
Technicien	M.M

Filter set weight

Number	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			
Before (1)	2	701	706	9	5	900	906	22	16	911	912	32	913		
Before (2)															
Before (3)															
Before (4)															
Before (5)	61,1014	0,1285	0,1272	10,3516	61,5072	0,1252	0,1269	10,7871	108,7544	0,1290	0,1296	10,4227	0,1299	19/05/2017	18:00
Before (6)	61,1015	0,1284	0,1271	10,3517	61,5071	0,1251	0,1268	10,7872	108,7545	0,1290	0,1297	10,4226	0,1298	23/05/2017	09:00
After (1)	61,1019	0,1284	0,1271	10,3546	61,5074	0,1247	0,1266	10,7891	108,7554	0,1285	0,1294	10,4260	0,1299	23/05/2017	15:00
After (2)	61,1016	0,1282	0,1271	10,3529	61,5072	0,1247	0,1266	10,7880	108,7551	0,1284	0,1294	10,4255	0,1298	24/05/2017	08:00
After (3)	61,1016	0,1282	0,1271	10,3529	61,5072	0,1247	0,1266	10,7880	108,7551	0,1284	0,1294	10,4244	0,1298	29/05/2017	08:00
After (4)	61,1016	0,1282	0,1271	10,3529	61,5072	0,1247	0,1266	10,7880	108,7551	0,1284	0,1294	10,4244	0,1298	30/05/2017	08:00
After (5)															
After (6)	61,1016	0,1282	0,1271	10,3529	61,5072	0,1247	0,1266	10,7880	108,7551	0,1284	0,1294	10,4244	0,1298	30/05/2017	08:00
Difference	0,0001	-0,0002	0,0000	0,0012	0,0001	-0,0004	-0,0002	0,0008	0,0006	-0,0006	-0,0003	0,0018	0,0000		
Total (mg)		1,1				1,4				1,5			0		
Total ajusté (mg)		1,10				1,40				1,50					

Project nu. PI 20149

Date 23-05-2017

Technicien M.M

SFBA EPA EMISSION RESULTS

RESULTS

Average emission rate: 0,40 g/hr

Burn Rate : 0,997 Dry kg/hr

Test Duration: 209 min

PRESSURE FACTOR: DGM 1 0,96557
 DGM 2 0,96752
 DGM 3 0,99141

BAROMETRIC PRESSURE
 Average: 29,662874 in Hg
 Start: 29,707169 in Hg
 End: 29,618579 in Hg

TEMPERATURE FACTORS DGM 1 0,98402
 DGM 2 0,98412
 DGM 3 0,98916

DGM CONTROLLER VALUES

DGM 1 Final: 18056,885 Cuft
 Initial: 18016,768 Cuft

VOLUMES SAMPLED DGM 1 37,622 SCft
 DGM 2 37,061 SCft
 DGM 3 46,026 SCft

DGM 2 Final: 15255,879 Cuft
 Initial: 15216,800 Cuft

DGM #3 Final: 149,880 Cuft
 Initial: 102,280 Cuft

TOTAL TUNNEL VOLUME : 35754

TEMPERATURES

SAMPLE RATIOS
 Sample Train 1: 950,350
 Sample Train 2: 964,733

DGM 1 536,572 °R
 DGM 2 536,518 °R

Paticulate concentration
 Sample Train 1 0,000037 g/dscf
 Sample Train 2 0,000040 g/dscf
 Room 0,000000 g/dscf

CALIBRATION FACTORS

DGM 1 0,9870
 DGM 2 0,9960
 DGM #3 0,9860

TUNNEL FLOW RATE: 171,070 Dscfm

TOTAL EMISSIONS
 Sample Train 1 1,33 g
 Sample Train 2 1,45 g

PARTICULATE CATCH

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

EMISSION RATES
 Sample Train 1 0,38 g/hr
 Sample Train 2 0,42 g/hr

1st hour emission rate 1,05 g/hr

DEVIATION: 4,20%

Cs Train 1 Train 2
 3,721E-05 4,04742E-05

*		*	*	*	*	*1	*2	*3	*4	*5	*6	*7	*8
Elapsed		Weight				Flue	Room	Tunnel	Unit	Unit	Unit	Unit	Unit
Time	Raw data row	Remaining	CO	CO ₂	O ₂	Gas	Temp	Dry Bulb	Top	Back	R.Side	L.Side	Bottom
min		lbs	%	%	%	°F	°F	°F	°F	°F	°F	°F	°F
0,00	179,00	9,2	0,1	4,8	0,0	283,6	72,6	104,8	402,5	283,0	375,7	340,9	400,8
1,0	180,0	8,9	0,0	4,6	0,0	304,1	72,6	93,3	397,3	283,7	374,4	339,0	399,7
2,0	181,0	8,9	0,0	1,5	0,0	333,0	72,5	94,3	400,1	283,6	372,7	338,6	398,1
3,0	182,0	8,7	0,0	2,0	0,0	355,7	72,6	95,8	413,9	283,4	371,0	337,5	396,8
4,0	183,0	8,6	0,0	2,2	0,0	378,9	72,6	97,4	431,9	282,7	369,2	336,8	395,0
5,0	184,0	8,5	0,0	1,9	0,0	342,3	72,6	90,4	439,0	282,0	367,3	335,5	395,2
6,0	185,0	8,4	0,0	5,3	0,0	314,9	72,6	88,2	434,5	281,2	365,2	334,3	395,1
7,0	186,0	8,4	0,0	5,3	0,0	300,0	72,6	87,9	429,5	279,7	363,0	332,7	393,5
8,0	187,0	8,3	0,0	6,3	0,0	294,4	72,6	87,5	425,8	278,2	360,5	330,9	392,4
9,0	188,0	8,2	0,0	9,8	0,0	299,3	72,6	87,9	428,0	276,7	357,9	329,2	390,6
10,0	189,0	8,1	0,1	10,6	0,0	307,9	72,5	88,9	433,0	275,2	355,1	326,7	389,0
11,0	190,0	7,9	0,1	10,7	0,0	316,6	72,6	88,8	439,4	273,4	353,2	324,6	386,9
12,0	191,0	7,8	0,0	10,3	0,0	319,9	72,6	89,2	445,3	272,1	350,7	323,0	384,6
13,0	192,0	7,8	0,0	8,6	0,0	321,8	72,6	88,5	446,6	271,2	348,7	320,6	383,0
14,0	193,0	7,7	0,0	8,8	0,0	323,8	72,6	88,8	447,8	269,6	346,9	318,5	380,6
15,0	194,0	7,6	0,0	10,5	0,0	326,2	72,6	89,4	450,0	268,3	345,0	316,7	378,4
16,0	195,0	7,4	0,0	11,4	0,0	334,4	72,6	90,2	453,8	267,4	343,0	315,0	376,0
17,0	196,0	7,2	0,3	12,5	0,0	344,3	72,7	91,3	462,2	266,5	341,1	314,0	373,3
18,0	197,0	7,1	0,6	12,9	0,0	345,6	72,7	91,6	475,8	265,7	339,9	312,5	371,2
19,0	198,0	7,0	0,5	12,9	0,0	343,6	72,8	91,8	487,8	265,5	338,6	311,9	368,9
20,0	199,0	6,8	0,4	13,3	0,0	341,7	72,8	91,8	498,5	265,3	338,0	311,1	367,2
21,0	200,0	6,7	0,3	13,4	0,0	341,5	72,8	92,0	507,4	265,2	337,4	310,9	364,7
22,0	201,0	6,6	0,4	13,4	0,0	341,3	72,6	91,4	515,6	265,9	336,7	311,1	363,0
23,0	202,0	6,4	0,3	13,5	0,0	341,0	72,8	91,5	522,5	266,2	336,4	311,6	360,7
24,0	203,0	6,3	0,3	13,6	0,0	341,9	72,8	91,5	528,7	267,3	336,5	311,7	359,2
25,0	204,0	6,2	1,0	13,1	0,0	340,8	72,8	91,4	534,0	267,5	336,2	313,2	356,8
26,0	205,0	6,0	1,3	13,5	0,0	341,0	72,8	91,2	537,5	268,4	336,0	314,0	354,9
27,0	206,0	5,9	1,4	13,5	0,0	341,8	73,0	91,5	542,7	269,6	336,2	315,0	353,4
28,0	207,0	5,8	1,4	13,5	0,0	340,7	72,9	91,6	548,3	270,8	336,1	315,8	351,4
29,0	208,0	5,7	1,4	13,5	0,0	340,0	72,9	91,2	552,2	272,0	336,2	316,8	349,7
30,0	209,0	5,5	1,5	13,6	0,0	339,5	73,0	90,7	556,6	273,0	336,7	318,0	348,2
31,0	210,0	5,4	1,6	13,7	0,0	338,7	73,1	90,8	560,7	274,1	337,7	319,1	346,7
32,0	211,0	5,3	1,7	13,7	0,0	337,6	73,2	90,8	563,7	276,0	338,8	320,3	345,5
33,0	212,0	5,1	1,6	13,8	0,0	336,5	73,1	91,3	565,8	276,9	340,0	322,3	343,8
34,0	213,0	5,0	1,4	13,9	0,0	335,6	73,2	91,1	569,6	278,2	341,6	323,8	342,6
35,0	214,0	4,9	1,0	13,9	0,0	335,5	73,2	91,1	572,2	279,9	343,2	325,8	340,6
36,0	215,0	4,8	0,9	13,8	0,0	334,5	73,3	90,8	576,3	281,2	344,9	327,4	339,3
37,0	216,0	4,7	0,9	13,9	0,0	333,4	73,3	90,9	579,1	282,8	347,0	329,0	338,1
38,0	217,0	4,6	1,0	14,0	0,0	333,5	73,3	91,1	582,0	283,9	348,7	330,6	336,0
39,0	218,0	4,5	0,9	13,9	0,0	333,0	73,3	90,8	583,7	285,0	350,7	332,8	334,4
40,0	219,0	4,4	0,9	13,8	0,0	331,9	73,4	90,9	584,8	286,9	352,8	333,8	333,6
41,0	220,0	4,3	0,7	13,8	0,0	329,5	73,4	90,6	585,6	288,1	354,7	336,1	331,9
42,0	221,0	4,2	0,5	13,7	0,0	329,3	73,4	90,4	586,8	289,8	356,7	338,3	330,0
43,0	222,0	4,1	0,5	13,7	0,0	328,8	73,5	90,7	587,1	291,3	359,0	339,2	329,2
44,0	223,0	4,0	0,7	13,9	0,0	329,2	73,5	90,6	589,5	292,4	360,7	341,8	327,2
45,0	224,0	3,9	0,7	13,8	0,0	329,0	73,5	90,5	591,3	294,7	362,3	343,1	325,8
46,0	225,0	3,8	0,6	13,7	0,0	327,4	73,6	90,7	590,8	295,4	364,7	345,6	323,8
47,0	226,0	3,7	0,6	13,7	0,0	326,8	73,7	89,9	592,1	297,2	366,8	347,3	322,3
48,0	227,0	3,6	0,4	13,9	0,0	326,5	73,7	90,0	592,7	298,3	368,8	349,5	320,5
49,0	228,0	3,5	0,8	14,0	0,0	327,2	73,8	90,7	593,9	299,2	371,2	351,5	318,7
50,0	229,0	3,4	1,0	13,9	0,0	328,4	73,8	90,6	596,1	300,8	373,4	353,2	317,4
51,0	230,0	3,4	0,7	13,9	0,0	328,0	73,7	91,1	595,6	301,9	375,2	355,2	315,5
52,0	231,0	3,3	0,5	13,9	0,0	327,8	73,8	90,5	596,3	304,0	376,9	357,6	313,8
53,0	232,0	3,2	0,7	14,0	0,0	327,7	73,7	90,6	596,3	304,7	378,6	359,6	312,3
54,0	233,0	3,1	0,2	13,9	0,0	328,7	73,9	90,6	596,5	306,5	381,0	361,5	311,3
55,0	234,0	3,0	0,2	13,9	0,0	328,7	73,9	90,7	598,1	307,8	382,8	362,8	310,1
56,0	235,0	2,9	0,7	13,8	0,0	327,6	74,0	90,5	599,7	309,0	385,0	365,0	309,1
57,0	236,0	2,8	0,6	13,6	0,0	325,1	74,0	90,2	600,7	311,1	387,1	366,6	308,2
58,0	237,0	2,7	0,4	13,4	0,0	323,4	73,9	89,9	602,0	312,0	389,0	368,7	306,6
59,0	238,0	2,6	0,4	13,3	0,0	321,9	73,9	89,6	600,8	313,5	390,7	370,1	305,9
60,0	239,0	2,6	0,4	13,3	0,0	318,7	73,8	89,2	599,7	314,7	391,9	372,3	304,4
61,0	240,0	2,5	0,2	13,3	0,0	317,0	74,0	89,9	597,3	315,4	393,5	374,0	303,7
62,0	241,0	2,5	0,0	13,1	0,0	315,4	74,0	89,4	595,1	316,6	395,5	375,5	303,3
63,0	242,0	2,4	0,0	13,1	0,0	313,6	73,9	89,8	592,3	317,9	396,7	377,4	302,4
64,0	243,0	2,3	0,0	12,9	0,0	310,9	74,0	89,3	590,2	319,0	398,9	378,9	302,0
65,0	244,0	2,2	0,0	12,3	0,0	307,3	74,1	89,0	586,7	320,2	400,3	380,0	301,7
66,0	245,0	2,2	0,0	11,5	0,0	302,6	74,1	88,7	583,9	321,1	402,2	381,5	301,3
67,0	246,0	2,2	0,0	11,0	0,0	297,2	74,1	88,7	579,9	322,1	403,7	382,9	300,8
68,0	247,0	2,1	0,0	10,6	0,0	292,3	74,1	88,1	576,2	323,7	405,0	383,6	300,7
69,0	248,0	2,1	0,0	10,1	0,0	288,1	74,1	87,8	570,4	323,9	406,0	385,1	300,2
70,0	249,0	2,1	0,0	9,8	0,0	284,1	74,2	87,5	565,7	325,6	407,2	386,1	300,5
71,0	250,0	2,0	0,0	9,7	0,0	280,7	74,1	87,3	560,3	325,7	407,8	387,1	300,4
72,0	251,0	2,0	0,0	9,7	0,0	277,8	74,0	87,3	554,8	326,1	408,1	387,7	300,5
73,0	252,0	1,9	0,0	9,5	0,0	274,8	74,0	87,2	549,1	326,8	408,5	388,5	300,7
74,0	253,0	1,9	0,0	9,5	0,0	271,8	74,1	87,0	543,6	327,2	408,6	389,3	300,7
75,0	254,0	1,9	0,0	9,5	0,0	268,7	74,1	86,9	538,2	327,8	408,5	389,9	301,1
76,0	255,0	1,9	0,0	9,4	0,0	266,3	74,0	86,7	532,7	327,1	408,3	390,5	301,1
77,0	256,0	1,8	0,0	9,4	0,0	263,9	74,1	86,5	527,5	327,1	408,0	390,6	301,7
78,0	257,0	1,8	0,0	9,2	0,0	261,0	74,0	86,3	521,6	327,3	407,4	390,5	302,1
79,0	258,0	1,8	0,0	9,0	0,0	258,7	74,1	86,2	515,3	327,3	407,0	390,9	302,3
80,0	259,0	1,8	0,0	8,9	0,0	256,2	74,1	86,1	509,5	327,1	406,2	390,3	302,8
81,0	260,0	1,8	0,0	8,8	0,0	254,5	74,1	85,8	503,0	327,2	405,7	390,3	303,4
82,0	261,0	1,7	0,0	8,8	0,0	252,6	74,0	85,5	497,3	326,7	404,6	390,2	303,5
83,0	262,0	1,7	0,0	8,8	0,0	251,3	74,1	85,6	491,5	327,0	404,3	389,7	304,3
84,0	263,0	1,7	0,0	8,7	0,0	248,9	74,0	85,5	486,2	325,9	403,1	389,2	304,9
85,0	264,0	1,7	0,0	8,7	0,0	248,0	74,1	85,2	480,6	325,8	402,4	388,6	305,6
86,0	265,0	1,7	0,0	8,7	0,0	246,8	74,0	85,3	475,5	325,7	401,5	387,4	306,3
87,0	266,0	1,7	0,0	8,6	0,0	244,7	74,0	85,3	471,6	325,4	400,7	386,9	307,0
88,0	267,0	1,6	0,0	8,6	0,0	243,4	74,0	85,3	466,5	326,0			

102,0	281,0	1,4	0,0	8,3	0,0	227,6	73,9	83,9	420,5	323,8	386,8	372,5	316,5
103,0	282,0	1,4	0,0	8,2	0,0	226,8	73,8	83,7	417,8	323,2	385,9	371,6	317,0
104,0	283,0	1,4	0,0	8,3	0,0	226,4	73,8	83,8	415,8	322,7	385,0	370,5	317,6
105,0	284,0	1,4	0,0	8,5	0,0	225,6	73,9	83,7	412,9	322,2	384,1	369,6	318,0
106,0	285,0	1,4	0,0	8,3	0,0	225,1	73,9	83,7	411,1	321,4	383,2	368,4	318,4
107,0	286,0	1,4	0,0	8,4	0,0	224,8	73,9	83,4	408,2	321,1	382,1	367,5	318,8
108,0	287,0	1,3	0,0	8,5	0,0	224,0	73,9	83,5	406,5	320,6	381,8	366,6	319,5
109,0	288,0	1,3	0,0	8,4	0,0	223,3	74,0	83,5	404,3	319,7	380,8	365,8	319,8
110,0	289,0	1,3	0,0	8,3	0,0	223,4	73,9	83,5	402,3	319,2	379,8	365,0	320,2
111,0	290,0	1,2	0,0	8,2	0,0	222,5	73,8	83,4	400,1	319,3	378,3	364,2	320,5
112,0	291,0	1,3	0,0	8,1	0,0	222,2	73,9	83,2	398,2	318,0	377,5	363,4	320,7
113,0	292,0	1,2	0,0	8,1	0,0	221,8	74,0	83,0	396,6	317,8	377,0	362,6	321,1
114,0	293,0	1,2	0,0	8,1	0,0	221,2	73,9	83,3	394,3	317,4	376,0	361,9	321,7
115,0	294,0	1,2	0,0	8,1	0,0	221,1	73,9	83,1	392,6	316,7	375,0	360,5	322,0
116,0	295,0	1,2	0,0	8,0	0,0	220,6	74,0	83,1	391,5	316,5	374,1	360,1	322,3
117,0	296,0	1,2	0,0	7,9	0,0	220,1	74,0	83,0	389,6	316,3	373,1	359,3	322,6
118,0	297,0	1,2	0,0	7,9	0,0	219,4	73,9	83,1	387,9	315,6	372,2	358,6	322,9
119,0	298,0	1,2	0,0	8,0	0,0	218,6	74,0	83,1	386,4	315,2	371,2	357,8	323,2
120,0	299,0	1,2	0,0	7,9	0,0	218,3	73,9	83,1	384,6	314,5	370,2	356,9	323,5
121,0	300,0	1,1	0,0	7,9	0,0	217,9	73,9	83,0	383,5	314,5	369,6	355,9	323,8
122,0	301,0	1,1	0,0	7,8	0,0	217,1	73,9	83,0	381,9	314,0	368,6	355,1	324,1
123,0	302,0	1,1	0,0	7,8	0,0	216,8	73,9	82,8	380,3	313,5	368,0	354,2	324,3
124,0	303,0	1,1	0,0	7,8	0,0	216,8	73,9	83,0	379,1	312,8	367,1	353,5	324,5
125,0	304,0	1,1	0,0	7,8	0,0	216,2	73,9	82,9	377,8	312,3	366,0	352,7	324,9
126,0	305,0	1,1	0,0	7,9	0,0	216,1	73,9	83,0	376,5	312,0	365,2	351,8	325,0
127,0	306,0	1,0	0,0	7,7	0,0	215,3	74,0	83,0	375,1	311,7	364,2	351,3	325,2
128,0	307,0	1,0	0,0	7,7	0,0	215,2	73,9	82,8	374,2	311,6	363,0	350,5	324,9
129,0	308,0	1,0	0,0	7,6	0,0	214,5	73,9	82,9	372,9	310,8	362,3	349,2	325,7
130,0	309,0	1,0	0,0	7,7	0,0	214,9	73,9	82,9	371,5	309,9	361,2	348,8	325,5
131,0	310,0	1,0	0,0	7,7	0,0	214,8	74,0	82,9	370,2	309,4	360,0	348,0	325,4
132,0	311,0	1,0	0,0	7,7	0,0	214,0	74,0	82,5	369,3	309,7	359,2	347,4	325,8
133,0	312,0	1,0	0,0	7,7	0,0	213,8	74,1	82,7	368,2	308,9	358,3	346,6	326,0
134,0	313,0	1,0	0,0	7,7	0,0	213,3	74,1	82,9	367,0	308,2	357,2	345,2	326,2
135,0	314,0	0,9	0,0	7,6	0,0	212,9	74,0	82,4	366,2	308,0	356,7	345,0	326,3
136,0	315,0	0,9	0,0	7,5	0,0	212,3	74,0	82,6	364,5	307,0	355,7	344,0	326,4
137,0	316,0	0,9	0,0	7,5	0,0	212,3	74,0	82,4	364,1	307,3	354,7	343,2	326,6
138,0	317,0	0,9	0,0	7,5	0,0	212,3	74,0	82,2	363,2	306,4	353,8	342,9	326,5
139,0	318,0	0,8	0,0	7,5	0,0	212,1	74,1	82,5	361,6	305,9	353,0	341,5	326,9
140,0	319,0	0,8	0,0	7,4	0,0	212,1	74,0	82,5	360,7	305,8	352,3	341,6	326,7
141,0	320,0	0,8	0,0	7,3	0,0	211,7	74,0	82,3	359,7	305,2	351,5	340,3	326,8
142,0	321,0	0,9	0,0	7,3	0,0	211,6	74,0	82,3	358,6	304,1	350,2	339,6	326,6
143,0	322,0	0,8	0,0	7,3	0,0	211,6	74,1	82,2	357,9	303,6	349,7	339,3	326,7
144,0	323,0	0,8	0,0	7,2	0,0	211,7	74,0	82,4	356,6	303,6	349,0	338,5	326,7
145,0	324,0	0,7	0,0	7,2	0,0	211,4	74,1	82,4	355,6	303,3	348,1	338,1	326,5
146,0	325,0	0,8	0,0	7,3	0,0	211,1	74,1	82,6	355,3	301,9	347,6	337,0	326,6
147,0	326,0	0,8	0,0	7,3	0,0	211,2	74,0	82,5	354,2	301,0	346,7	336,4	326,6
148,0	327,0	0,8	0,0	7,2	0,0	211,2	74,0	82,6	354,0	300,5	346,1	335,5	326,4
149,0	328,0	0,8	0,0	7,2	0,0	210,8	74,0	82,7	352,6	300,0	345,3	334,6	326,5
150,0	329,0	0,8	0,0	7,1	0,0	210,5	74,0	82,5	352,0	299,7	344,6	333,9	326,3
151,0	330,0	0,7	0,0	7,0	0,0	210,7	74,1	82,7	350,6	298,8	343,7	333,8	325,8
152,0	331,0	0,7	0,0	6,9	0,0	210,3	74,1	82,5	349,7	298,3	342,8	333,0	325,7
153,0	332,0	0,7	0,0	6,9	0,0	210,3	74,2	82,6	349,2	298,0	342,4	332,3	325,8
154,0	333,0	0,7	0,0	7,0	0,0	210,1	74,1	82,3	348,4	297,4	341,6	331,7	325,6
155,0	334,0	0,7	0,0	7,0	0,0	210,2	74,1	82,6	348,0	296,3	341,3	331,0	325,6
156,0	335,0	0,7	0,0	6,8	0,0	210,1	74,1	82,7	346,7	295,5	340,4	329,8	325,3
157,0	336,0	0,7	0,0	7,1	0,0	209,7	74,0	82,5	345,6	295,0	339,5	329,6	324,8
158,0	337,0	0,6	0,0	7,6	0,0	209,6	74,1	82,4	345,0	293,8	338,9	329,0	325,0
159,0	338,0	0,6	0,0	7,5	0,0	208,1	74,1	82,8	344,2	293,2	338,2	328,2	325,0
160,0	339,0	0,6	0,0	7,3	0,0	207,3	74,1	82,7	344,1	292,7	337,3	327,9	325,1
161,0	340,0	0,6	0,0	7,2	0,0	207,1	74,1	82,5	343,2	291,8	336,6	327,4	325,2
162,0	341,0	0,5	0,0	7,2	0,0	206,0	74,1	82,5	342,7	291,2	336,2	326,6	326,0
163,0	342,0	0,6	0,0	7,1	0,0	205,3	74,0	82,5	341,9	290,8	335,4	326,1	326,4
164,0	343,0	0,5	0,0	6,9	0,0	204,9	74,1	82,5	341,3	290,1	334,7	325,6	326,5
165,0	344,0	0,5	0,0	7,2	0,0	204,8	74,1	82,6	340,4	289,7	334,0	325,1	327,2
166,0	345,0	0,5	0,0	7,2	0,0	204,6	74,0	82,4	339,1	289,6	333,4	324,5	327,7
167,0	346,0	0,5	0,0	7,0	0,0	204,2	74,1	82,4	338,0	288,4	332,6	323,9	328,2
168,0	347,0	0,5	0,0	6,9	0,0	204,3	74,1	82,0	338,2	288,0	331,8	323,5	328,6
169,0	348,0	0,5	0,0	6,9	0,0	203,7	74,1	82,5	336,9	286,6	331,6	322,8	329,2
170,0	349,0	0,4	0,0	6,9	0,0	203,1	74,1	82,6	335,8	286,1	330,9	322,0	329,6
171,0	350,0	0,4	0,0	7,0	0,0	203,1	74,1	82,4	335,5	285,3	330,3	321,3	330,1
172,0	351,0	0,4	0,0	6,9	0,0	202,4	74,1	82,5	334,7	285,1	329,6	320,7	330,6
173,0	352,0	0,4	0,0	6,8	0,0	202,2	74,1	82,5	334,2	284,8	328,9	320,5	330,8
174,0	353,0	0,4	0,0	6,8	0,0	201,8	74,2	82,2	333,5	284,3	328,5	320,1	331,3
175,0	354,0	0,4	0,0	6,8	0,0	201,8	74,1	82,6	332,3	283,8	327,9	319,6	331,2
176,0	355,0	0,4	0,0	6,8	0,0	201,5	74,2	82,0	331,9	283,1	327,4	318,6	331,8
177,0	356,0	0,4	0,0	6,8	0,0	201,3	74,2	82,2	330,6	282,3	327,1	318,3	332,2
178,0	357,0	0,4	0,0	6,7	0,0	200,7	74,2	82,3	329,7	281,7	326,5	317,8	332,2
179,0	358,0	0,4	0,0	6,8	0,0	200,3	74,2	82,2	329,6	281,0	325,9	317,3	332,5
180,0	359,0	0,4	0,0	6,7	0,0	199,7	74,2	82,4	328,1	280,4	325,3	316,8	332,5
181,0	360,0	0,3	0,0	6,6	0,0	199,8	74,2	82,3	327,3	280,1	324,4	316,7	332,0
182,0	361,0	0,3	0,0	6,6	0,0	199,3	74,3	82,0	326,8	279,0	324,0	315,4	332,7
183,0	362,0	0,3	0,0	6,6	0,0	199,1	74,3	82,4	326,2	278,3	323,3	315,2	333,0
184,0	363,0	0,3	0,0	6,7	0,0	198,5	74,2	82,0	325,4	277,5	323,0	314,2	333,1
185,0	364,0	0,3	0,0	6,7	0,0	197,7	74,2	82,2	324,5	277,0	322,3	313,5	333,3
186,0	365,0	0,3	0,0	6,6	0,0	197,9	74,2	82,3	324,2	276,5	321,6	313,8	332,9
187,0	366,0	0,3	0,0	6,7	0,0	197,8	74,2	82,0	322,8	276,2	321,1	313,0	333,3
188,0	367,0	0,3	0,0	6,6	0,0	197,3	74,3	82,2	322,4	275,3	320,7	312,3	333,6
189,0	368,0	0,3	0,0	6,6	0,0	197,0	74,2	82,2	321,8	274,6	320,0	312,1	333,2
190,0	369,0	0,3	0,0	6,6	0,0	197,3	74,2	82,1	321,6	273,8	319,5	311,4	333,6
191,0	370,0	0,3	0,0	6,6	0,0	196,9	74,2	82,5	321,1	273,4	318,8	310,3	333,7
192,0	371,0	0,3	0,0	6,6	0,0	197,0	74,3	82,3	320,7	273,3	318,0	310,5	333,7
193,0													

208,0	387,0	0,1	0,0	7,2	0,0	198,1	74,3	82,3	318,8	262,6	308,7	303,3	329,6
209,0	388,0	0,0	0,0	7,2	0,0	198,1	74,2	82,4	318,7	261,9	308,1	303,2	329,2

Manufacturer: HEARTHSTONE
Model: GM 40

Run: 2
Project #: PI 20149
Test Duration: 209 min

	HHV	LHV
Eff	77.50%	83.76%
Comb Eff	97.95%	97.95%
HT Eff	79.12%	85.51%
Output	15 307	kJ/h
Burn Rate	1.00	kg/h
Grams CO	115	g
Input	19 752	kJ/h
MC wet	16,96	

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

Overall Heating Efficiency:	77.50%	Air Fuel Ratio (A/F)	29.89
Combustion Efficiency:	97.95%	Dry Molecular Weight (M _d)	421.70
Heat Transfer Efficiency:	79.12%	Dry Moles Exhaust Gas (N ₂):	12.10

Heat Output:	14 520 Btu/h	15 307 kJ/h
Heat Input:	18 736 Btu/h	19 752 kJ/h
Burn Duration:	3.48 h	
Burn Rate:	2.20 lb/h	0.997 kg/h
Stack Temp:	254.2 Deg. F	123.5 Deg. C

CO_{2-ut} Ultimate CO₂
F₀ 19.64
1.062

Date: 2017-05-23 Manufacturer: Hearthstone Model: GM 40
Project #: PJ 20149 Run: 2 Tech: MM Reviewer: DP

loading 25 LBS stand fine
- At 23 close Door
- At 0.8 LBS instl preload
- At 11.9 LBS close Door
At 1000 LBS close by pass
At 4.7 LBS close air inlet Drill bit (0.077 in)
At 23 LBS instl load
- open by pass
- open Door
- instl load open air inlet
- instl load
- close Door
- close by pass
- At 5 minute close air inlet / Drill bit (0.077 in)
TEST LOAD CONFIGURATION
4.7 LBS
Fan on Low

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

Side view	Front view	Top view

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

	ADDITION		SUBTRACTION	
	ft3	Volume	ft3	Volume
V measure				
V ashlip				
%				
V usable				
				
Usable Firebox: _____				
Test load weight: _____	Minimum: _____		Maximum: _____	
Déviation: _____				

PRE / POST CHECKS

Date: 2012-05-23 Manufacturer: Hearthstone Model: GM 40
 Project #: PT 20149 Run: 2 Tech: MM Reviewer: DP

Moisture Meter Calibration Check:

Facility Conditions:

Air Velocity from less than 2 feet

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%.....

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).....

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

Pre-Test

Post-Test

9 (max50 Fpm)	6 (max50 Fpm)
OK	OK
4 sides OK	OK

2012-05-19
2012-05-19
OK
OK

OK

OK	°F
OK	°F

OK
OK
OK

Train 1 st hour	Train 1	Train 2
02	05	10
701	900	911
706	906	912
11	11	12
OK	OK	OK

Date: 2017-05-24 Manufacturer: Hearst Heathston Model: GM 40
 Project #: PT 20149 Run: 2 Tech: MM Reviewer: DP

SAMPLING EQUIPMENT CHECK OUT

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)	51017782	51131486	51017788	51131495	430896.82	431999.16
Initial 1minute DGM (Liter)	51017782	51131485	51017788	51131495	430896.82	431999.16
Change © (Liter)	0	0.01	0	0	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	.5	3	.5
Check OK (no change after 15 sec.)	ok	ok	ok	ok

PRE-TEST SCALE AUDIT

Date: 2017-05-23 Manufacturer: Healthstone Model: GM 40
 Project #: PI 20142 Run: 2 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-122	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: 2017-05-23 Manufacturer: Heathstone Model: GM 40
 Project #: PI 20149 Run: 2 Tech: mm Reviewer: DP

Pre-Test (Adjust and Record)

	ZERO		SPAN		CAL. (Record Only)	
CO	0	0	2951	2971	0.998	1.00
Tolerance CO		+/- 0.02		+/- 0.15		+/- 0.05
CO ₂	0	0	1788	1787	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	0.001	2943	1.002	0.001	0.02	0.008	0.15	0.004	0.05	✓	
CO ₂	0	1784	9.75	0	0.02	0.04	0.5	0.01	0.5	✓	
O ₂	na	na	na	-	na	-	na	-	na	-	

TEST DATA LOG

Date: 2017-05-23 Manufacturer: Heathstone Model: GM 40
 Project #: PI 20749 Run: 2 Tech: MM Reviewer: NP

RAW DRY GAS METER READINGS

	System 1	System 2	Blank
Final (Liter)	511314.04	431998.38	149.88
Initial (Liter)	510178.05	430891.79	102.28

AMBIENT CONDITIONS

	Before	After
Barometer (kPa):	100.6	100.3
Dry Bulb (F):	70.07	77.18
Humidity (%):	49.0	39

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: 2017-05-23 Manufacturer: Hearthstone Model: GM 40
 Project #: PI 20149 Run: 2 Tech: MM Reviewer: DP

FUEL DESCRIPTION:

Type of wood:

PRE-TEST LOAD

Piece Size	Weight	Meter Moisture Content (% dry)*				
1.5 x 3 1/4 x 8 in.	0 908 lbs.	208	206	193	196	196
1.5 x 3 1/4 x 8 in.	0 940 lbs.	201	203	210	211	2018
1.5 x 3 1/4 x 8 in.	0 938 lbs.	206	204	210	218	213
1.5 x 3 1/4 x 8 in.	0 916 lbs.	221	219	216	213	210
1.5 x 3 1/4 x 8 in.	0 932 lbs.	213	210	216	212	210
1.5 x 3 1/4 x 8 in.	0 926 lbs.	220	220	221	218	213
1.5 x 3 1/4 x 8 in.	0 920 lbs.	213	216	216	214	218
1.5 x 3 1/4 x 8 in.	0 820 lbs.	213	213	218	216	216
1.5 x 3 1/4 x 8 in.	0 834 lbs.	226	191	198	197	212
1.5 x 3 1/4 x 8 in.	0 868 lbs.	221	221	226	220	216
1.5 x 3 x 8 in.	0 828 lbs.	226	218	220	216	214
1.5 x 3 x 8 in.	0 836 lbs.	218	213	214	213	210
1.5 x 3 x 8 in.	0 824 lbs.	216	212	211	215	213
1.5 x 3 x 8 in.	0 816 lbs.	213	216	201	206	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.					

TEST LOAD WEIGHT: 12.24 lbs

FUEL DATA

Date: 2017-05-23 Manufacturer: Heathstone Model: Gm 40
 Project #: 0120149 Run: 2 Tech: MM Reviewer: DP

FUEL DESCRIPTION:

Type of wood :

TEST LOAD

Piece Size			Weight	Meter Moisture Content (% dry)*					
1 1/2	x 3	x 13 1/4 in.	1,38	lbs.	200	201	202	203	208
1 1/2	x 3	x 13 1/4 in.	1,49	lbs.	205	208	210	206	203
1 1/2	x 3	x 13 1/4 in.	1,462	lbs.	206	203	204	204	201
1 1/2	x 3	x 13 1/4 in.	1,442	lbs.	200	201	202	206	199
1 1/2	x 3	x 13 1/4 in.	1,450	lbs.	208	206	201	205	202
1 1/2	x 3/4	x 5 in.	0,120	lbs.			206		
1 1/2	x 3/4	x 5 in.	0,116	lbs.			201		
1 1/2	x 3/4	x 5 in.	0,116	lbs.			203		
1 1/2	x 3/4	x 5 in.	0,140	lbs.			203		
1 1/2	x 3/4	x 5 in.	0,126	lbs.			205		
1 1/2	x 3/4	x 5 in.	0,120	lbs.			210		
1 1/2	x 3/4	x 5 in.	0,114	lbs.			211		
1 1/2	x 3/4	x 5 in.	0,152	lbs.			208		
1 1/2	x 3/4	x 5 in.	0,114	lbs.			205		
1 1/2	x 3/4	x 5 in.	0,118	lbs.			209		
1 1/2	x 3/4	x 5 in.	0,126	lbs.			209		
1 1/2	x 3/4	x 5 in.	0,116	lbs.			213		
1 1/2	x 3/4	x 5 in.	0,114	lbs.			210		
1 1/2	x 3/4	x 5 in.	0,112	lbs.			208		
1 1/2	x 3/4	x 5 in.	0,116	lbs.			206		
1 1/2	x 3/4	x 5 in.	0,144	lbs.			207		
	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: 922 lbs Min 20%: 184 Max 25%: 230

Date: 2017-05-19 Manufacturer: 11 EARTH 560 RL Model: GM 40
 Project #: PT 20147 Run: 2 Tech: MM Reviewer: BP

		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	02	701	706	9	05	900	906	22	913	
2017-05-19	18:00	61.10/14	0.1285	0.1272	10.35/6	61.50/72	0.1252	0.1269	10.78/71	0.1299	
2017-05-23	9:00	61.10/15	0.1284	0.1271	10.35/7	61.50/71	0.1251	0.1268	10.78/72	0.1298	

		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	02	701	706	9	05	900	906	22	913	
2017-05-23	15:00	61.10/19	0.1284	0.1271	10.35/46	61.50/74	0.1247	0.1266	10.78/91	0.1299	
2017-05-24	8:00	61.10/16	0.1282	0.1271	10.35/29	61.50/72	0.1247	0.1266	10.78/80	0.1298	
2017-05-29	8:00	61.10/16	0.1282	0.1271	10.35/29	61.50/72	0.1247	0.1266	10.78/80	0.1298	
2017-05-30	8:00	61.10/16	0.1282	0.1271	10.35/29	61.50/72	0.1247	0.1266	10.78/80	0.1298	

DILUTION TUNNEL PARTICULATE SAMPLER DATA

Date: 2017-05-19 Manufacturer: Highstone Model: GM40

Project #: PI 20149 Run: 2 Tech: MR Reviewer: DD

SYSTEM 2				
Pre-test Weight Record	Probe & Housing Number	Front Filter Number	Back Filter Number	gaskets
Date	Time			
2017-05-19	18:00	1087544	01290	01296 104227
2017-05-23	9:00	1087545	01290	01297 104226

SYSTEM 2				
Post-test Weight Record	Probe & Housing Number	Front Filter Number	Back Filter Number	gaskets
Date	Time			
2017-05-23	15:00	1087554	01285	01294 104260
2017-05-24	8:00	1087551	01284	01294 104255
2017-05-29	8:00	1087551	01284	01294 104244
2017-05-30	8:00	1087551	01284	01294 104244

Paramètres

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

Code verrouillage: HEA

Description du test

Test standard	EPA
Run #	3
Date	24-05-2017
Technicien	M.M
Project #	PI 20149

Description de l'unité

Manufacturier	HEARTHSTONE	
Modèle	GM 40	
Combustion system	Cat	
Appliance type	WOOD STOVE	
Firebox volume	1,32	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	na	BTU/h Donnée fournie par le manfacturier
Targeted category	1	
Targeted output	na	BTU/h
Cp steel	na	BTU/lb-°F

Échantillonnage

Blank sampling rate	0,20	cuft/min
Internal probe diameter	0,18	in.
Calibration Factor (DGM #1):	0,987	Dimensionless
Equipment number (DGM #1):	EM-178	
Calibration Factor (DGM #2):	0,996	Dimensionless
Equipment number (DGM #2):	EM-179	
Calibration Factor (DGM #3):	0,986	Dimensionless
Equipment number (DGM #3):	EM-070	

Tunnel

Targeted tunnel flow rate	140	scfm
Tunnel diameter	6	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 20149
Date	24-05-2017
Technicien	M.M

Fuel data

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

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

	Start	End
Barometer (kPa):	100,2	100
Barometer (in.Hg):	29,589049	29,529989
Dry Bulb (F):	72,68	79,34
Humidity (%):	48,8	42,5
Air velocity (ft/min)	5	3

DGM #1	Final: ##### cuft
	Initial: ##### cuft
DGM #2	Final: ##### cuft
	Initial: ##### cuft

DGM room	
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Final: 512525,210	Liter
Initial: 511315,360	Liter
Final: 433175,520	Liter
Initial: 432000,500	Liter

Final: 207,800	cuft
Initial: 149,880	cuft

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

203

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

Project nu.	PI 20149
Date	24-05-2017
Technicien	M.M

FUEL LOAD DATA SHEET, CSA B415

Test Load Weight:

Lower	Ideal	Upper
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8,3	9,2	10,2
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* 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):	29,0	lbs./ft3
Dry Wood Density:	23,9	lbs./ft3

[illegible]

Test Load Weight: lbs.

Dry Weight: kg.

Average Moisture Content: %

Dry:	21,32	Dry(EPA)	21,32
		Dry(B415)	21,32

21,32
Must be 19-25

Wet: 17,57
must be 15,2-22

Coal Bed Range: 1,8 lbs. to

2,3 lbs.

TEST CHARGE:

Coal bed weight: 2,1

lbs.

Project nu.	PI 20149
Date	24-05-2017
Technicien	M.M

Tunnel Traverse Worksheet (for velocity calculations)

Static Pressure: 0,22 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=
0,946

Pour un tunnel moins de 12", prendre 4 lectures

	TUNNEL VELOCITY	TUNNEL TEMP	SQUARE ROOT
	In. wc	°F	
A center	0,057	71,08	0,2387
B center	0,056	71,04	0,2366
A1	0,047	71,06	0,2168
A2	0,049	71,09	0,2214
A3	0,048	71,13	0,2191
A4	0,051	71,17	0,2258
B1	0,050	71,110	0,2236
B2	0,047	70,860	0,2168
B3	0,049	70,930	0,2214
B4	0,052	70,990	0,2280
AVERAGE	0,0506	71,0460	0,2248

Project nu.	PI 20149
Date	24-05-2017
Technicien	M.M

Filter set weight

Number	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			
Before (1)	6	358	702	8	17	709	730	21	43	734	913	31	914		
Before (2)															
Before (3)															
Before (4)															
Before (5)	61,3768	0,1286	0,1257	10,2107	108,9515	0,1259	0,1313	10,2274	109,1638	0,1300	0,1273	10,9732	0,1259	23/05/2017	17:30
Before (6)	61,3768	0,1287	0,1257	10,2106	108,9514	0,1258	0,1312	10,2275	109,1638	0,1299	0,1274	10,9733	0,1260	24/05/2017	08:30
After (1)	61,3773	0,1283	0,1254	10,2140	108,9525	0,1249	0,1305	10,2307	109,1642	0,1291	0,1267	10,9764	0,1261	24/05/2017	15:00
After (2)	61,3771	0,1283	0,1254	10,2120	108,9520	0,1249	0,1305	10,2290	109,1641	0,1291	0,1267	10,9753	0,1261	29/05/2017	08:00
After (3)	61,3771	0,1283	0,1254	10,2120	108,9520	0,1249	0,1305	10,2290	109,1641	0,1291	0,1267	10,9759	0,1261	30/05/2017	08:00
After (4)															
After (5)															
After (6)	61,3771	0,1283	0,1254	10,2120	108,9520	0,1249	0,1305	10,2290	109,1641	0,1291	0,1267	10,9759	0,1261	30/05/2017	08:00
Difference	0,0003	-0,0004	-0,0003	0,0014	0,0006	-0,0009	-0,0007	0,0015	0,0003	-0,0008	-0,0007	0,0026	0,0001		
Total (mg)		1				1,5				1,4			0,1		
Total ajusté (mg)		0,90				1,40				1,30					

Project nu. PI 20149

Date 24-05-2017

Technicien M.M

SFBA EPA EMISSION RESULTS

RESULTS

Average emission rate: 0,35 g/hr

Burn Rate : 0,934 Dry kg/hr

Test Duration: 222 min

PRESSURE FACTOR: DGM 1 0,96219
DGM 2 0,96410
DGM 3 0,98795

BAROMETRIC PRESSURE
Average: 29,559519 in Hg
Start: 29,589049 in Hg
End: 29,529989 in Hg

TEMPERATURE FACTORS DGM 1 0,98120
DGM 2 0,98103
DGM 3 0,98396

DGM CONTROLLER VALUES

DGM 1 Final: 18099,657 Cuft
Initial: 18056,932 Cuft

VOLUMES SAMPLED DGM 1 39,813 SCft
DGM 2 39,090 SCft
DGM 3 55,516 SCft

DGM 2 Final: 15297,449 Cuft
Initial: 15255,954 Cuft

DGM #3 Final: 207,800 Cuft
Initial: 149,880 Cuft

TOTAL TUNNEL VOLUME : 37354

TEMPERATURES

SAMPLE RATIOS
Sample Train 1: 938,239
Sample Train 2: 955,592

DGM 1 538,116 °R
DGM 2 538,208 °R

Paticulate concentration
Sample Train 1 0,000038 g/dscf
Sample Train 2 0,000036 g/dscf
Room 0,000002 g/dscf

CALIBRATION FACTORS

DGM 1 0,9870
DGM 2 0,9960
DGM #3 0,9860

TUNNEL FLOW RATE: 168,261 Dscfm

TOTAL EMISSIONS
Sample Train 1 1,34 g
Sample Train 2 1,27 g

PARTICULATE CATCH
Total Sample Train 1: 1,50 mg
Total Sample Train 2: 1,40 mg
Total Sample Train 1 1st hour: 1,00 mg

EMISSION RATES
Sample Train 1 0,36 g/hr
Sample Train 2 0,34 g/hr

1st hour emission rate 0,94 g/hr

DEVIATION: 2,66%

Cs Train 1 Train 2
3,768E-05 3,5815E-05

*		*	*	*	*	*1	*2	*3	*4	*5	*6	*7	*8
Elapsed		Weight				Flue	Room	Tunnel	Unit	Unit	Unit	Unit	Unit
Time	Raw data row	Remaining	CO	CO ₂	O ₂	Gas	Temp	Dry Bulb	Top	Back	R.Side	L.Side	Bottom
min		lbs	%	%	%	°F	°F	°F	°F	°F	°F	°F	°F
0.00	203.00	9.2	0.1	0.6	0.0	254.4	74.9	106.4	351.1	268.2	341.5	313.6	434.1
1.0	204.0	9.1	0.1	1.7	0.0	258.6	74.9	91.5	345.3	269.4	340.0	312.2	429.6
2.0	205.0	9.1	0.0	3.6	0.0	271.7	74.8	91.0	341.7	269.2	338.2	311.1	424.8
3.0	206.0	9.0	0.0	4.3	0.0	284.4	74.9	91.2	342.0	268.5	336.6	309.3	420.6
4.0	207.0	8.9	0.0	6.3	0.0	297.8	75.0	92.0	345.3	268.2	334.4	308.0	416.7
5.0	208.0	8.8	0.0	5.5	0.0	268.0	74.9	86.8	346.1	266.1	332.4	306.2	415.4
6.0	209.0	8.8	0.0	3.0	0.0	249.0	74.6	85.9	342.2	264.1	329.9	304.6	413.6
7.0	210.0	8.8	0.0	2.8	0.0	237.1	74.6	85.0	337.9	262.7	327.5	302.6	410.5
8.0	211.0	8.7	0.0	2.8	0.0	229.8	74.6	84.2	334.2	261.1	324.8	299.8	408.1
9.0	212.0	8.7	0.0	3.4	0.0	225.9	74.6	84.3	330.9	258.9	322.4	298.0	405.3
10.0	213.0	8.6	0.0	4.2	0.0	224.8	74.7	84.3	328.1	256.8	319.5	295.4	402.0
11.0	214.0	8.6	0.0	5.2	0.0	225.7	74.9	84.6	327.0	254.5	317.1	293.5	399.3
12.0	215.0	8.6	0.0	5.6	0.0	228.9	74.9	84.8	326.9	251.8	314.3	291.7	395.8
13.0	216.0	8.5	0.0	6.6	0.0	231.9	74.9	84.8	329.4	249.9	312.1	289.4	393.4
14.0	217.0	8.4	0.0	6.1	0.0	236.8	75.0	85.0	331.6	247.6	309.8	287.6	390.5
15.0	218.0	8.3	0.1	10.1	0.0	245.7	74.9	85.9	339.7	245.0	307.5	285.8	387.6
16.0	219.0	8.2	0.0	9.9	0.0	251.6	74.8	85.9	349.5	243.0	305.4	284.3	384.6
17.0	220.0	8.1	0.0	7.6	0.0	253.9	74.9	85.9	355.3	241.3	303.8	282.7	381.7
18.0	221.0	8.1	0.0	7.2	0.0	258.6	74.8	86.3	357.6	239.6	302.1	281.2	379.0
19.0	222.0	8.0	0.0	10.8	0.0	268.4	74.9	87.3	364.1	238.5	300.6	279.9	376.1
20.0	223.0	7.9	0.0	11.2	0.0	278.6	75.0	87.6	370.4	237.4	299.3	278.3	373.7
21.0	224.0	7.8	0.0	10.5	0.0	284.3	75.0	87.6	377.1	236.6	298.0	277.3	370.7
22.0	225.0	7.7	0.0	10.2	0.0	288.0	75.1	87.6	383.6	235.4	297.0	276.1	368.7
23.0	226.0	7.6	0.0	10.1	0.0	294.0	75.2	88.4	387.3	234.5	296.1	275.1	366.5
24.0	227.0	7.4	0.5	12.1	0.0	302.2	75.1	88.7	390.1	234.1	295.1	274.0	363.9
25.0	228.0	7.3	0.7	12.3	0.0	311.6	74.8	89.4	394.3	233.8	294.6	273.4	361.0
26.0	229.0	7.2	0.9	12.2	0.0	317.5	74.9	89.9	402.3	233.3	293.8	272.8	358.1
27.0	230.0	7.1	0.9	12.5	0.0	319.0	75.3	89.9	413.8	233.5	294.1	272.2	357.3
28.0	231.0	6.9	0.6	12.7	0.0	317.8	75.3	89.9	422.5	234.0	294.0	272.1	355.0
29.0	232.0	6.8	0.5	12.4	0.0	317.7	75.4	89.9	428.7	234.7	294.2	272.1	353.5
30.0	233.0	6.7	0.5	13.0	0.0	319.1	75.5	90.0	434.0	235.5	294.5	272.5	351.5
31.0	234.0	6.6	0.5	12.6	0.0	318.9	75.5	90.2	440.7	236.7	295.1	272.9	349.2
32.0	235.0	6.5	0.2	12.1	0.0	317.8	75.4	90.3	447.1	237.8	295.7	273.4	347.4
33.0	236.0	6.4	0.3	12.0	0.0	317.5	75.6	90.1	453.4	238.9	296.5	273.6	345.9
34.0	237.0	6.3	0.3	12.1	0.0	316.9	75.5	89.9	458.5	240.4	297.3	274.3	343.5
35.0	238.0	6.2	0.5	12.3	0.0	316.6	75.6	90.2	463.3	241.8	298.4	274.8	342.1
36.0	239.0	6.1	0.9	12.6	0.0	318.1	75.8	90.6	468.8	243.3	299.6	275.2	340.4
37.0	240.0	6.0	1.3	13.1	0.0	320.0	75.8	91.0	475.3	244.8	300.9	275.8	338.9
38.0	241.0	5.8	1.6	13.4	0.0	320.8	75.9	91.1	483.2	246.0	302.5	277.1	337.4
39.0	242.0	5.7	0.9	13.5	0.0	318.2	76.0	90.8	491.8	248.0	303.9	278.5	335.9
40.0	243.0	5.6	0.2	12.8	0.0	313.0	76.0	90.3	499.0	249.3	305.7	279.9	334.3
41.0	244.0	5.6	0.0	11.6	0.0	307.5	76.1	89.8	507.1	250.7	307.5	281.4	332.9
42.0	245.0	5.5	0.1	11.1	0.0	302.4	76.0	89.1	513.9	252.5	309.2	283.4	330.8
43.0	246.0	5.4	0.2	11.7	0.0	301.8	76.2	89.6	516.1	253.1	311.2	284.7	329.7
44.0	247.0	5.3	0.2	12.7	0.0	305.9	76.2	90.1	518.7	253.7	312.7	286.7	327.6
45.0	248.0	5.2	0.5	13.4	0.0	307.2	76.2	90.1	523.0	254.3	314.4	288.4	326.0
46.0	249.0	5.1	0.3	13.3	0.0	306.7	76.3	90.3	525.2	255.2	316.0	290.1	324.3
47.0	250.0	5.0	0.1	13.0	0.0	305.6	76.1	90.3	527.7	255.6	317.9	292.3	322.6
48.0	251.0	4.9	0.1	12.7	0.0	304.1	76.4	90.2	530.3	256.6	319.7	294.4	320.8
49.0	252.0	4.8	0.0	12.7	0.0	302.6	76.4	89.8	532.7	257.1	321.4	296.6	319.0
50.0	253.0	4.8	0.0	12.1	0.0	300.5	76.3	89.7	535.3	257.8	323.2	298.7	317.4
51.0	254.0	4.6	0.0	12.0	0.0	298.3	76.7	89.7	536.5	258.5	325.3	300.5	316.2
52.0	255.0	4.6	0.0	11.7	0.0	297.2	76.5	89.8	537.9	259.1	327.1	302.3	314.6
53.0	256.0	4.5	0.0	11.6	0.0	295.4	76.6	89.7	537.9	260.1	329.1	304.4	312.9
54.0	257.0	4.5	0.0	11.6	0.0	293.8	76.6	89.7	537.0	260.6	330.9	306.0	311.4
55.0	258.0	4.4	0.0	11.7	0.0	292.1	76.8	89.6	535.4	261.9	332.7	307.9	309.7
56.0	259.0	4.3	0.0	11.2	0.0	290.5	76.7	89.6	534.0	262.7	334.7	309.5	308.3
57.0	260.0	4.2	0.0	11.2	0.0	288.5	76.5	89.2	533.7	263.4	336.1	311.3	306.3
58.0	261.0	4.2	0.0	11.2	0.0	287.4	76.9	89.4	532.2	264.4	338.0	312.8	305.3
59.0	262.0	4.1	0.0	11.4	0.0	286.8	76.6	88.7	533.2	265.0	339.5	313.8	303.9
60.0	263.0	4.0	0.0	11.8	0.0	286.4	76.8	89.4	532.3	265.8	341.1	316.3	301.7
61.0	264.0	3.9	0.0	12.1	0.0	286.6	77.1	89.4	531.9	267.5	343.0	317.9	300.4
62.0	265.0	3.9	0.0	12.3	0.0	287.1	77.1	89.4	531.9	267.8	344.9	319.6	298.9
63.0	266.0	3.8	0.0	12.5	0.0	287.7	76.9	89.5	534.1	268.7	346.6	321.4	297.1
64.0	267.0	3.7	0.0	12.3	0.0	287.9	76.8	89.5	534.4	269.1	348.3	323.3	295.5
65.0	268.0	3.6	0.0	12.5	0.0	288.2	76.9	89.4	534.5	269.9	349.8	325.2	294.0
66.0	269.0	3.6	0.0	12.3	0.0	287.8	77.0	89.4	535.0	271.3	351.6	327.3	292.4
67.0	270.0	3.5	0.0	12.4	0.0	287.5	77.0	89.7	537.0	273.3	353.2	328.7	291.4
68.0	271.0	3.4	0.4	13.0	0.0	288.5	77.0	89.7	539.2	274.1	354.8	330.5	289.7
69.0	272.0	3.3	0.2	13.1	0.0	290.2	76.9	89.8	540.6	275.4	356.5	332.6	287.7
70.0	273.0	3.3	0.1	12.7	0.0	290.0	76.6	90.0	543.0	276.3	358.3	334.1	287.0
71.0	274.0	3.2	0.5	13.0	0.0	290.7	76.8	89.5	544.2	277.9	360.1	336.0	285.5
72.0	275.0	3.1	0.6	13.3	0.0	292.5	77.2	89.9	546.0	279.5	361.7	337.6	284.8
73.0	276.0	3.0	0.5	13.1	0.0	293.6	77.0	89.9	547.4	280.4	363.5	339.3	283.3
74.0	277.0	2.9	0.4	12.7	0.0	294.1	76.7	89.8	548.6	282.5	365.3	341.2	281.9
75.0	278.0	2.9	0.4	13.2	0.0	294.1	77.2	89.9	549.4	283.2	367.2	342.8	281.3
76.0	279.0	2.8	0.2	13.6	0.0	295.2	76.9	89.9	549.8	284.6	369.0	344.6	280.3
77.0	280.0	2.7	0.1	13.4	0.0	295.5	77.0	90.0	549.4	286.0	371.0	346.1	279.5
78.0	281.0	2.7	0.0	13.2	0.0	295.4	77.2	89.6	549.2	287.2	372.6	347.9	278.8
79.0	282.0	2.6	0.0	12.8	0.0	292.7	77.3	89.5	548.5	288.3	374.2	349.9	277.7
80.0	283.0	2.5	0.0	12.1	0.0	290.5	77.4	89.4	547.8	289.1	375.7	351.5	277.3
81.0	284.0	2.5	0.0	11.4	0.0	287.0	77.1	89.1	547.6	290.0	377.2	353.3	276.9
82.0	285.0	2.5	0.0	10.7	0.0	284.0	77.2	89.1	545.4	290.7	378.4	355.0	276.7
83.0	286.0	2.4	0.0	10.7	0.0	281.3	77.2	88.9	544.4	291.4	379.4	356.6	276.6
84.0	287.0	2.3	0.0	10.7	0.0	278.6	76.9	89.0	542.2	291.9	380.3	358.2	276.4
85.0	288.0	2.3	0.0	10.6	0.0	276.5	77.2	88.9	538.6	292.8	380.9	359.7	276.4
86.0	289.0	2.3	0.0	10.4	0.0	274.3	77.2	88.5	536.2	294.1	381.3	361.6	276.1
87.0	290.0	2.2	0.0	10.2	0.0	272.2	77.2	88.6	533.6	294.9	381.5	363.1	276.2
88.0	291.0	2.2	0.0	10.2	0.0	270.6	77.2	88.6	53				

102,0	305,0	1,8	0,0	8,4	0,0	238,2	77,3	86,5	448,5	301,0	374,9	370,8	284,8
103,0	306,0	1,8	0,0	8,6	0,0	235,8	77,2	86,4	443,9	301,1	374,6	370,3	286,0
104,0	307,0	1,8	0,0	8,6	0,0	233,9	77,1	86,2	439,7	301,0	374,2	369,4	287,0
105,0	308,0	1,8	0,0	8,7	0,0	231,7	77,1	86,1	434,7	302,0	373,9	368,7	288,1
106,0	309,0	1,8	0,0	8,7	0,0	230,4	77,0	86,0	431,0	301,4	373,7	368,0	289,3
107,0	310,0	1,7	0,0	8,5	0,0	229,4	77,0	86,0	427,0	301,8	373,5	367,0	290,7
108,0	311,0	1,7	0,0	8,7	0,0	228,4	77,1	85,9	423,4	301,9	373,1	366,6	291,8
109,0	312,0	1,7	0,0	8,6	0,0	227,1	77,1	85,8	419,9	301,7	372,9	365,7	293,0
110,0	313,0	1,6	0,0	8,8	0,0	225,7	76,9	85,7	416,7	301,8	372,5	364,7	294,2
111,0	314,0	1,7	0,0	8,7	0,0	225,1	76,9	85,6	413,3	302,0	372,3	364,3	295,2
112,0	315,0	1,6	0,0	8,7	0,0	224,1	77,1	85,7	410,3	302,6	371,8	363,6	296,4
113,0	316,0	1,6	0,0	8,8	0,0	222,9	77,1	85,7	407,8	302,8	371,5	362,7	297,7
114,0	317,0	1,6	0,0	8,9	0,0	222,3	77,0	85,7	405,3	302,8	371,2	362,1	298,8
115,0	318,0	1,6	0,0	8,9	0,0	221,4	77,0	85,4	402,1	302,8	370,7	361,4	299,9
116,0	319,0	1,6	0,0	8,9	0,0	220,1	77,1	85,5	399,8	303,1	370,6	360,6	301,1
117,0	320,0	1,6	0,0	9,0	0,0	219,5	77,0	85,2	398,0	303,3	370,4	359,9	302,3
118,0	321,0	1,5	0,0	9,0	0,0	218,7	77,0	85,5	395,3	303,1	370,0	359,0	303,5
119,0	322,0	1,5	0,0	9,1	0,0	218,3	77,1	85,3	393,0	303,0	369,8	358,3	304,6
120,0	323,0	1,5	0,0	9,0	0,0	217,6	76,9	85,3	391,5	303,0	369,5	357,6	305,8
121,0	324,0	1,5	0,0	9,1	0,0	217,2	77,0	85,0	389,8	302,9	369,2	357,0	306,8
122,0	325,0	1,4	0,0	9,0	0,0	216,9	76,9	85,0	388,3	302,5	368,9	356,3	308,0
123,0	326,0	1,4	0,0	9,1	0,0	216,5	77,0	85,0	387,0	301,8	368,6	355,7	309,1
124,0	327,0	1,4	0,0	9,1	0,0	215,8	76,5	84,8	385,6	302,4	368,3	355,1	309,6
125,0	328,0	1,4	0,0	9,1	0,0	215,6	76,9	85,0	383,9	301,9	367,9	354,8	311,1
126,0	329,0	1,4	0,0	9,1	0,0	214,8	77,0	84,9	382,6	302,1	367,7	354,2	312,1
127,0	330,0	1,4	0,0	9,1	0,0	214,8	77,0	84,8	381,8	301,5	367,5	353,6	313,4
128,0	331,0	1,4	0,0	9,1	0,0	214,0	76,9	84,9	380,4	301,6	367,0	352,9	314,4
129,0	332,0	1,3	0,0	9,1	0,0	213,6	77,0	84,8	379,4	300,9	366,7	352,2	315,7
130,0	333,0	1,3	0,0	9,1	0,0	212,7	77,1	84,8	378,1	300,9	366,4	351,8	316,7
131,0	334,0	1,3	0,0	9,0	0,0	212,6	76,8	84,8	377,0	300,6	366,0	351,1	317,8
132,0	335,0	1,3	0,0	9,0	0,0	213,0	77,0	84,4	375,5	300,5	365,7	350,6	318,7
133,0	336,0	1,3	0,0	9,0	0,0	212,1	77,0	84,6	374,8	299,9	365,3	349,9	319,8
134,0	337,0	1,3	0,0	9,0	0,0	212,1	77,0	84,6	374,2	299,5	365,1	349,3	320,7
135,0	338,0	1,2	0,0	9,0	0,0	212,1	77,0	84,6	372,9	299,5	364,6	349,2	321,0
136,0	339,0	1,2	0,0	9,0	0,0	212,4	76,9	84,5	372,2	298,6	364,4	348,9	322,5
137,0	340,0	1,2	0,0	9,0	0,0	211,8	77,1	84,6	371,6	298,5	364,0	348,1	323,3
138,0	341,0	1,2	0,0	9,0	0,0	211,1	76,8	84,7	370,3	298,2	363,7	347,8	323,7
139,0	342,0	1,2	0,0	8,9	0,0	210,6	76,8	84,6	370,1	297,5	363,2	347,3	325,1
140,0	343,0	1,1	0,0	9,0	0,0	210,9	76,9	84,4	369,3	297,3	362,9	346,6	326,0
141,0	344,0	1,2	0,0	8,9	0,0	210,6	76,7	84,5	368,8	297,3	362,5	346,3	326,5
142,0	345,0	1,1	0,0	9,0	0,0	210,6	76,9	84,6	368,2	296,7	362,0	345,8	327,7
143,0	346,0	1,1	0,0	8,9	0,0	210,7	76,4	84,2	366,9	296,5	361,5	345,5	327,8
144,0	347,0	1,1	0,0	9,0	0,0	210,4	76,7	84,4	366,0	297,6	361,2	345,2	328,7
145,0	348,0	1,1	0,0	8,9	0,0	210,2	76,9	84,5	366,3	297,9	360,7	344,6	329,5
146,0	349,0	1,1	0,0	8,9	0,0	210,3	76,9	84,5	365,7	297,8	360,5	344,3	330,6
147,0	350,0	1,1	0,0	8,9	0,0	209,9	76,9	84,4	364,6	297,2	360,0	343,7	331,5
148,0	351,0	1,1	0,0	8,8	0,0	210,2	76,7	84,5	364,3	297,1	359,5	343,3	331,9
149,0	352,0	1,1	0,0	8,8	0,0	210,0	77,0	84,6	364,1	296,5	359,1	342,5	333,1
150,0	353,0	1,0	0,0	8,8	0,0	209,5	76,9	84,4	363,7	296,2	358,7	341,9	334,0
151,0	354,0	1,0	0,0	8,7	0,0	209,5	76,9	84,5	363,1	295,4	358,2	341,5	334,7
152,0	355,0	1,0	0,0	8,8	0,0	209,5	77,0	84,4	362,8	295,2	357,9	341,0	335,5
153,0	356,0	1,0	0,0	8,8	0,0	209,7	77,0	84,3	362,3	295,3	357,5	340,4	336,2
154,0	357,0	1,0	0,0	8,8	0,0	209,7	76,7	84,3	361,4	294,8	357,3	340,2	336,4
155,0	358,0	0,9	0,0	8,7	0,0	209,8	76,8	84,3	361,1	294,9	356,8	339,8	337,0
156,0	359,0	0,9	0,0	8,7	0,0	209,7	77,0	84,3	360,6	293,7	356,4	339,1	337,9
157,0	360,0	0,9	0,0	8,7	0,0	209,6	77,1	84,4	359,9	292,9	356,0	338,6	338,4
158,0	361,0	0,9	0,0	8,7	0,0	209,7	77,0	84,3	359,4	293,0	355,7	338,4	338,7
159,0	362,0	0,9	0,0	8,7	0,0	209,8	76,4	84,4	359,4	292,2	355,2	338,0	339,1
160,0	363,0	0,9	0,0	9,0	0,0	210,0	76,3	84,2	358,9	291,8	354,8	337,7	339,5
161,0	364,0	0,9	0,0	8,9	0,0	209,6	76,8	84,4	359,2	291,6	354,5	336,9	340,5
162,0	365,0	0,9	0,0	8,9	0,0	209,9	77,1	84,3	358,3	291,4	354,1	336,7	341,3
163,0	366,0	0,8	0,0	8,9	0,0	209,8	77,1	84,4	358,5	291,3	353,8	336,2	341,8
164,0	367,0	0,8	0,0	8,8	0,0	210,3	77,1	84,4	358,8	290,6	353,5	335,9	342,9
165,0	368,0	0,8	0,0	8,8	0,0	210,2	77,1	84,5	358,4	290,2	353,0	335,2	343,6
166,0	369,0	0,8	0,0	8,7	0,0	210,3	77,1	84,3	358,1	289,6	352,6	335,0	344,5
167,0	370,0	0,8	0,0	8,7	0,0	210,1	77,1	84,5	357,5	289,3	352,3	334,4	345,3
168,0	371,0	0,8	0,0	8,7	0,0	210,2	76,7	84,6	357,3	289,2	351,9	333,9	345,9
169,0	372,0	0,8	0,0	8,7	0,0	210,0	76,8	84,4	357,5	288,8	351,6	333,7	346,0
170,0	373,0	0,7	0,0	8,7	0,0	209,7	77,0	84,5	357,0	288,3	351,2	333,3	346,8
171,0	374,0	0,7	0,0	8,7	0,0	210,0	77,1	84,4	356,5	286,5	350,8	332,9	347,9
172,0	375,0	0,7	0,0	8,9	0,0	209,7	77,1	84,6	356,7	286,5	350,6	332,2	348,7
173,0	376,0	0,7	0,0	8,8	0,0	209,3	77,2	84,4	356,0	286,1	350,3	331,6	349,4
174,0	377,0	0,6	0,0	8,7	0,0	209,0	76,6	84,5	355,7	285,3	350,1	331,3	349,8
175,0	378,0	0,6	0,0	8,7	0,0	208,5	76,8	84,4	354,7	285,5	349,6	331,1	350,3
176,0	379,0	0,6	0,0	8,6	0,0	208,1	77,0	84,5	354,7	284,8	349,3	330,7	351,2
177,0	380,0	0,6	0,0	8,6	0,0	207,8	77,0	84,5	354,4	285,0	348,9	330,3	351,1
178,0	381,0	0,6	0,0	8,6	0,0	207,8	76,8	84,3	353,8	284,3	348,7	330,1	352,1
179,0	382,0	0,6	0,0	8,7	0,0	208,1	77,0	84,3	353,9	283,7	348,4	329,8	352,9
180,0	383,0	0,5	0,0	8,4	0,0	207,7	76,8	84,4	353,0	283,2	348,0	329,4	353,5
181,0	384,0	0,5	0,0	8,3	0,0	207,1	76,8	84,3	352,4	282,6	347,6	329,4	354,1
182,0	385,0	0,5	0,0	8,3	0,0	206,2	77,1	84,5	351,9	281,9	347,2	329,0	355,3
183,0	386,0	0,5	0,0	8,3	0,0	206,1	77,2	84,6	351,3	281,5	346,6	328,6	356,2
184,0	387,0	0,5	0,0	8,2	0,0	206,1	77,2	84,6	350,2	281,1	346,1	328,5	357,3
185,0	388,0	0,4	0,0	8,1	0,0	206,1	77,2	84,5	350,0	281,1	345,6	328,1	358,0
186,0	389,0	0,4	0,0	8,1	0,0	205,9	76,7	84,5	349,3	280,7	345,3	328,1	358,6
187,0	390,0	0,4	0,0	8,0	0,0	205,6	77,1	84,5	349,1	280,3	344,8	327,8	359,7
188,0	391,0	0,5	0,0	7,9	0,0	205,6	77,1	84,7	348,7	279,9	344,2	327,3	360,5
189,0	392,0	0,5	0,0	7,9	0,0	205,5	77,1	84,5	348,1	279,9	343,6	327,0	361,2
190,0	393,0	0,4	0,0	7,8	0,0	205,5	77,1	84,7	347,5	279,3	343,1	326,8	362,0
191,0	394,0	0,4	0,0	7,7	0,0	205,4	77,1	84,6	346,8	279,1	342,4	326,5	362,6
192,0	395,0	0,4	0,0	7,8	0,0	205,3	77,0	84,5	346,1	278,7	342,0	326,4	363,6
193,0													

208,0	411,0	0,2	0,0	7,8	0,0	204,2	77,2	84,6	341,8	268,2	334,6	321,4	373,2
209,0	412,0	0,2	0,0	7,4	0,0	204,7	77,1	84,6	340,8	268,3	334,1	321,1	373,5
210,0	413,0	0,2	0,0	7,2	0,0	204,7	76,5	84,5	340,4	267,7	333,6	320,9	373,2
211,0	414,0	0,2	0,0	7,1	0,0	205,2	77,1	84,6	339,3	267,8	333,3	320,6	373,6
212,0	415,0	0,1	0,0	7,1	0,0	205,6	77,1	84,5	338,2	267,2	332,9	320,3	373,5
213,0	416,0	0,1	0,0	7,0	0,0	205,6	77,2	84,6	337,5	266,1	332,3	319,8	373,0
214,0	417,0	0,1	0,0	6,8	0,0	206,2	76,9	84,1	336,7	266,0	331,4	319,4	372,7
215,0	418,0	0,1	0,0	6,8	0,0	206,2	76,9	84,7	335,8	265,1	330,9	319,1	372,5
216,0	419,0	0,1	0,0	6,9	0,0	206,8	76,9	84,7	335,6	264,3	330,3	318,6	372,2
217,0	420,0	0,1	0,0	6,8	0,0	206,8	77,0	84,7	335,2	263,5	329,5	318,1	371,1
218,0	421,0	0,1	0,0	6,7	0,0	207,1	77,1	84,4	334,7	262,8	328,9	317,5	371,0
219,0	422,0	0,1	0,0	6,8	0,0	207,4	77,2	84,6	334,0	262,8	328,1	317,6	370,3
220,0	423,0	0,1	0,0	6,6	0,0	207,3	77,0	84,7	333,5	262,4	327,5	317,0	370,0
221,0	424,0	0,1	0,0	6,6	0,0	207,4	77,0	84,6	333,0	261,7	326,5	316,7	369,4
222,0	425,0	0,0	0,0	6,5	0,0	207,5	77,0	84,6	332,6	260,8	325,9	316,3	368,6

Manufacturer: HEARTHSTONE
Model: GM 40

Run: 3
Project #: PI 20149
Test Duration: 222

	min	
	HHV	LHV
Eff	80.60%	87.11%
Comb Eff	98.99%	98.99%
HT Eff	81.42%	88.00%
Output	14 908	kJ/h
Burn Rate	0.93	kg/h
Grams CO	64	g
Input	18 498	kJ/h
MC wet	17.57	

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

Overall Heating Efficiency:	80.60%	Air Fuel Ratio (A/F)	
	98.99%	Dry Molecular Weight (M _d)	
	81.42%	Dry Moles Exhaust Gas (N ₂):	
Combustion Efficiency:		Air Fuel Ratio (A/F)	
Heat Transfer Efficiency:			

Heat Output:	14 142 Btu/h	14 908 kJ/h
Heat Input:	17 547 Btu/h	18 498 kJ/h
Burn Duration:	3.70 h	
Burn Rate:	2.06 lb/h	0.934 kg/h
Stack Temp:	244.1 Deg. F	117.8 Deg. C

CO_{2-ut} Ultimate CO₂
F₀ 19.64
1.062

Date: 2012-05-24 Manufacturer: Hearthstone Model: GM 40
Project #: PI 20149 Run: 3 Tech: MM Reviewer: SD

- kindling 2.5 LBS STAND FINE
- At 2.5 LBS close door
- At 6.8 LBS instant pre load
- At 11.9 LBS close door
- At 10.00 LBS close by pass
- At 46 LBS close air n/w (Drill bit open)
- At 21 LBS instant load
- open by pass
- open door
- open air n/w
- instant load
- close door
- close by pass
- At 5 min close air n/w (Drill bit open)

TEST LOAD CONFIGURATION

Fan ON
Low

46

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

Side view	Front view	Top view

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

	ADDITION		SUBTRACTION	
	ft3	Volume	ft3	Volume
V measure				
V ashlip				
%				
V usable				
Usable Firebox: _____				
Test load weight: _____ Minimum: _____ Maximum: _____				
Déviation: _____				

D.P.

PRE / POST CHECKS

Date: 2017-05-24 Manufacturer: Hearthstone Model: GM40
 Project #: PI 20149 Run: 3 Tech: MM Reviewer: DO

Moisture Meter Calibration Check:

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

Pre-Test

Post-Test

Facility Conditions:

Air Velocity from less than 2 feet

5 (max 50 Fpm)	3 (max 50 Fpm)
ok	ok
4 sides ok	ok

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%.....

2017-05-14
2017-05-14
ok
ok

ok

Temperature System:

Ambient (65°-90°F).....

Wood Heater Surface (±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
06	17	43
358	709	734
702	730	913
11	11	12
ok	ok	ok

SAMPLING EQUIPMENT CHECK OUT

Date: 2017-05-24 Manufacturer: Heath Stark Model: GM 40
 Project #: PI 20149 Run: 3 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)	511315.04	512526.03	511315.09	512526.08	431999.59	433176.34
Initial 1minute DGM (Liter)	511315.04	512526.03	511315.09	512526.08	431999.59	433176.34
Change © (Liter)	0	0	0	0	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 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	mm 0.4	3	.5
Check OK (no change after 15 sec.)	ok	ok	ok	ok

PRE-TEST SCALE AUDIT

Date: 2017-05-24

Manufacturer: Health Stone

Model: GM 40

Project #: PL 20149

Run: 3

Tech: mm

Reviewer: SD

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-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: 2017-05-24 Manufacturer: Heath stone Model: GM 40
 Project #: PI 20149 Run: 3 Tech: mm Reviewer: DO

FOR TUNNELS < 12 in

Barometric pressure (P_{bar}) 101.5 (KPa.) Static pressure (P_q) 0.22 (inches w.c.)
 Inside diameter: Port A _____ Port B _____
 Tunnel cross sectional area: .1963 Ft²
 Pitot tube type: Standard

Traverse Point	Position (inches)			Velocity Head Δ_p (inches H ₂ O)	Tunnel Temperature (°F)
	6 po	7 po	8 po		
A- Centroid	3.00	3.50	4	0.057	71.08
B - Centroid	3.00	3.50	4	0.056	71.04
A-1	0.40	0.50	0.50	0.047	71.06
A-2	1.50	1.75	2	0.049	71.09
A-3	4.50	5.25	6	0.048	71.13
A-4	5.60	6.5	7.5	0.051	71.17
B-1	0.40	0.50	0.50	0.050	71.11
B-2	1.50	1.75	2	0.047	70.86
B-3	4.50	5.25	6	0.049	70.93
B-4	5.60	6.5	7.5	0.052	70.99
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: 2-12-05-24 Manufacturer: Heath stone Model: GM 40
 Project #: PI 20149 Run: 3 Tech: MR Reviewer: BP

Pre-Test (Adjust and Record)

	ZERO		SPAN		CAL. (Record Only)	
CO	0	0	2948	2971	9998	100
Tolerance CO		+/- 0.02		+/- 0.15		+/- 0.05
CO ₂	0	0	1789	1787	976	100
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	0.004	2950	1001	0.004	0.02	0.002	0.15	0.003	0.05	✓	
CO ₂	0.01	1785	978	0.01	0.02	0.01	0.5	0.01	0.5		
O ₂	na	na	na	—	na	—	na	—	na	✓	

TEST DATA LOG

Date: 2017-05-24 Manufacturer: Hearth stone Model: GM 40
 Project #: PT 2014a Run: 3 Tech: MM Reviewer: DP

RAW DRY GAS METER READINGS

	System 1	System 2	Blank
Final (Liter)	512525,21	433175,52	207,80
Initial (Liter)	511315,36	432000,50	147,88

AMBIENT CONDITIONS

	Before	After
Barometer (kPa):	100,2	100,0
Dry Bulb (F):	72,68	79,34
Humidity (%):	48,8	42,5

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: 2017-05-24 Manufacturer: Heathston Model: GM 40
 Project #: PI 20149 Run: 3 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 8 in.	0.872 lbs.	221	216	213	212	210
1 1/2 x 3 1/2 x 8 in.	0.888 lbs.	208	206	203	202	201
1 1/2 x 3 1/2 x 8 in.	0.860 lbs.	206	207	202	208	209
1 1/2 x 3 1/2 x 8 in.	0.874 lbs.	209	208	205	203	202
1 1/2 x 3 1/2 x 8 in.	0.860 lbs.	196	198	199	201	206
1 1/2 x 3 1/2 x 8 in.	0.864 lbs.	198	199	201	206	216
1 1/2 x 3 1/2 x 8 in.	0.842 lbs.	196	199	200	206	202
1 1/2 x 3 1/2 x 8 in.	0.852 lbs.	201	203	201	206	208
1 1/2 x 2 1/2 x 8 in.	0.812 lbs.	203	211	218	209	213
1 1/2 x 3 1/2 x 8 in.	0.878 lbs.	202	206	205	211	210
1 1/2 x 3 1/2 x 8 in.	0.956 lbs.	193	196	199	192	196
1 1/2 x 3 1/2 x 8 in.	0.946 lbs.	206	203	208	206	204
1 1/2 x 3 1/2 x 8 in.	0.950 lbs.	203	202	206	201	208
1 1/2 x 3 1/2 x 8 in.	0.950 lbs.	199	200	201	198	196
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: 12.40 lbs

FUEL DATA

 Date: 2017-05-24

 Manufacturer: Heathstone

 Model: GM 40

 Project #: PT 20149

 Run: 3

 Tech: MR

 Reviewer: DP

FUEL DESCRIPTION:

Type of wood :

TEST LOAD

Piece Size	Weight	Meter Moisture Content (% dry)*				
1 1/2 x 3/4 x 14 1/4 in.	1.460 lbs.	216	213	216	209	211
1 1/2 x 3/4 x 14 1/4 in.	1.556 lbs.	213	216	213	216	218
1 1/2 x 3/4 x 14 1/4 in.	1.576 lbs.	215	218	220	216	213
1 1/2 x 3/4 x 14 1/4 in.	1.572 lbs.	208	216	218	220	216
1 1/2 x 3/4 x 14 1/4 in.	1.450 lbs.	207	213	208	206	205
1 1/2 x 3/4 x 5 in.	0.104 lbs.			206		
1 1/2 x 3/4 x 5 in.	0.092 lbs.			211		
1 1/2 x 3/4 x 5 in.	0.096 lbs.			223		
1 1/2 x 3/4 x 5 in.	0.104 lbs.			216		
1 1/2 x 3/4 x 5 in.	0.098 lbs.			208		
1 1/2 x 3/4 x 5 in.	0.106 lbs.			201		
1 1/2 x 3/4 x 5 in.	0.104 lbs.			199		
1 1/2 x 3/4 x 5 in.	0.090 lbs.			206		
1 1/2 x 3/4 x 5 in.	0.106 lbs.			203		
1 1/2 x 3/4 x 5 in.	0.094 lbs.			206		
1 1/2 x 3/4 x 5 in.	0.102 lbs.			207		
1 1/2 x 3/4 x 5 in.	0.104 lbs.			211		
1 1/2 x 3/4 x 5 in.	0.086 lbs.			221		
1 1/2 x 3/4 x 5 in.	0.094 lbs.			216		
1 1/2 x 3/4 x 5 in.	0.110 lbs.			220		
1 1/2 x 3/4 x 5 in.	0.104 lbs.			218		
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: 924

lbs

 Min 20%: 185

 Max 25%: 230

DILUTION TUNNEL PARTICULATE SAMPLER DATA

Date: 2017-05-23 Manufacturer: Healthstone Model: Gm 40
 Project #: 0120144 Run: 3 Tech: MM Reviewer: BO

		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	06	358	702	8	17	709	730	21	914	
2017-05-23	17:30	613768	01286	01257	102107	1089515	01259	01313	102274	01259	
2017-05-24	8:30	613768	01287	01257	102106	1089514	01258	01312	102275	01260	

		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	06	358	702	8	17	709	730	21	914	
2017-05-24	15:00	613773	01283	01254	102140	1089525	01249	01305	102307	01261	
2017-05-29	8:00	613771	01283	01254	102120	1089520	01249	01305	102290	01261	
2017-05-30	8:00	613771	01283	01254	102120	1089520	01249	01305	102290	01261	

DILUTION TUNNEL PARTICULATE SAMPLER DATA

Date: 2017-05-23 Project #: PI 2014 Run: 3 Manufacturer: Heathstone Model: GM 40
 Tech: MM Reviewer: DP

SYSTEM 2				
Pre-test Weight Record	Probe & Housing Number	Front Filter Number	Back Filter Number	gaskets
Date	Time			
2017-05-23	17:30	1091638	01320	109732
2017-05-23	18:30	1091638	01299	109733

SYSTEM 2				
Post-test Weight Record	Probe & Housing Number	Front Filter Number	Back Filter Number	gaskets
Date	Time			
2017-05-24	15:00	1091642	01291	109764
		1091641	01291	109758
		1091641	01291	109759

Paramètres

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

Code verrouillage: HEA

Description du test

Test standard	EPA
Run #	4
Date	25-05-2017
Technicien	M.M
Project #	PI 20149

Description de l'unité

Manufacturier	HEARTHSTONE	
Modèle	GM 40	
Combustion system	Cat	
Appliance type	WOOD STOVE	
Firebox volume	1,32	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	na	BTU/h Donnée fournie par le manfacturier
Targeted category	3	
Targeted output	na	BTU/h
Cp steel	na	BTU/lb-°F

Échantillonnage

Blank sampling rate	0,20	cuft/min
Internal probe diameter	0,18	in.
Calibration Factor (DGM #1):	0,987	Dimensionless
Equipment number (DGM #1):	EM-178	
Calibration Factor (DGM #2):	0,996	Dimensionless
Equipment number (DGM #2):	EM-179	
Calibration Factor (DGM #3):	0,986	Dimensionless
Equipment number (DGM #3):	EM-070	

Tunnel

Targeted tunnel flow rate	140	scfm
Tunnel diameter	6	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 20149
Date	25-05-2017
Technicien	M.M

Fuel data

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

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

	Start	End
Barometer (kPa):	100,2	99,8
Barometer (in.Hg):	29,589049	29,470929
Dry Bulb (F):	70,7	85,1
Humidity (%):	45,8	35,2
Air velocity (ft/min)	5	4

DGM #1	Final: ##### cuft
	Initial: ##### cuft
DGM #2	Final: ##### cuft
	Initial: ##### cuft

DGM room	
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Final: 513215,130	Liter
Initial: 512526,930	Liter
Final: 433849,070	Liter
Initial: 433177,840	Liter

Final: 236,740	cuft
Initial: 207,820	cuft

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

191

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

Project nu.	PI 20149
Date	25-05-2017
Technicien	M.M

Page 1 of 1

FUEL LOAD DATA SHEET, CSA B415

Test Load Weight:

Lower	Ideal	Upper
-------	-------	-------

8,3	9,2	10,2
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* 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):	29,8	lbs./ft3
Dry Wood Density:	24,5	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	13,5	1,56	20,80	20,90	21,10	21,60	21,80	33,04944	70,88	21,2
1,5	3,5	13,5	1,54	21,80	21,30	21,40	21,50	21,50	33,067	70,88	21,5
1,5	3,5	13,5	1,57	22,10	21,80	21,60	20,20	21,80	33,841	70,88	21,5
1,5	3,5	13,5	1,35	21,00	21,60	21,30	21,80	21,90	29,09504	70,88	21,5
1,5	3,5	13,5	1,55	21,60	21,80	21,90	21,80	22,00	33,86464	70,88	21,8
1,5	0,75	5	0,11			22,10			2,4752	5,63	22,1
1,5	0,75	5	0,11			21,90			2,4966	5,63	21,9
1,5	0,75	5	0,10			21,80			2,18	5,63	21,8
1,5	0,75	5	0,11			22,30			2,5422	5,63	22,3
1,5	0,75	5	0,11			22,60			2,5312	5,63	22,6
1,5	0,75	5	0,09			22,30			2,0962	5,63	22,3
1,5	0,75	5	0,11			21,80			2,4416	5,63	21,8
1,5	0,75	5	0,09			21,60			1,9008	5,63	21,6
1,5	0,75	5	0,11			21,80			2,4416	5,63	21,8
1,5	0,75	5	0,09			22,60			1,9888	5,63	22,6
1,5	0,75	5	0,10			21,70			2,0832	5,63	21,7
1,5	0,75	5	0,09			21,90			2,0148	5,63	21,9
1,5	0,75	5	0,12			22,00			2,552	5,63	22,0
1,5	0,75	5	0,09			21,60			1,8576	5,63	21,6
1,5	0,75	5	0,092			21,80			2,0056	5,63	21,8
1,5	0,75	5	0,104			21,00			2,184	5,63	21,0
										0,00	
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Test Load Weight: lbs.

Dry Weight: kg.

Average Moisture Content: %

Dry:	21,59	Dry(EPA)	21,59
		Dry(B415)	21,59

21,59
Must be 19-25

Wet:
must be 15,2-22

Coal Bed Range: lbs. to

2,3 lbs.

TEST CHARGE:

Coal bed weight: 2,2

lbs.

Project nu.	PI 20149
Date	25-05-2017
Technicien	M.M

Tunnel Traverse Worksheet (for velocity calculations)

Static Pressure: 0,22 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=
0,941

Pour un tunnel moins de 12", prendre 4 lectures

	TUNNEL VELOCITY	TUNNEL TEMP	SQUARE ROOT
	In. wc	°F	
A center	0,057	72,72	0,2387
B center	0,056	72,4	0,2366
A1	0,046	72,7	0,2145
A2	0,050	72,85	0,2236
A3	0,047	72,11	0,2168
A4	0,051	72,43	0,2258
B1	0,047	72,440	0,2168
B2	0,049	72,830	0,2214
B3	0,048	72,780	0,2191
B4	0,050	72,800	0,2236
AVERAGE	0,0501	72,6060	0,2237

Project nu.	PI 20149
Date	25-05-2017
Technicien	M.M

Filter set weight

Number	System 1 (g) 1st hour						System 1 (g)						System 2 (g)				Ambient blank (g)	Date	Heure
	probe	front	back	gasket	probe	back	front	back	gasket	probe	front	back	front	back	gasket	Filter			
Before (1)	3	360	361	3	21	901	710	901	53	41	907	909	907	909	55	910			
Before (2)																			
Before (3)																			
Before (4)																			
Before (5)	61,4571	0,1286	0,1283	10,1160	108,7416	0,1262	0,1283	0,1283	10,2511	110,3646	0,1282	0,1312	0,1282	0,1312	10,9433	0,1307	24/05/2017	17:30	
Before (6)	61,4572	0,1285	0,1282	10,1159	108,7417	0,1262	0,1284	0,1284	10,2510	110,3645	0,1283	0,1312	0,1283	0,1312	10,9434	0,1308	25/05/2017	09:00	
After (1)	61,4577	0,1300	0,1275	10,1211	108,7428	0,1260	0,1282	0,1282	10,2540	110,3652	0,1297	0,1309	0,1297	0,1309	10,9468	0,1310	25/05/2017	08:00	
After (2)	61,4574	0,1297	0,1275	10,1178	108,7419	0,1257	0,1282	0,1282	10,2521	110,3650	0,1295	0,1309	0,1295	0,1309	10,9454	0,1310	30/05/2017	08:00	
After (3)	61,4574	0,1297	0,1275	10,1178	108,7419	0,1257	0,1282	0,1282	10,2521	110,3650	0,1295	0,1309	0,1295	0,1309	10,9454	0,1310	01/06/2017	08:00	
After (4)																			
After (5)																			
After (6)	61,4574	0,1297	0,1275	10,1178	108,7419	0,1257	0,1282	0,1282	10,2521	110,3650	0,1295	0,1309	0,1295	0,1309	10,9454	0,1310	01/06/2017	08:00	
Difference	0,0002	0,0012	-0,0007	0,0019	0,0002	-0,0005	-0,0002	0,0011	0,0005	0,0005	0,0012	-0,0003	0,0020	0,0002	0,0002	0,0002			
Total (mg)		2,6			3,2		3,2				3,4								
Total ajusté (mg)		2,40			3,00		3,00				3,20								

Project nu. PI 20149

Date 25-05-2017

Technicien

SFBA EPA EMISSION RESULTS

RESULTS

Average emission rate: 1,4 g/hr

Burn Rate : 1,635 Dry kg/hr

Test Duration: 126 min

PRESSURE FACTOR: DGM 1 0,96001
DGM 2 0,96110
DGM 3 0,98696

BAROMETRIC PRESSURE
Average: 29,529989 in Hg
Start: 29,589049 in Hg
End: 29,470929 in Hg

TEMPERATURE FACTORS DGM 1 0,97909
DGM 2 0,97932
DGM 3 0,98042

DGM CONTROLLER VALUES

DGM 1 Final: 18124,022 Cuft
Initial: 18099,718 Cuft

VOLUMES SAMPLED DGM 1 22,547 SCft
DGM 2 22,222 SCft
DGM 3 27,592 SCft

DGM 2 Final: 15321,236 Cuft
Initial: 15297,531 Cuft

DGM #3 Final: 236,740 Cuft
Initial: 207,820 Cuft

TOTAL TUNNEL VOLUME : 21217

TEMPERATURES

SAMPLE RATIOS
Sample Train 1: 941,000
Sample Train 2: 954,764

DGM 1 539,274 °R
DGM 2 539,150 °R

Paticulate concentration
Sample Train 1 0,000142 g/dscf
Sample Train 2 0,000153 g/dscf
Room 0,000007 g/dscf

CALIBRATION FACTORS

DGM 1 0,9870
DGM 2 0,9960
DGM #3 0,9860

TUNNEL FLOW RATE: 168,385 Dscfm

TOTAL EMISSIONS
Sample Train 1 2,86 g
Sample Train 2 3,09 g

PARTICULATE CATCH

Total Sample Train 1: 3,20 mg
Total Sample Train 2: 3,40 mg
Total Sample Train 1 1st hour: 2,60 mg

EMISSION RATES
Sample Train 1 1,36 g/hr
Sample Train 2 1,47 g/hr

1st hour emission rate 2,45 g/hr

DEVIATION: 3,95%

Cs Train 1 Train 2
0,0001419 0,000153003

*		*	*	*	*	*1	*2	*3	*4	*5	*6	*7	*8
Elapsed		Weight				Flue	Room	Tunnel	Unit	Unit	Unit	Unit	Unit
Time	Raw data row	Remaining	CO	CO ₂	O ₂	Gas	Temp	Dry Bulb	Top	Back	R.Side	L.Side	Bottom
min		lbs	%	%	%	°F	°F	°F	°F	°F	°F	°F	°F
0,0	191,00	9,2	0,1	6,0	0,0	342,3	76,5	93,0	469,4	300,8	384,2	384,4	404,8
1,0	192,0	9,0	0,0	4,5	0,0	351,0	76,8	93,2	460,2	303,2	384,4	383,4	404,0
2,0	193,0	8,9	0,0	4,8	0,0	372,3	76,8	93,2	454,1	304,1	384,4	383,0	402,6
3,0	194,0	8,8	0,0	5,3	0,0	362,7	76,6	93,3	451,8	304,1	384,2	381,2	401,1
4,0	195,0	8,8	0,0	5,9	0,0	354,1	76,3	93,2	454,6	303,5	383,0	379,8	399,2
5,0	196,0	8,7	0,0	6,2	0,0	347,9	76,3	93,2	455,1	302,4	381,5	377,5	397,9
6,0	197,0	8,6	0,0	7,6	0,0	349,1	76,3	92,5	456,8	300,3	379,9	374,8	395,5
7,0	198,0	8,5	0,0	7,4	0,0	351,9	76,5	93,0	460,7	298,0	377,6	372,5	392,7
8,0	199,0	8,4	0,0	9,0	0,0	354,2	76,3	93,0	467,1	295,5	375,6	370,4	389,4
9,0	200,0	8,3	0,0	7,8	0,0	354,8	76,4	93,0	471,0	293,0	373,3	368,2	386,4
10,0	201,0	8,2	0,0	8,8	0,0	367,6	76,6	93,0	469,5	290,5	371,1	364,9	384,4
11,0	202,0	8,1	0,0	9,2	0,0	374,5	76,3	93,0	474,8	288,3	368,7	363,5	380,5
12,0	203,0	7,9	0,0	8,2	0,0	381,9	76,5	95,9	476,0	286,0	366,2	361,0	377,5
13,0	204,0	7,8	0,0	7,2	0,0	384,4	76,3	97,7	476,9	284,4	363,7	359,0	374,3
14,0	205,0	7,7	0,0	8,3	0,0	387,2	76,6	101,0	476,2	282,2	361,5	356,6	371,1
15,0	206,0	7,6	0,0	9,0	0,0	393,4	76,6	102,5	482,8	280,2	359,4	354,8	368,2
16,0	207,0	7,4	0,2	13,8	0,0	405,4	76,6	102,7	495,4	278,2	357,5	353,1	365,4
17,0	208,0	7,2	0,6	14,5	0,0	412,1	76,9	103,4	507,4	277,2	356,0	351,3	362,6
18,0	209,0	7,1	0,1	12,8	0,0	412,5	76,8	103,5	517,3	276,1	354,7	350,7	360,3
19,0	210,0	6,9	0,1	14,1	0,0	415,1	76,9	104,7	525,6	275,7	354,2	349,6	358,2
20,0	211,0	6,8	0,1	12,9	0,0	415,9	76,7	104,3	534,2	275,5	353,4	350,1	355,1
21,0	212,0	6,6	0,2	13,3	0,0	418,4	77,2	104,9	543,4	275,5	353,4	350,0	352,7
22,0	213,0	6,4	0,2	14,1	0,0	422,3	77,3	104,9	552,1	275,7	353,3	349,5	350,7
23,0	214,0	6,3	0,3	14,3	0,0	425,6	77,3	104,8	561,4	276,1	353,7	350,1	348,4
24,0	215,0	6,1	0,2	14,2	0,0	427,9	77,6	105,5	569,4	276,4	354,4	350,8	346,8
25,0	216,0	5,9	0,3	14,2	0,0	430,4	77,4	105,5	577,5	277,3	354,8	351,7	344,4
26,0	217,0	5,8	0,4	14,6	0,0	432,8	77,7	105,8	585,3	278,7	355,5	352,8	342,4
27,0	218,0	5,7	0,5	14,7	0,0	435,6	77,7	107,0	593,5	279,6	356,7	353,6	340,8
28,0	219,0	5,5	0,9	15,0	0,0	438,8	77,9	107,1	600,8	280,6	358,1	355,1	339,2
29,0	220,0	5,3	1,1	15,1	0,0	440,7	78,1	107,4	606,9	282,3	359,5	356,5	337,8
30,0	221,0	5,2	1,5	15,0	0,0	441,6	78,2	107,3	613,1	284,1	361,3	358,2	336,3
31,0	222,0	5,0	1,4	15,0	0,0	442,2	78,2	107,6	619,2	286,6	363,1	360,0	335,2
32,0	223,0	4,8	1,5	15,0	0,0	443,2	78,2	107,7	624,7	289,4	364,7	362,0	333,9
33,0	224,0	4,7	1,7	14,9	0,0	444,2	78,4	108,3	629,2	291,8	366,7	363,3	332,9
34,0	225,0	4,5	2,0	14,8	0,0	443,8	78,5	108,2	634,8	294,7	369,3	365,9	331,9
35,0	226,0	4,4	2,1	14,8	0,0	443,6	77,9	108,4	639,9	297,4	371,4	368,1	330,4
36,0	227,0	4,2	2,2	14,8	0,0	443,8	78,1	105,6	644,2	299,9	374,0	370,5	329,5
37,0	228,0	4,0	2,3	14,7	0,0	443,1	78,0	108,4	648,0	303,0	376,3	372,6	328,8
38,0	229,0	3,9	2,2	14,8	0,0	441,8	78,6	108,3	650,8	306,4	379,4	375,5	327,8
39,0	230,0	3,7	1,9	14,8	0,0	442,1	78,9	103,3	653,6	309,9	382,5	377,8	327,4
40,0	231,0	3,6	1,4	14,9	0,0	442,0	78,9	107,7	655,3	312,8	385,6	380,5	326,8
41,0	232,0	3,5	1,0	14,9	0,0	441,5	79,0	103,6	657,1	315,9	388,7	383,7	326,1
42,0	233,0	3,3	0,6	14,6	0,0	441,2	79,2	107,4	656,6	318,4	391,8	386,5	325,5
43,0	234,0	3,2	0,3	14,4	0,0	439,6	79,2	107,4	656,8	321,2	394,9	389,4	325,0
44,0	235,0	3,1	0,2	14,6	0,0	437,9	79,3	107,3	656,5	323,8	398,1	392,2	324,1
45,0	236,0	3,0	0,2	14,6	0,0	436,2	79,3	106,8	655,3	326,3	401,1	395,1	323,8
46,0	237,0	2,9	0,1	14,1	0,0	433,3	79,4	104,3	655,6	328,8	404,4	397,9	323,3
47,0	238,0	2,8	0,1	13,9	0,0	429,8	79,4	105,8	652,9	331,4	407,5	400,2	323,0
48,0	239,0	2,7	0,0	13,4	0,0	427,0	79,6	104,7	651,9	334,2	410,8	403,3	322,5
49,0	240,0	2,6	0,0	13,4	0,0	424,0	79,6	104,3	649,6	336,9	413,8	406,3	321,7
50,0	241,0	2,5	0,0	13,0	0,0	420,0	79,6	105,8	647,7	339,8	416,8	409,0	321,3
51,0	242,0	2,4	0,0	12,8	0,0	416,6	79,5	104,7	644,7	342,9	419,5	411,4	320,9
52,0	243,0	2,4	0,0	12,6	0,0	412,8	79,6	103,5	641,7	345,1	422,4	414,2	320,7
53,0	244,0	2,2	0,0	12,5	0,0	408,7	79,8	103,3	637,8	347,2	425,5	416,1	320,7
54,0	245,0	2,1	0,0	12,4	0,0	405,8	79,6	103,1	633,9	349,6	428,1	418,8	320,5
55,0	246,0	2,1	0,0	12,6	0,0	402,7	79,8	102,9	628,7	352,0	430,8	420,4	320,6
56,0	247,0	2,0	0,0	11,9	0,0	399,2	79,7	102,7	624,5	354,4	433,7	422,9	320,7
57,0	248,0	2,0	0,0	11,6	0,0	394,5	79,7	102,5	620,6	356,4	436,0	424,9	320,8
58,0	249,0	1,9	0,0	11,6	0,0	390,6	79,8	102,3	616,6	358,3	438,4	427,2	320,9
59,0	250,0	1,8	0,0	11,1	0,0	386,8	79,6	102,1	612,8	360,8	440,2	429,5	321,3
60,0	251,0	1,7	0,0	10,8	0,0	382,8	79,7	101,9	606,5	362,9	442,4	431,4	322,1
61,0	252,0	1,7	0,0	10,5	0,0	378,9	79,9	101,7	603,2	364,9	444,6	433,4	322,7
62,0	253,0	1,6	0,0	10,5	0,0	375,7	79,8	101,6	598,1	366,8	446,5	435,4	323,2
63,0	254,0	1,6	0,0	10,6	0,0	372,0	79,8	100,6	592,9	368,2	448,1	437,0	323,8
64,0	255,0	1,5	0,0	10,5	0,0	369,7	79,7	100,7	588,4	369,2	449,8	439,2	324,4
65,0	256,0	1,5	0,0	10,2	0,0	366,6	79,6	100,4	583,2	370,1	451,0	440,4	324,8
66,0	257,0	1,5	0,0	10,0	0,0	363,2	79,5	100,0	576,8	371,2	451,8	440,8	325,7
67,0	258,0	1,4	0,0	9,7	0,0	360,2	79,8	99,7	572,1	371,9	453,3	442,7	326,1
68,0	259,0	1,4	0,0	9,4	0,0	356,6	79,5	99,3	566,5	372,4	453,9	443,9	326,9
69,0	260,0	1,3	0,0	9,1	0,0	353,3	79,7	98,1	561,7	373,1	454,6	444,8	327,5
70,0	261,0	1,3	0,0	8,8	0,0	350,7	79,7	97,8	555,2	374,2	454,5	445,3	328,5
71,0	262,0	1,3	0,0	8,6	0,0	349,0	79,5	97,6	549,9	373,9	454,5	446,3	329,0
72,0	263,0	1,3	0,0	8,4	0,0	347,0	79,5	97,4	543,8	374,8	454,4	447,0	329,8
73,0	264,0	1,2	0,0	8,4	0,0	345,1	79,6	97,1	537,2	374,6	454,6	446,8	330,5
74,0	265,0	1,2	0,0	8,3	0,0	343,0	79,5	96,9	531,2	374,4	454,0	446,6	331,4
75,0	266,0	1,2	0,0	8,4	0,0	341,5	79,4	96,6	525,5	374,2	453,8	446,4	332,3
76,0	267,0	1,1	0,0	8,3	0,0	340,4	79,4	96,4	520,9	373,5	453,0	446,1	333,4
77,0	268,0	1,1	0,0	8,3	0,0	338,1	79,3	96,2	516,0	373,3	452,6	445,4	334,3
78,0	269,0	1,1	0,0	8,3	0,0	336,2	79,3	95,9	510,0	372,7	451,6	444,8	335,1
79,0	270,0	1,1	0,0	8,3	0,0	334,3	79,3	95,7	506,2	371,1	450,6	444,3	336,0
80,0	271,0	1,0	0,0	8,2	0,0	333,4	79,2	96,1	500,9	371,7	449,9	443,7	337,0
81,0	272,0	1,0	0,0	8,2	0,0	332,2	79,4	96,1	496,6	370,5	448,8	442,7	337,7
82,0	273,0	1,0	0,0	8,2	0,0	331,0	79,4	96,1	491,8	369,9	448,1	441,5	338,7
83,0	274,0	1,0	0,0	8,2	0,0	330,3	79,3	96,1	488,0	369,2	447,1	440,6	339,7
84,0	275,0	0,9	0,0	8,1	0,0	329,1	79,4	96,1	484,5	368,7	446,3	439,4	340,6
85,0	276,0	1,0	0,0	8,1	0,0	327,7	79,1	96,0	481,1	367,1	445,1	438,4	341,2
86,0	277,0	0,9	0,0	8,1	0,0	327,3	79,3	96,0	478,2	366,4	443,9	436,6	342,2
87,0	278,0	0,9	0,0	8,1	0,0	326,6	79,2	96,0	474,8	365,8	443,0	435,3	343,3
88,0	279,0	0,9	0,0	8,1	0,0								

102,0	293,0	0,5	0,0	7,7	0,0	315,9	78,9	94,8	438,6	354,9	428,2	415,5	353,2
103,0	294,0	0,5	0,0	7,7	0,0	315,4	79,0	94,7	436,4	353,6	427,2	413,8	353,8
104,0	295,0	0,5	0,0	7,7	0,0	314,8	79,0	94,7	434,6	352,7	426,2	412,8	354,1
105,0	296,0	0,4	0,0	7,6	0,0	314,8	78,8	94,7	433,1	351,7	425,1	411,4	354,6
106,0	297,0	0,4	0,0	7,6	0,0	314,1	78,7	94,7	430,4	350,8	424,1	410,1	355,1
107,0	298,0	0,4	0,0	7,6	0,0	314,1	78,7	94,6	428,7	350,0	422,9	408,5	355,7
108,0	299,0	0,4	0,0	7,5	0,0	313,0	78,6	94,6	427,1	349,5	422,1	407,3	356,2
109,0	300,0	0,4	0,0	7,5	0,0	313,1	78,6	94,6	425,8	348,5	421,2	405,9	356,5
110,0	301,0	0,3	0,0	7,4	0,0	313,2	78,6	94,5	423,6	347,1	420,3	404,7	356,7
111,0	302,0	0,3	0,0	7,4	0,0	312,1	78,6	94,5	423,1	346,4	419,1	403,5	357,1
112,0	303,0	0,3	0,0	7,4	0,0	311,6	78,5	94,5	421,4	345,7	418,1	402,8	357,3
113,0	304,0	0,3	0,0	7,4	0,0	311,8	78,5	94,4	420,1	344,9	417,1	401,5	357,8
114,0	305,0	0,3	0,0	7,4	0,0	311,6	78,4	94,4	418,5	344,0	416,3	400,3	357,8
115,0	306,0	0,2	0,0	7,3	0,0	311,7	78,5	94,4	417,4	343,3	415,3	399,3	358,1
116,0	307,0	0,2	0,0	7,3	0,0	311,4	78,4	94,4	416,4	342,4	414,3	398,1	358,4
117,0	308,0	0,2	0,0	7,3	0,0	311,0	78,4	94,3	415,6	342,0	413,4	397,1	358,5
118,0	309,0	0,2	0,0	7,3	0,0	310,9	78,4	94,3	414,6	341,6	412,4	395,7	358,8
119,0	310,0	0,2	0,0	7,2	0,0	311,1	78,3	94,3	413,6	340,4	411,4	394,7	358,9
120,0	311,0	0,1	0,0	7,2	0,0	311,6	78,3	94,2	412,4	340,1	410,3	394,0	359,0
121,0	312,0	0,2	0,0	7,2	0,0	311,1	78,1	94,2	411,1	340,2	409,5	393,4	359,2
122,0	313,0	0,1	0,0	7,1	0,0	311,0	78,3	94,2	410,3	339,0	408,8	392,3	359,3
123,0	314,0	0,1	0,0	7,1	0,0	311,1	78,3	94,1	409,5	338,9	407,9	391,1	359,8
124,0	315,0	0,1	0,0	7,1	0,0	310,2	78,3	94,1	409,1	338,2	406,8	390,2	359,7
125,0	316,0	0,1	0,0	7,0	0,0	310,3	78,3	94,1	407,9	337,0	405,7	389,2	359,9
126,0	317,0	0,0	0,0	7,0	0,0	310,7	78,3	94,1	407,2	337,2	404,6	388,4	360,1

Manufacturer: HEARTHSTONE
Model: GM 40
Run: 4
Project #: PI 20149
Test Duration: 126 min

	HHV	LHV
Eff	76.10%	82.25%
Comb Eff	97.77%	97.77%
HT Eff	77.84%	84.13%
Output	24 656	kJ/h
Burn Rate	1.64	kg/h
Grams CO	115	g
Input	32 399	kJ/h
MC wet	17.76	

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

Overall Heating Efficiency:	76.10%	Air Fuel Ratio (A/F)	30.01
Combustion Efficiency:	97.77%	Dry Molecular Weight (M _d)	381.61
Heat Transfer Efficiency:	77.84%	Dry Moles Exhaust Gas (N ₂):	10.94

Heat Output:	23 389 Btu/h	24 656 kJ/h
Heat Input:	30 734 Btu/h	32 399 kJ/h
Burn Duration:	2.10 h	
Burn Rate:	3.60 lb/h	1.635 kg/h
Stack Temp:	367.5 Deg. F	186.4 Deg. C

CO_{2-ut} Ultimate CO₂
F₀ 19.64
1.062



Date: 2017-05-25 Manufacturer: Hearthstone Model: GM 40
Project #: PI 20199 Run: 4 Tech: MM Reviewer: DP

- kindling 25 LBS stand FIRE
- AT 23 LBS close Door
- AT 08 LBS insert pre load
- AT 11.8 LBS close Door
- AT 10.9 LBS open Door
AT 10.5 LBS close Door
AT 9.7 LBS close by pass
AT 7.7 LBS close air inlet (Drill bit 1/4)
AT 2.3 LBS insert load
open by pass
open Door
open air inlet
insert load
close Door
close by pass
AT 3mm close air inlet (Drill bit 1/4)

TEST LOAD CONFIGURATION

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Date: _____
Project #: _____

Manufacturer: _____
Run: _____

Model: _____
Reviewer: _____

Side view	Front view	Top view
		

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

	ADDITION		SUBTRACTION	
	ft3	Volume	ft3	Volume
V measure				
V ashlip				
%				
V usable				
Usable Firebox: _____				
				
Test load weight: _____	Minimum: _____		Maximum: _____	
Déviation: _____				

PRE / POST CHECKS

 Date: 2017-05-25

 Manufacturer: Hearthstone

 Model: GM40

 Project #: PI 20149

 Run: 4

 Tech: MM

 Reviewer: DP

Moisture Meter Calibration Check:

Equipment #	Time	12%	22%
EM 191	7:00	OK	OK

Pre-Test

Post-Test

Facility Conditions:

Air Velocity from less than 2 feet

Smoke Capture Check.....

Picture.....

Pre-Test	Post-Test
5 (max50 Fpm)	4 (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 ±10%.....

2017-05-19
2017-05-19
OK
OK

OK

Temperature System:

Ambient (65°-90°F).....

Wood Heater Surface (±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
3	21	41
360	710	907
361	901	909
N	V1	12
✓	✓	✓

SAMPLING EQUIPMENT CHECK OUT

Date: 2017-05-25 Manufacturer: Heath Stone Model: GM 40
 Project #: PI 20149 Run: 4 Tech: MM Reviewer: RP

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)	512526.31	513215.96	512526.43	513216.04	433177.18	433849.90
Initial 1minute DGM (Liter)	512526.28	513215.94	512526.41	513216.03	433177.18	433849.81
Change © (Liter)	0.03	0.02	0.02	0.01	0	0.01
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		

PRE-TEST SCALE AUDIT

 Date: 2012-05-25

 Manufacturer: Hearthstone

 Model: GM 40

 Project #: PL 20149

 Run: 4

 Tech: mm

 Reviewer: SP

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 ^{mm} 200 mg
Analytical	EM-129	200 g, Class S	200 g

LIMITS OF WEIGHT RANGES

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

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

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

Date: 2017-05-25 Manufacturer: Heathstone Model: GM 40
 Project #: PL 20149 Run: 4 Tech: MM Reviewer: DO

FOR TUNNELS < 12 in

Barometric pressure (P_{bar}) 100.2 (KPa.) Static pressure (P_q) 0.00 (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	0.057	72.72
B - Centroid	3.00	3.50	4	0.056	72.40
A-1	0.40	0.50	0.50	0.046	72.70
A-2	1.50	1.75	2	0.050	72.85
A-3	4.50	5.25	6	0.047	72.11
A-4	5.60	6.5	7.5	0.047 0.051	72.43
B-1	0.40	0.50	0.50	0.047	72.44
B-2	1.50	1.75	2	0.049	72.83
B-3	4.50	5.25	6	0.048	72.78
B-4	5.60	6.5	7.5	0.050	72.80
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_p avg. = average of the square roots of the velocity heads (Δ_p) measured at each traverse point.

Date: 2017-05-25

 Manufacturer: Hearthstone

 Model: GM 40

 Project #: p1 20149

 Run: 4

 Tech: MM

 Reviewer: SP

Pre-Test (Adjust and Record)

	ZERO		SPAN		CAL. (Record Only)	
CO	0	0	2449	2971	0997	1.00
Tolerance CO		+/- 0.02		+/- 0.15		+/- 0.05
CO ₂	0	0	1792	1787	9.76	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	0.005	2963	3.008	0.005	0.02	0.014	0.15	0.004	0.05	✓	
CO ₂	0	1782	9.70	0	0.02	0.10	0.5	0.06	0.5	✓	
O ₂	na	na	na	-	na	-	na	-	na	✓	

TEST DATA LOG

Date: 2012-05-25 Manufacturer: Hearthstone Model: GM 40
 Project #: PI 20199 Run: 4 Tech: MM Reviewer: DP

RAW DRY GAS METER READINGS

	System 1	System 2	Blank
Final (Liter)	513215, 13	433849, 07	236, 74
Initial (Liter)	512526, 93	433177, 84	207, 82

AMBIENT CONDITIONS

	Before	After
Barometer (kPa):	100,2	99,8
Dry Bulb (F):	70,7	85,1
Humidity (%):	45,8	35,2

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: 2017-05-25 Manufacturer: Hearthstone Model: GM 40
 Project #: PL 20149 Run: 4 Tech: MM Reviewer: DP

FUEL DESCRIPTION:

Type of wood:

PRE-TEST LOAD

Piece Size	Weight	Meter Moisture Content (% dry)*					
1 1/2" x 3 1/2" x 8 in.	0.846 lbs.	196	199	201	211	211	211
1 1/2" x 3 1/2" x 8 in.	0.796 lbs.	198	206	203	204	204	202
1 1/2" x 3 1/2" x 8 in.	0.894 lbs.	199	201	206	205	205	208
1 1/2" x 3 1/2" x 8 in.	0.806 lbs.	208	210	219	218	218	22
1 1/2" x 3 1/2" x 8 in.	0.856 lbs.	220	226	222	218	218	219
1 1/2" x 3 1/2" x 8 in.	0.882 lbs.	218	226	223	222	222	218
1 1/2" x 3 1/2" x 8 in.	0.872 lbs.	220	219	216	213	213	215
1 1/2" x 3 1/2" x 8 in.	0.878 lbs.	213	212	199	201	201	201
1 1/2" x 3 1/2" x 8 in.	0.874 lbs.	221	217	218	213	213	210
1 1/2" x 3 1/2" x 8 in.	0.846 lbs.	217	213	216	212	212	220
1 1/2" x 3 1/2" x 8 in.	0.870 lbs.	223	224	226	222	222	219
1 1/2" x 3 1/2" x 8 in.	0.848 lbs.	216	215	213	216	216	217
1 1/2" x 3 1/2" x 8 in.	0.844 lbs.	209	209	206	203	203	202
1 1/2" x 3 1/2" x 8 in.	0.854 lbs.	205	201	206	208	208	203
x x in.	lbs.	20.5 mm					
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: 1197 lbs

FUEL DATA

Date: 2017-05-25 Manufacturer: Hearthstone Model: GM 40
 Project #: PI 20149 Run: 4 Tech: mm Reviewer: DP

FUEL DESCRIPTION:

Type of wood :

TEST LOAD

Piece Size	Weight	Meter Moisture Content (% dry)*				
1 1/2 x 3 1/4 x 13 1/8 in.	1,556 lbs.	20.8	20.9	21.1	21.6	21.8
1 1/2 x 3 1/4 x 13 1/2 in.	1,538 lbs.	21.8	21.3	21.4	21.5	21.5
1 1/2 x 3 1/4 x 13 1/2 in.	1,574 lbs.	20.1	21.8	21.6	21.2	21.8
1 1/2 x 3 1/4 x 13 1/2 in.	1,352 lbs.	21.0	21.6	21.3	21.8	21.9
1 1/2 x 3 1/4 x 13 1/2 in.	1,552 lbs.	21.6	21.8	21.9	21.8	22.0
1 1/2 x 3/4 x 5 in.	0,112 lbs.			22.1		
1 1/2 x 3/4 x 5 in.	0,114 lbs.			21.9		
1 1/2 x 3/4 x 5 in.	0,100 lbs.			21.8		
1 1/2 x 3/4 x 5 in.	0,114 lbs.			22.3		
1 1/2 x 3/4 x 5 in.	0,112 lbs.			22.6		
1 1/2 x 3/4 x 5 in.	0,094 lbs.			22.3		
1 1/2 x 3/4 x 5 in.	0,112 lbs.			21.8		
1 1/2 x 3/4 x 5 in.	0,088 lbs.			21.6		
1 1/2 x 3/4 x 5 in.	0,112 lbs.			21.8		
1 1/2 x 3/4 x 5 in.	0,088 lbs.			22.6		
1 1/2 x 3/4 x 5 in.	0,096 lbs.			21.7		
1 1/2 x 3/4 x 5 in.	0,092 lbs.			21.9		
1 1/2 x 3/4 x 5 in.	0,116 lbs.			22.0		
1 1/2 x 3/4 x 5 in.	0,086 lbs.			21.6		
1 1/2 x 3/4 x 5 in.	0,092 lbs.			21.8		
1 1/2 x 3/4 x 5 in.	0,104 lbs.			21.0		
x x in.	lbs.					
x x in.	lbs.					
x x in.	lbs.					
x x in.	lbs.					
x x in.	lbs.					
x x in.	lbs.					

TEST LOAD WEIGHT: 924 lbs Min 20%: 185 Max 25%: 230

Date: 2017-05-24 Manufacturer: Heathstone Model: GM 40
Project #: PI 20149 Run: 41 Tech: MR 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	Blank		
Date	Time	360	361	3	21	710	901	53	910		
2017-05-24	17:30	61,4571	0,1286	10,1160	108,7416	0,1262	0,1283	10,2511	0,1307		
2017-05-25	9:00	61,4572	0,1285	10,1159	108,7417	0,1262	0,1284	10,2510	0,1308		

		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	360	361	3	21	710	901	53	910		
2017-05-25	15:00	61,4577	0,1275	10,1211	108,7428	0,1260	0,1282	10,2540	0,1310		
2017-05-30	8:00	61,4574	0,1297	10,1178	108,7419	0,1257	0,1282	10,2521	0,1310		
2017-06-01	8:00	61,4574	0,1297	10,1178	108,7419	0,1257	0,1282	10,2521	0,1310		

DILUTION TUNNEL PARTICULATE SAMPLER DATA

Date: 2017-05-24 Project #: PIW 144 Run: 4 Manufacturer: Hearthstone Model: GM40
 Tech: MM Reviewer: DE

SYSTEM 2					
Pre-test Weight Record	Probe & Housing Number	Front Filter Number	Back Filter Number	gaskets	
Date	Time				
2017-05-24	17:30	110, 3646	0, 1282	0, 1312	10, 9433
2017-05-25	9:00	110, 3645	0, 1283	0, 1312	10, 9434

SYSTEM 2					
Post-test Weight Record	Probe & Housing Number	Front Filter Number	Back Filter Number	gaskets	
Date	Time				
2017-05-24	15:00	110, 3652	0, 1297	0, 1309	10, 9468
2017-05-30	8:00	110, 3650	0, 1295	0, 1309	10, 9454
2017-06-01	8:00	110, 3650	0, 1295	0, 1309	10, 9454

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	26-05-2017
Technicien	M.M
Project #	PI 20149

Description de l'unité

Manufacturier	HEARTHSTONE	
Modèle	GM 40	
Combustion system	Cat	
Appliance type	WOOD STOVE	
Firebox volume	1,32	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	na	BTU/h Donnée fournie par le manfacturier
Targeted category	4	
Targeted output	na	BTU/h
Cp steel	na	BTU/lb-°F

Échantillonnage

Blank sampling rate	0,20	cuft/min
Internal probe diameter	0,18	in.
Calibration Factor (DGM #1):	0,987	Dimensionless
Equipment number (DGM #1):	EM-178	
Calibration Factor (DGM #2):	0,996	Dimensionless
Equipment number (DGM #2):	EM-179	
Calibration Factor (DGM #3):	0,986	Dimensionless
Equipment number (DGM #3):	EM-070	

Tunnel

Targeted tunnel flow rate	140	scfm
Tunnel diameter	6	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 20149
Date	26-05-2017
Technicien	M.M

Fuel data

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

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

	Start	End
Barometer (kPa):	99,5	99,4
Barometer (in.Hg):	29,382339	29,352809
Dry Bulb (F):	74,48	78,26
Humidity (%):	43	40,7
Air velocity (ft/min)	6	3

DGM #1	Final: ##### cuft
	Initial: ##### cuft
DGM #2	Final: ##### cuft
	Initial: ##### cuft

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

Final: 514400,280	Liter
Initial: 513216,550	Liter
Final: 435002,000	Liter
Initial: 433851,110	Liter

Final: 286,820	cuft
Initial: 236,740	cuft

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

185

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

Project nu.	PI 20149
Date	26-05-2017
Technicien	M.M

FUEL LOAD DATA SHEET, CSA B415

Test Load Weight:

Lower	Ideal	Upper
-------	-------	-------

8,3	9,2	10,2
-----	-----	------

* 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):	29,8	lbs./ft3
Dry Wood Density:	24,6	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	13,5	1,53	20,90	21,00	20,80	21,10	21,10	32,0994	70,88	21,0
1,5	3,5	13,5	1,56	22,10	21,60	21,90	21,90	21,70	34,02672	70,88	21,8
1,5	3,5	13,5	1,57	21,10	21,30	21,40	21,80	21,30	33,48108	70,88	21,4
1,5	3,5	13,5	1,47	20,10	20,20	19,90	19,60	19,80	29,20272	70,88	19,9
1,5	3,5	13,5	1,31	21,50	22,10	22,30	21,80	21,70	28,6628	70,88	21,9
1,5	0,75	5	0,11			20,10			2,2914	5,63	20,1
1,5	0,75	5	0,11			20,60			2,3072	5,63	20,6
1,5	0,75	5	0,11			20,10			2,2914	5,63	20,1
1,5	0,75	5	0,09			20,90			1,881	5,63	20,9
1,5	0,75	5	0,13			21,00			2,646	5,63	21,0
1,5	0,75	5	0,10			21,60			2,0736	5,63	21,6
1,5	0,75	5	0,11			21,30			2,4282	5,63	21,3
1,5	0,75	5	0,09			20,90			1,9228	5,63	20,9
1,5	0,75	5	0,11			20,60			2,3072	5,63	20,6
1,5	0,75	5	0,11			21,10			2,3632	5,63	21,1
1,5	0,75	5	0,13			20,80			2,6624	5,63	20,8
1,5	0,75	5	0,11			20,30			2,3142	5,63	20,3
1,5	0,75	5	0,11			20,60			2,3484	5,63	20,6
1,5	0,75	5	0,12			21,00			2,478	5,63	21,0
1,5	0,75	5	0,112			20,30			2,2736	5,63	20,3
1,5	0,75	5	0,114			20,80			2,3712	5,63	20,8
										0,00	
										0,00	
										0,00	
										0,00	
										0,00	
										0,00	
										0,00	
										0,00	
										0,00	
										0,00	
									SUM MCx	194,43252	20,9 %

Test Load Weight: lbs.

Dry Weight: kg.

Average Moisture Content: %

Dry:	21,11	Dry(EPA)	21,11
		Dry(B415)	21,11

21,11
Must be 19-25

Wet: 17,43
must be 15,2-22

Coal Bed Range: lbs. to

2,3 lbs.

TEST CHARGE:

Coal bed weight: 2,3

lbs.

Project nu.	PI 20149
Date	26-05-2017
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=
0,942

Pour un tunnel moins de 12", prendre 4 lectures

	TUNNEL VELOCITY	TUNNEL TEMP	SQUARE ROOT
	In. wc	°F	
A center	0,056	74,75	0,2366
B center	0,055	74,29	0,2345
A1	0,045	74,71	0,2121
A2	0,049	74,19	0,2214
A3	0,047	74	0,2168
A4	0,050	73,98	0,2236
B1	0,046	74,310	0,2145
B2	0,047	74,160	0,2168
B3	0,050	74,180	0,2236
B4	0,048	74,260	0,2191
AVERAGE	0,0493	74,2830	0,2219

Project nu.	PI 20149
Date	26-05-2017
Technicien	M.M

Filter set weight

Number	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			
Before (1)	1	202	373	4	32	379	903	6	50	904	905	12	908		
Before (2)															
Before (3)															
Before (4)															
Before (5)	61,0684	0,1296	0,1271	10,1538	110,1775	0,1266	0,1276	10,3136	107,6456	0,1272	0,1282	10,4061	0,1300	25/05/2017	18:00
Before (6)	61,0684	0,1295	0,1271	10,1537	110,1776	0,1265	0,1277	10,3137	107,6457	0,1271	0,1282	10,4062	0,1299	26/04/2107	09:30
After (1)	61,0688	0,1293	0,1269	10,1581	110,1784	0,1254	0,1276	10,3176	107,6465	0,1270	0,1282	10,4100	0,1300	26/05/2017	16:00
After (2)	61,0685	0,1291	0,1269	10,1552	110,1778	0,1254	0,1276	10,3155	107,6458	0,1270	0,1282	10,4074	0,1300	29/05/2017	08:00
After (3)	61,0685	0,1291	0,1269	10,1550	110,1778	0,1254	0,1276	10,3155	107,6458	0,1270	0,1282	10,4076	0,1300	30/05/2017	08:00
After (4)	61,0685	0,1291	0,1269	10,1550	110,1778	0,1254	0,1276	10,3155	107,6458	0,1270	0,1282	10,4076	0,1300	02/06/2017	08:00
After (5)															
After (6)	61,0685	0,1291	0,1269	10,1550	110,1778	0,1254	0,1276	10,3155	107,6458	0,1270	0,1282	10,4076	0,1300	02/06/2017	08:00
Difference	0,0001	-0,0004	-0,0002	0,0013	0,0002	-0,0011	-0,0001	0,0018	0,0001	-0,0001	0,0000	0,0014	0,0001		
Total (mg)		0,8				1,6				1,4			0,1		
Total ajusté (mg)		0,70				1,50				1,30					

Project nu. PI 20149

Date 26-05-2017

Technicien

SFBA EPA EMISSION RESULTS

RESULTS

Average emission rate: 0,37 g/hr
Burn Rate : 0,958 Dry kg/hr

Test Duration: 216 min

PRESSURE FACTOR: DGM 1 0,95534
DGM 2 0,95715
DGM 3 0,98154

BAROMETRIC PRESSURE
Average: 29,367574 in Hg
Start: 29,382339 in Hg
End: 29,352809 in Hg

TEMPERATURE FACTORS DGM 1 0,98060
DGM 2 0,98048
DGM 3 0,98114

DGM CONTROLLER VALUES

DGM 1 Final: 18165,875 Cuft
Initial: 18124,072 Cuft

VOLUMES SAMPLED DGM 1 38,652 SCft
DGM 2 37,990 SCft
DGM 3 47,553 SCft

DGM 2 Final: 15361,951 Cuft
Initial: 15321,308 Cuft

DGM #3 Final: 286,820 Cuft
Initial: 236,740 Cuft

TOTAL TUNNEL VOLUME : 36071

TEMPERATURES

SAMPLE RATIOS
Sample Train 1: 933,229
Sample Train 2: 949,490

DGM 1 538,448 °R
DGM 2 538,509 °R

CALIBRATION FACTORS

Paticulate concentration
Sample Train 1 0,000041 g/dscf
Sample Train 2 0,000037 g/dscf
Room 0,000002 g/dscf

DGM 1 0,9870
DGM 2 0,9960
DGM #3 0,9860

TUNNEL FLOW RATE: 166,996 Dscfm

TOTAL EMISSIONS
Sample Train 1 1,42 g
Sample Train 2 1,25 g

PARTICULATE CATCH
Total Sample Train 1: 1,60 mg
Total Sample Train 2: 1,40 mg
Total Sample Train 1 1st hour: 0,80 mg

EMISSION RATES
Sample Train 1 0,39 g/hr
Sample Train 2 0,35 g/hr

1st hour emission rate 0,75 g/hr

DEVIATION: 6,14%

Cs Train 1 Train 2
4,14E-05 3,68519E-05

*		*	*	*	*	*1	*2	*3	*4	*5	*6	*7	*8
Elapsed		Weight				Flue	Room	Tunnel	Unit	Unit	Unit	Unit	Unit
Time	Raw data row	Remaining	CO	CO ₂	O ₂	Gas	Temp	Dry Bulb	Top	Back	R.Side	L.Side	Bottom
min		lbs	%	%	%	°F	°F	°F	°F	°F	°F	°F	°F
0,0	185,00	9,2	0,1	3,2	0,0	282,7	76,2	106,8	418,1	391,4	354,5	356,8	420,3
1,0	186,0	9,0	0,0	4,4	0,0	301,8	76,3	98,0	412,1	391,2	353,0	355,9	417,5
2,0	187,0	8,9	0,0	7,0	0,0	330,7	76,3	99,1	415,1	390,6	352,3	354,4	415,5
3,0	188,0	8,8	0,0	9,3	0,0	353,1	76,4	100,4	431,5	389,7	350,9	353,2	413,2
4,0	189,0	8,7	0,0	10,1	0,0	371,8	76,5	102,0	448,8	388,6	350,1	351,9	410,5
5,0	190,0	8,6	0,0	11,2	0,0	340,5	76,4	94,7	459,4	387,3	348,7	350,5	409,5
6,0	191,0	8,5	0,0	5,5	0,0	317,0	76,4	93,3	455,2	386,0	347,6	348,9	408,4
7,0	192,0	8,4	0,0	4,8	0,0	303,6	76,2	92,4	448,8	384,5	345,6	347,2	406,1
8,0	193,0	8,4	0,0	7,4	0,0	299,5	76,5	92,0	445,6	382,9	343,3	344,6	404,3
9,0	194,0	8,3	0,0	10,1	0,0	300,0	76,3	92,1	451,0	381,3	341,9	342,8	401,7
10,0	195,0	8,2	0,0	8,6	0,0	301,5	76,1	92,0	453,7	379,6	339,8	340,6	398,7
11,0	196,0	8,1	0,0	8,7	0,0	305,5	76,4	91,6	454,9	377,9	337,8	339,0	397,0
12,0	197,0	8,0	0,6	10,6	0,0	310,7	76,8	92,6	461,0	376,4	335,9	337,3	393,6
13,0	198,0	7,9	0,0	9,8	0,0	314,2	76,7	93,0	466,0	374,9	333,9	336,1	390,5
14,0	199,0	7,8	0,0	10,1	0,0	319,7	77,0	93,2	468,6	373,5	332,6	334,4	388,7
15,0	200,0	7,6	0,0	10,9	0,0	326,6	76,7	93,4	474,0	372,2	330,6	333,2	386,2
16,0	201,0	7,6	0,0	9,7	0,0	329,9	77,0	93,4	477,3	371,2	329,1	332,3	383,3
17,0	202,0	7,4	0,0	10,1	0,0	331,2	77,1	93,6	481,8	370,2	328,1	331,4	381,4
18,0	203,0	7,3	0,2	11,6	0,0	333,1	77,1	94,0	490,4	369,5	326,4	330,3	378,8
19,0	204,0	7,2	0,0	11,5	0,0	333,4	77,3	93,8	498,0	368,8	325,4	329,5	376,3
20,0	205,0	7,1	0,0	12,1	0,0	334,0	77,3	93,4	502,4	368,6	324,1	328,3	374,7
21,0	206,0	6,9	0,1	12,2	0,0	335,0	77,2	94,3	506,8	368,3	323,5	328,0	371,7
22,0	207,0	6,9	0,7	12,5	0,0	335,7	77,4	94,5	513,2	368,2	323,1	327,6	369,6
23,0	208,0	6,7	0,7	12,2	0,0	335,1	77,6	94,5	519,5	368,4	322,9	327,1	367,9
24,0	209,0	6,7	0,8	12,1	0,0	335,1	77,8	94,7	524,6	368,8	322,8	327,2	365,9
25,0	210,0	6,5	0,9	12,1	0,0	334,3	77,6	94,4	529,2	369,2	322,3	326,9	363,6
26,0	211,0	6,4	1,2	11,8	0,0	331,7	77,8	93,9	533,8	369,8	322,5	327,7	361,2
27,0	212,0	6,3	0,0	12,2	0,0	331,9	77,8	94,3	534,3	370,4	322,8	328,1	359,6
28,0	213,0	6,2	0,5	13,3	0,0	333,5	77,7	94,4	539,6	371,1	323,0	328,6	357,5
29,0	214,0	6,1	0,6	13,1	0,0	334,0	77,9	94,0	545,9	372,0	323,3	329,7	354,6
30,0	215,0	6,0	0,7	13,3	0,0	333,2	78,0	94,2	552,2	372,9	323,9	330,9	352,5
31,0	216,0	5,9	0,1	12,6	0,0	331,7	78,0	94,8	558,3	373,8	324,8	331,9	350,6
32,0	217,0	5,8	0,0	11,9	0,0	328,9	78,2	94,7	563,2	374,7	325,7	333,2	348,6
33,0	218,0	5,7	0,0	11,2	0,0	326,5	78,2	94,6	567,7	375,5	326,7	334,4	346,6
34,0	219,0	5,6	0,1	12,4	0,0	326,5	78,1	94,6	573,0	376,2	327,6	335,5	344,6
35,0	220,0	5,6	0,0	11,9	0,0	326,0	78,2	94,6	577,4	376,8	328,7	336,8	342,4
36,0	221,0	5,4	0,1	12,2	0,0	324,6	78,2	94,7	579,9	377,3	329,6	337,7	340,8
37,0	222,0	5,4	0,2	12,8	0,0	325,6	78,4	94,2	583,3	377,6	330,9	338,8	339,1
38,0	223,0	5,3	0,1	12,9	0,0	326,4	78,1	93,9	586,4	378,1	331,5	340,0	337,0
39,0	224,0	5,2	0,2	13,3	0,0	328,4	78,3	94,6	589,2	378,5	333,1	341,4	335,3
40,0	225,0	5,1	0,5	13,8	0,0	330,7	78,7	94,5	590,8	379,0	334,7	342,3	333,9
41,0	226,0	5,0	0,5	14,1	0,0	333,0	78,6	94,5	594,1	379,7	335,9	343,6	331,8
42,0	227,0	4,9	0,3	13,9	0,0	334,4	78,9	94,8	594,8	380,4	337,5	345,0	330,2
43,0	228,0	4,8	0,3	13,7	0,0	334,8	78,9	94,9	595,2	381,3	339,3	346,7	328,8
44,0	229,0	4,7	0,3	13,7	0,0	335,4	78,9	94,9	596,6	382,3	341,0	348,6	327,0
45,0	230,0	4,6	0,1	13,7	0,0	334,8	78,9	95,1	598,7	383,6	342,7	350,3	325,0
46,0	231,0	4,5	0,2	13,3	0,0	334,7	79,0	95,1	600,3	385,0	344,6	351,9	323,6
47,0	232,0	4,4	0,1	13,1	0,0	333,7	79,0	95,1	601,8	386,5	346,5	353,6	321,5
48,0	233,0	4,3	0,1	13,0	0,0	332,9	79,1	94,9	602,8	388,0	348,4	355,1	319,7
49,0	234,0	4,2	0,1	12,9	0,0	331,7	79,0	95,0	604,2	389,6	350,2	356,8	317,9
50,0	235,0	4,2	0,2	13,2	0,0	330,6	79,2	95,1	604,9	391,1	352,2	358,5	316,3
51,0	236,0	4,1	0,1	13,3	0,0	330,5	79,2	95,1	604,4	392,6	354,1	360,2	314,7
52,0	237,0	4,0	0,2	13,0	0,0	329,7	79,3	95,2	604,3	394,2	356,2	361,6	313,2
53,0	238,0	3,9	0,1	13,0	0,0	329,5	79,3	94,6	603,8	395,8	357,8	363,2	311,6
54,0	239,0	3,8	0,1	13,1	0,0	329,2	78,7	94,4	601,8	397,4	359,8	364,9	309,9
55,0	240,0	3,7	0,1	13,0	0,0	329,7	78,4	94,2	600,8	399,1	361,4	366,7	307,8
56,0	241,0	3,6	0,1	12,9	0,0	328,9	79,5	93,6	599,4	400,8	363,7	367,9	306,6
57,0	242,0	3,6	0,1	12,8	0,0	327,1	79,4	94,4	599,1	402,4	365,8	369,5	305,1
58,0	243,0	3,5	0,0	12,8	0,0	326,4	79,1	94,7	597,8	404,2	367,7	371,0	303,6
59,0	244,0	3,5	0,0	12,7	0,0	325,8	79,1	93,8	597,6	405,8	369,3	372,4	302,1
60,0	245,0	3,3	0,3	14,3	0,0	328,3	79,1	94,2	600,3	407,6	371,2	374,0	300,2
61,0	246,0	3,3	0,2	14,0	0,0	330,8	79,7	94,2	603,6	409,2	373,4	374,9	299,1
62,0	247,0	3,2	0,2	13,9	0,0	331,3	79,8	94,8	607,3	410,8	375,4	376,5	297,8
63,0	248,0	3,1	0,2	14,0	0,0	331,9	79,7	95,4	609,4	412,5	377,4	378,0	296,6
64,0	249,0	3,0	0,9	13,9	0,0	332,1	79,6	95,4	611,4	414,2	379,2	379,6	295,2
65,0	250,0	2,9	0,9	13,9	0,0	332,6	79,7	95,3	613,0	416,0	381,3	381,1	294,2
66,0	251,0	2,8	0,8	13,9	0,0	332,0	79,8	95,3	614,4	417,9	383,3	382,5	293,3
67,0	252,0	2,8	0,6	13,9	0,0	331,1	79,9	94,9	614,2	419,9	385,3	384,0	292,3
68,0	253,0	2,7	0,5	13,9	0,0	330,3	79,8	94,9	615,5	421,9	387,2	385,8	291,4
69,0	254,0	2,6	0,3	13,7	0,0	328,1	79,8	94,7	615,8	424,0	389,2	387,5	291,3
70,0	255,0	2,5	0,1	13,3	0,0	325,7	79,9	94,7	615,5	426,2	391,2	389,0	290,8
71,0	256,0	2,5	0,0	12,7	0,0	322,4	79,9	94,4	615,1	428,3	393,3	390,6	290,4
72,0	257,0	2,4	0,0	12,1	0,0	318,6	80,0	94,3	614,4	430,5	395,3	392,0	290,1
73,0	258,0	2,4	0,0	11,6	0,0	314,6	79,9	93,8	612,2	432,5	397,3	393,4	289,7
74,0	259,0	2,3	0,0	11,1	0,0	311,1	80,0	93,7	609,1	434,5	399,1	394,6	290,1
75,0	260,0	2,3	0,0	10,8	0,0	307,0	79,9	93,5	605,8	436,4	400,8	395,8	289,9
76,0	261,0	2,2	0,0	10,6	0,0	303,5	79,8	92,6	601,1	438,0	402,0	396,4	289,9
77,0	262,0	2,2	0,0	10,3	0,0	299,5	80,0	91,7	596,9	439,5	403,8	397,0	290,2
78,0	263,0	2,2	0,0	10,2	0,0	295,6	80,1	92,5	591,9	440,9	405,2	397,3	290,7
79,0	264,0	2,1	0,0	9,9	0,0	292,2	80,0	92,2	585,8	442,0	406,5	398,1	290,7
80,0	265,0	2,1	0,0	9,9	0,0	289,2	79,8	91,8	580,8	443,0	407,5	398,1	290,9
81,0	266,0	2,0	0,0	9,8	0,0	286,7	79,9	91,8	575,5	443,9	408,4	397,8	291,7
82,0	267,0	2,0	0,0	9,7	0,0	283,7	79,9	91,9	569,3	444,7	409,3	397,9	292,4
83,0	268,0	2,0	0,0	9,8	0,0	281,2	79,8	91,8	564,1	445,4	409,9	397,9	292,3
84,0	269,0	2,0	0,0	9,8	0,0	278,7	79,9	91,4	558,8	446,1	410,6	397,9	293,1
85,0	270,0	2,0	0,0	9,8	0,0	275,8	79,7	89,9	552,1	446,7	410,5	396,4	293,5
86,0	271,0	1,9	0,0	9,7	0,0	273,1	79,3	89,8	548,0	447,2	410,6	397,3	293,7
87,0	272,0	1,9	0,0	9,5	0,0	270,7	79,5	89,6	541,6	447,6	411,1	397,5	294,2
88,0	273,0	1,9	0,0	9,3	0,0	268,2	79,6	89,5	5				

102,0	287,0	1,7	0,0	8,7	0,0	245,4	78,8	87,3	473,8	449,8	404,0	394,2	305,6
103,0	288,0	1,6	0,0	8,8	0,0	244,5	78,7	87,2	469,5	449,7	403,3	394,3	306,3
104,0	289,0	1,6	0,0	8,8	0,0	243,6	79,1	86,9	466,4	449,5	402,9	394,1	307,4
105,0	290,0	1,6	0,0	8,6	0,0	242,7	78,9	86,9	462,8	449,4	402,1	394,1	307,5
106,0	291,0	1,5	0,0	8,6	0,0	241,8	78,8	87,0	459,3	449,3	401,1	394,1	307,9
107,0	292,0	1,5	0,0	8,6	0,0	241,0	78,8	87,3	456,9	449,1	400,5	393,4	308,9
108,0	293,0	1,5	0,0	8,5	0,0	240,4	78,6	87,5	454,9	448,9	399,8	393,1	309,6
109,0	294,0	1,5	0,0	8,5	0,0	239,4	78,6	87,5	452,0	448,7	398,9	392,7	310,1
110,0	295,0	1,5	0,0	8,3	0,0	239,2	78,7	87,1	448,7	448,5	398,4	392,1	310,6
111,0	296,0	1,4	0,0	8,4	0,0	238,9	78,7	87,7	446,7	448,2	397,6	392,1	311,3
112,0	297,0	1,4	0,0	8,2	0,0	237,9	78,7	87,3	444,0	447,9	396,8	391,5	311,5
113,0	298,0	1,4	0,0	8,1	0,0	237,0	78,6	87,1	441,1	447,6	396,1	390,9	312,1
114,0	299,0	1,4	0,0	8,3	0,0	236,5	78,5	87,0	438,1	447,3	395,2	390,4	312,7
115,0	300,0	1,4	0,0	8,3	0,0	235,9	78,5	86,3	436,9	446,8	394,2	389,6	313,8
116,0	301,0	1,4	0,0	8,3	0,0	235,2	78,4	86,1	434,4	446,4	393,4	389,3	313,9
117,0	302,0	1,4	0,0	8,4	0,0	235,1	78,5	86,3	432,3	446,0	392,9	388,5	314,3
118,0	303,0	1,4	0,0	8,3	0,0	234,7	78,3	86,1	430,1	445,5	391,9	388,1	314,9
119,0	304,0	1,4	0,0	8,4	0,0	233,7	78,5	86,1	428,3	445,1	391,2	387,4	315,2
120,0	305,0	1,3	0,0	8,4	0,0	232,8	78,3	86,1	426,0	444,6	390,5	386,5	316,1
121,0	306,0	1,3	0,0	8,3	0,0	232,4	78,2	86,0	424,0	444,1	389,5	386,0	316,2
122,0	307,0	1,3	0,0	8,2	0,0	231,9	77,5	85,8	421,8	443,7	388,5	385,4	316,6
123,0	308,0	1,2	0,0	8,1	0,0	231,5	78,1	86,2	419,7	443,1	387,9	385,1	317,3
124,0	309,0	1,3	0,0	8,1	0,0	231,5	78,3	86,3	418,6	442,6	387,0	384,4	318,2
125,0	310,0	1,3	0,0	8,1	0,0	231,8	78,4	86,5	417,0	442,1	386,3	383,8	319,2
126,0	311,0	1,2	0,0	8,2	0,0	230,9	78,2	86,9	416,2	441,6	385,4	383,4	319,8
127,0	312,0	1,2	0,0	8,1	0,0	231,0	78,2	86,7	414,3	441,1	384,4	382,8	320,6
128,0	313,0	1,2	0,0	8,0	0,0	230,7	78,1	86,2	412,9	440,6	383,5	381,9	321,3
129,0	314,0	1,2	0,0	8,1	0,0	230,6	78,4	86,5	411,2	440,0	382,9	381,7	321,9
130,0	315,0	1,2	0,0	7,9	0,0	230,4	78,1	86,3	409,5	439,5	381,8	381,2	322,7
131,0	316,0	1,1	0,0	7,9	0,0	229,6	77,9	86,0	407,9	438,9	380,9	380,3	323,2
132,0	317,0	1,2	0,0	7,9	0,0	228,4	77,8	86,0	406,3	438,4	379,9	380,1	323,9
133,0	318,0	1,2	0,0	7,9	0,0	227,9	78,0	86,3	405,1	437,8	379,1	379,6	324,6
134,0	319,0	1,1	0,0	8,0	0,0	228,1	78,0	86,6	404,3	437,3	378,2	379,0	325,6
135,0	320,0	1,1	0,0	8,0	0,0	227,4	78,1	86,3	402,6	436,8	377,3	378,6	326,2
136,0	321,0	1,1	0,0	8,0	0,0	226,5	78,1	86,3	400,9	436,3	376,8	378,1	327,1
137,0	322,0	1,1	0,0	7,9	0,0	226,1	78,0	86,2	400,3	435,8	375,5	377,4	328,0
138,0	323,0	1,0	0,0	8,0	0,0	225,8	77,8	85,0	398,5	435,2	374,3	377,0	328,5
139,0	324,0	1,1	0,0	7,9	0,0	225,2	77,9	85,1	397,3	434,7	373,5	376,9	328,8
140,0	325,0	1,0	0,0	7,9	0,0	225,1	78,0	85,3	395,8	434,0	373,1	376,1	329,9
141,0	326,0	1,0	0,0	7,8	0,0	224,9	78,1	85,4	394,4	433,5	372,4	375,8	330,8
142,0	327,0	1,0	0,0	7,9	0,0	224,1	78,0	85,5	393,4	433,0	371,4	375,0	331,4
143,0	328,0	1,0	0,0	7,9	0,0	223,5	78,0	85,9	392,7	432,5	370,7	374,8	331,9
144,0	329,0	1,0	0,0	7,2	0,0	222,8	78,0	85,9	391,2	432,0	370,0	374,3	332,5
145,0	330,0	1,0	0,0	7,2	0,0	222,2	78,0	85,9	389,7	431,4	369,2	373,7	333,2
146,0	331,0	0,9	0,0	7,2	0,0	221,6	77,9	85,8	388,8	430,9	368,3	373,2	333,6
147,0	332,0	0,9	0,0	7,2	0,0	221,3	77,9	85,7	388,2	430,3	367,6	372,9	333,8
148,0	333,0	0,9	0,0	7,1	0,0	220,5	77,8	86,2	387,0	429,6	366,9	372,4	334,2
149,0	334,0	0,9	0,0	7,2	0,0	220,0	77,9	85,6	384,8	429,0	366,4	371,9	334,6
150,0	335,0	0,9	0,0	7,1	0,0	219,7	77,7	85,2	383,3	428,4	365,5	371,2	334,7
151,0	336,0	0,9	0,0	7,1	0,0	218,9	77,8	85,6	382,3	427,7	364,7	370,8	334,7
152,0	337,0	0,9	0,0	7,2	0,0	219,1	77,8	86,0	381,8	427,0	364,0	370,1	334,8
153,0	338,0	0,8	0,0	7,1	0,0	218,8	77,8	85,5	380,4	426,3	363,3	369,5	335,1
154,0	339,0	0,9	0,0	7,2	0,0	218,3	77,7	85,4	379,2	425,6	362,6	368,9	335,2
155,0	340,0	0,9	0,0	7,1	0,0	217,4	77,8	85,5	378,0	424,9	361,7	368,3	335,3
156,0	341,0	0,8	0,0	7,2	0,0	217,6	77,7	85,5	376,9	424,2	361,1	367,8	335,2
157,0	342,0	0,8	0,0	7,3	0,0	217,3	77,7	85,2	375,6	423,5	360,5	367,0	335,3
158,0	343,0	0,8	0,0	7,4	0,0	217,1	77,5	85,4	375,0	422,8	359,7	366,4	335,4
159,0	344,0	0,8	0,0	7,2	0,0	217,0	77,7	85,2	373,9	422,1	359,0	365,7	335,2
160,0	345,0	0,8	0,0	7,3	0,0	217,1	77,7	85,5	373,4	421,4	358,3	365,2	335,4
161,0	346,0	0,8	0,0	7,4	0,0	217,0	77,6	85,3	372,6	420,7	357,4	364,8	335,3
162,0	347,0	0,8	0,0	7,4	0,0	216,6	77,5	84,8	372,0	420,0	356,7	364,0	335,3
163,0	348,0	0,8	0,0	7,2	0,0	216,8	77,5	84,7	371,1	419,4	355,8	363,6	335,1
164,0	349,0	0,8	0,0	7,2	0,0	217,2	77,5	84,4	370,4	418,6	355,5	363,1	335,5
165,0	350,0	0,8	0,0	7,2	0,0	216,9	77,6	84,7	369,7	417,9	354,9	362,5	335,0
166,0	351,0	0,7	0,0	7,2	0,0	216,5	77,4	84,6	369,3	417,3	354,2	362,1	334,9
167,0	352,0	0,7	0,0	7,2	0,0	216,6	77,6	84,9	368,9	416,7	353,5	361,3	335,0
168,0	353,0	0,7	0,0	7,2	0,0	216,8	77,5	85,0	368,6	416,0	353,1	360,9	334,9
169,0	354,0	0,6	0,0	8,6	0,0	217,4	77,5	85,0	367,8	415,4	352,3	360,2	334,6
170,0	355,0	0,7	0,0	8,8	0,0	216,5	77,7	85,1	367,6	414,8	351,8	359,4	334,9
171,0	356,0	0,7	0,0	8,6	0,0	215,9	77,4	84,9	367,5	414,2	351,2	358,5	335,0
172,0	357,0	0,6	0,0	8,5	0,0	215,3	77,6	84,9	367,1	413,6	350,8	358,1	335,5
173,0	358,0	0,6	0,0	8,5	0,0	214,8	77,5	84,9	367,0	413,0	350,3	357,7	335,8
174,0	359,0	0,6	0,0	8,5	0,0	214,5	77,5	84,7	366,9	412,4	350,0	357,0	336,5
175,0	360,0	0,6	0,0	8,5	0,0	214,8	77,5	84,9	366,6	411,8	349,7	356,5	336,9
176,0	361,0	0,6	0,0	8,4	0,0	214,5	77,5	84,8	366,5	411,2	349,4	356,2	337,5
177,0	362,0	0,6	0,0	8,4	0,0	214,4	77,5	84,8	366,5	410,5	349,1	355,6	338,5
178,0	363,0	0,5	0,0	8,2	0,0	214,1	77,3	84,0	367,1	409,9	348,5	355,1	339,3
179,0	364,0	0,5	0,0	8,3	0,0	214,7	76,7	83,8	366,7	409,3	348,2	355,3	339,8
180,0	365,0	0,5	0,0	8,3	0,0	214,4	77,3	84,3	366,4	408,6	348,1	354,9	340,5
181,0	366,0	0,5	0,0	8,4	0,0	214,1	77,4	84,7	366,2	408,0	347,9	354,4	341,7
182,0	367,0	0,5	0,0	8,5	0,0	214,2	76,9	84,6	366,3	407,4	347,4	354,2	342,2
183,0	368,0	0,5	0,0	8,4	0,0	214,3	77,3	84,4	365,8	406,9	347,4	354,2	342,5
184,0	369,0	0,4	0,0	8,3	0,0	214,3	77,3	84,8	366,0	406,4	347,1	353,9	343,5
185,0	370,0	0,5	0,0	8,3	0,0	214,8	77,3	84,8	365,8	405,9	346,8	353,4	344,3
186,0	371,0	0,4	0,0	8,1	0,0	214,5	77,2	84,7	366,4	405,4	346,5	353,4	344,8
187,0	372,0	0,4	0,0	8,0	0,0	214,7	77,3	84,4	366,0	405,0	346,6	353,0	345,3
188,0	373,0	0,4	0,0	8,0	0,0	214,6	77,3	84,7	366,0	404,5	346,5	352,9	345,7
189,0	374,0	0,3	0,0	8,0	0,0	214,2	77,3	84,7	366,3	403,9	346,3	352,7	346,3
190,0	375,0	0,3	0,0	8,0	0,0	214,3	77,2	84,4	366,0	403,3	345,9	352,3	347,0
191,0	376,0	0,3	0,0	7,9	0,0	214,3	77,1	84,2	366,2	402,7	345,7	352,0	347,7
192,0	377,0	0,3	0,0	7,9	0,0	214,6	77,2	84,1	366,0	402,1	345,5	351,9	347,7
193,0													

208,0	393,0	0,1	0,0	7,0	0,0	214,9	77,3	84,4	364,5	389,3	342,3	344,8	355,6
209,0	394,0	0,1	0,0	7,0	0,0	214,8	77,3	84,8	364,9	388,4	341,9	344,1	356,1
210,0	395,0	0,1	0,0	7,0	0,0	215,2	77,3	84,8	364,4	387,5	341,4	343,5	356,2
211,0	396,0	0,1	0,0	7,0	0,0	215,0	77,1	83,7	363,6	386,6	340,8	342,2	357,3
212,0	397,0	0,1	0,0	6,9	0,0	215,1	77,1	83,3	363,1	385,7	340,4	341,9	357,0
213,0	398,0	0,1	0,0	6,9	0,0	215,0	77,1	83,7	362,5	384,8	339,7	341,2	357,6
214,0	399,0	0,1	0,0	6,9	0,0	215,3	77,2	83,6	362,1	384,0	339,5	341,1	357,4
215,0	400,0	0,1	0,0	6,9	0,0	215,3	77,1	83,3	361,7	383,2	339,0	340,2	357,9
216,0	401,0	0,0	0,0	6,9	0,0	215,0	77,3	83,9	361,3	382,2	338,9	339,4	358,3

Manufacturer: HEARTHSTONE
Model: GM 40
Run: 5
Project #: PI 20149
Test Duration: 216 min

	HHV	LHV
Eff	80.47%	86.97%
Comb Eff	99.24%	99.24%
HT Eff	81.08%	87.64%
Output	15 282	kJ/h
Burn Rate	0.96	kg/h
Grams CO	49	g
Input	18 991	kJ/h
MC wet	17.43	

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

Overall Heating Efficiency:	80.47%	Air Fuel Ratio (A/F)	29.94
Combustion Efficiency:	99.24%	Dry Molecular Weight (M _d)	409.88
Heat Transfer Efficiency:	81.08%	Dry Moles Exhaust Gas (N ₂):	11.76

Heat Output:	14 496 Btu/h	15 282 kJ/h
Heat Input:	18 015 Btu/h	18 991 kJ/h
Burn Duration:	3.60 h	
Burn Rate:	2.11 lb/h	0.959 kg/h
Stack Temp:	264.5 Deg. F	129.2 Deg. C

CO_{2-ut} 19.64
F₀ 1.062

Date: 2017-05-26 Manufacturer: Hearthstone Model: GM40
Project #: PI 20149 Run: 5 Tech: MM Reviewer: SP

-	kindling	25 LBS	START	FIRE
-	At	2 TLBS	close	Door
7	At	12.2 LBS	close	Door
7	At	0.8 LBS	instl	preload
	At	11.8 LBS	open	Door
	At	11.4 LBS	close	Door
	At	10.00 LBS	close	by pass
	At	4.7 LBS	close	a.n. nld (0.077 Drill bit)
	At	2.3 LBS	instl	load
			open	by pass
			open	Door
			open	a.n. nld
			instl	load
			close	Door
			close	by pass
TEST LOAD CONFIGURATION				
	At	5 mm	close	a.n. nld (0.077 Drill bit)
No Fan				

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

Side view	Front view	Top view
		

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

	ADDITION		SUBTRACTION	
	ft3	Volume	ft3	Volume
V measure				
V ashlip				
%				
V usable				
Usable Firebox: _____				
Test load weight: _____ Minimum: _____ Maximum: _____				
Déviation: _____				

DO

PRE / POST CHECKS

 Date: 2017-05-26

 Manufacturer: Hearthstone

 Model: 6M40

 Project #: pf 20149

 Run: 5

 Tech: mr

 Reviewer: DP

Moisture Meter Calibration Check:

Equipment #	Time	12%	22%
EM-191	7:15	ok	ok

Pre-Test

Post-Test

Facility Conditions:

Air Velocity from less than 2 feet

Smoke Capture Check.....

Picture.....

6 (max50 Fpm)	3 (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%.....

2017-05-19
2017-05-19
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
01	32	50
202	329	904
323	903	905
h	h	12
ok	ok	ok

SAMPLING EQUIPMENT CHECK OUT

Date: 2017-05-26 Manufacturer: Hearthstone Model: GM 40
 Project #: PI 20149 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.)	-15	-15	-15	-15	-15	-15
Final 1minute DGM (Liter)	513216, 11	514403, 06	513216, 20	514403, 17	433850, 12	435003, 80
Initial 1minute DGM (Liter)	513216, 11	514403, 05	513216, 18	514403, 16	433850, 12	435003, 80
Change © (Liter)	0	0.01	0.02	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 (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	.5	3	.4
Check OK (no change after 15 sec.)	OK	OK	OK	OK

PRE-TEST SCALE AUDIT

Date: 2012-05-26 Manufacturer: Hearthstone Model: GM 40
 Project #: PL 20149 Run: 5 Tech: MM Reviewer: DP

Scale Type	Audit		Measured Weight	
	Equipment #	Weight		
Platform	EM-090	44 lbs, Class F	44	lbs
Wood	EM-090	44 lbs, Class F	44	lbs
Analytical	EM-128	100 mg, Class S	100	mg
Analytical	EM-129	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: 2017-05-26 Manufacturer: Heartstone Model: GM 40
 Project #: PL 20149 Run: 5 Tech: mm Reviewer: DP

FOR TUNNELS < 12 in

Barometric pressure (P_{bar}) 99.5 (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	9.056	74.75
B - Centroid	3.00	3.50	4	6.055	74.29
A-1	0.40	0.50	0.50	0.045	74.71
A-2	1.50	1.75	2	0.049	74.19
A-3	4.50	5.25	6	0.047	74.00
A-4	5.60	6.5	7.5	0.050	73.98
B-1	0.40	0.50	0.50	0.046	74.31
B-2	1.50	1.75	2	0.047	74.16
B-3	4.50	5.25	6	0.050	74.18
B-4	5.60	6.5	7.5	0.048	74.26
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_p avg. = average of the square roots of the velocity heads (Δ_p) measured at each traverse point.

CONTINUOUS ANALYZERS

 Date: 2017-05-26

 Manufacturer: Hearthstone

 Model: GM 40

 Project #: PI 20149

 Run: 5

Tech: _____

 Reviewer: DO

Pre-Test (Adjust and Record)

	ZERO		SPAN		CAL. (Record Only)	
CO	<u>0</u>	<u>0</u>	<u>2951</u>	<u>2971</u>	<u>1001</u>	<u>1000</u>
Tolerance CO		+/- 0.02		+/- 0.15		+/- 0.05
CO ₂	<u>0</u>	<u>0</u>	<u>1783</u>	<u>1783</u>	<u>971</u>	<u>1000</u>
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	<u>0.000</u>	<u>2941</u>	<u>1000</u>	<u>0</u>	<u>0.02</u>	<u>0.016</u>	<u>0.15</u>	<u>0.001</u>	<u>0.05</u>	<u>✓</u>	
CO ₂	<u>0.00</u>	<u>1781</u>	<u>974</u>	<u>0</u>	<u>0.02</u>	<u>0.02</u>	<u>0.5</u>	<u>0.03</u>	<u>0.5</u>	<u>✓</u>	
O ₂	na	na	na	—	na	—	na	—	na	<u>✓</u>	

TEST DATA LOG

Date: 2017-05-26 Manufacturer: Heathstone Model: GM 40
 Project #: PT 20149 Run: 5 Tech: MM Reviewer: DP

RAW DRY GAS METER READINGS

	System 1	System 2	Blank
Final (Liter)	514400, 28	435003, 00	286, 82
Initial (Liter)	513216, 55	433851, 11	236, 74

AMBIENT CONDITIONS

	Before	After
Barometer (kPa):	99.5	99.4
Dry Bulb (F):	74.48	78.26
Humidity (%):	43	40.7

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: 2017-05-26 Manufacturer: Hearthstone Model: GM 40
 Project #: PT 20149 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 8 in.	0 892 lbs.	216	213	221	226	223
1 1/2	x 3 1/2	x 8 in.	0 926 lbs.	223	216	220	213	212
1 1/2	x 3 1/2	x 8 in.	0 754 lbs.	223	218	213	213	216
1 1/2	x 3 1/2	x 8 in.	0 928 lbs.	221	218	212	218	220
1 1/2	x 3 1/2	x 8 in.	0 906 lbs.	218	213	214	218	226
1 1/2	x 3 1/2	x 8 in.	0 898 lbs.	217	228	224	216	212
1 1/2	x 3 1/2	x 8 in.	0 902 lbs.	201	206	203	210	210
1 1/2	x 3 1/2	x 8 in.	0 872 lbs.	203	203	210	211	208
1 1/2	x 3 1/2	x 8 in.	0 868 lbs.	199	196	193	201	200
1 1/2	x 3 1/2	x 8 in.	0 884 lbs.	206	203	202	201	200
1 1/2	x 3 1/2	x 8 in.	0 870 lbs.	230	213	206	209	210
1 1/2	x 3 1/2	x 8 in.	0 888 lbs.	221	226	223	221	223
1 1/2	x 3 1/2	x 8 in.	0 896 lbs.	216	213	226	223	223
1 1/2	x 3 1/2	x 8 in.	0 886 lbs.	201	201	206	205	205
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: 12,37 lbs

FUEL DATA

Date: 2017-05-26 Manufacturer: Aca-th stone Model: GM 40
 Project #: p2 20149 Run: 5 Tech: MM Reviewer: DP

FUEL DESCRIPTION:

Type of wood :

TEST LOAD

Piece Size	Weight	Meter Moisture Content (% dry)*				
1 1/2" x 3 1/2" x 13 1/2" in.	1,53 lbs.	20.9	21.0	20.8	21.1	21.2
1 1/2" x 3 1/2" x 13 1/2" in.	1,558 lbs.	22.1	21.6	21.9	21.9	21.7
1 1/2" x 3 1/2" x 13 1/2" in.	1,566 lbs.	21.1	21.3	21.4	21.8	21.3
1 1/2" x 3 1/2" x 13 1/2" in.	1,466 lbs.	20.1	20.2	19.9	19.6	19.8
1 1/2" x 3 1/2" x 13 1/2" in.	1,310 lbs.	21.5	22.1	22.3	21.8	21.7
1 1/2" x 3 1/2" x 5 in.	0,114 lbs.			20.1		
1 1/2" x 3 1/2" x 5 in.	0,112 lbs.			20.6		
1 1/2" x 3 1/2" x 5 in.	0,114 lbs.			20.1		
1 1/2" x 3 1/2" x 5 in.	0,090 lbs.			20.9		
1 1/2" x 3 1/2" x 5 in.	0,126 lbs.			21.0		
1 1/2" x 3 1/2" x 5 in.	0,096 lbs.			21.6		
1 1/2" x 3 1/2" x 5 in.	0,114 lbs.			21.3		
1 1/2" x 3 1/2" x 5 in.	0,092 lbs.			20.9		
1 1/2" x 3 1/2" x 5 in.	0,112 lbs.			20.6		
1 1/2" x 3 1/2" x 5 in.	0,112 lbs.			20.1		
1 1/2" x 3 1/2" x 5 in.	0,128 lbs.			20.8		
1 1/2" x 3 1/2" x 5 in.	0,114 lbs.			20.3		
1 1/2" x 3 1/2" x 5 in.	0,114 lbs.			20.6		
1 1/2" x 3 1/2" x 5 in.	0,118 lbs.			21.0		
1 1/2" x 3 1/2" x 5 in.	0,112 lbs.			20.3		
1 1/2" x 3 1/2" x 5 in.	0,114 lbs.			20.8		
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: 921 lbs Min 20%: 184 Max 25%: 330

Date: 2017-05-26

Project #: PI 20149 Run: 5

Manufacturer: M M

Tech: M M

Model: GM 40

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	Back Filter Number	gaskets	Blank
Date	01	202	373	4	32	379	903	6			908
2017-05-25 18:00	610684	01296	01271	10, 1538	110, 1775	01266	01276	10, 3136			01300
2017-05-26 9:30	610684	01295	01271	10, 1537	110, 1776	01265	01277	10, 3137			01299
											01299

		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	01	202	373	4	32	379	903	6	908
2017-05-26 16:00	610688	01293	01269	10, 1581	110, 1784	01254	01276	10, 3176	01300
	610685	01291	01269	10, 1552	110, 1778	01254	01276	10, 3155	01300
	610685	01291	01269	10, 1550	110, 1778	01254	01276	10, 3155	01300
	610685	01291	01269	10, 1550	110, 1778	01254	01276	10, 3155	01300

DILUTION TUNNEL PARTICULATE SAMPLER DATA

Date: 2017-05-25 Manufacturer: Healthstone Model: GM 40
 Project #: PT 20149 Tech: MM Reviewer: DL

SYSTEM 2				
Pre-test Weight Record	Probe & Housing Number	Front Filter Number	Back Filter Number	gaskets
Date	Time			
2017-05-25	18:20	1076456	01272	01282 10 4061
2017-05-26	9:30	1076457	01271	01282 10 4062

SYSTEM 2				
Post-test Weight Record	Probe & Housing Number	Front Filter Number	Back Filter Number	gaskets
Date	Time			
2017-05-26	16:00	1076465	01270	01282 10 4100
2017-05-29	8:00	1076458	01270	01282 10 4074
2017-05-30	8:00	1076458	01270	01282 10 4076
2017-06-07	8:00	1076458	01270	01282 10 4076

APPENDIX 2: Proportionality results

					Average
					0,235
Average	Average	#1	#2		
99,73	99,64	System 1	System 2		SQRT
Proportional Rates		Vol.Std.	Vol.Std.		Delta-P
PR1	PR2			Time	
%	%	(ft3)	(ft3)	min	(in H2O)2
		0,174	0,156	0	0,2295395
101,14	101,08	0,172	0,162	1	0,2348381
100,61	100,41	0,170	0,168	2	0,2348511
99,77	99,65	0,170	0,168	3	0,2363481
99,83	99,81	0,170	0,168	4	0,2363486
99,05	98,97	0,170	0,168	5	0,2382722
99,47	99,42	0,170	0,168	6	0,2374186
99,73	99,42	0,170	0,168	7	0,2374185
99,41	99,46	0,170	0,168	8	0,237847
99,60	99,47	0,170	0,168	9	0,2374188
100,64	100,70	0,170	0,168	10	0,2348399
100,94	100,87	0,170	0,168	11	0,2348401
100,54	100,22	0,170	0,167	12	0,235703
100,04	100,02	0,170	0,167	13	0,2363487
99,56	99,51	0,169	0,167	14	0,2378469
101,38	101,02	0,169	0,167	15	0,2337578
100,67	100,33	0,170	0,167	16	0,2357028
100,53	100,33	0,170	0,167	17	0,2357033
100,94	100,83	0,170	0,167	18	0,2348401
100,36	100,26	0,170	0,167	19	0,2363035
101,19	101,14	0,169	0,167	20	0,2342382
100,55	100,08	0,170	0,167	21	0,2363495
101,52	101,35	0,170	0,167	22	0,2337586
101,18	101,31	0,169	0,167	23	0,2342033
101,20	101,09	0,169	0,167	24	0,2341925
101,02	100,92	0,169	0,167	25	0,2348176
100,57	100,28	0,169	0,167	26	0,2363493
101,79	101,80	0,169	0,167	27	0,2331068
101,49	101,57	0,169	0,167	28	0,2337595
101,40	101,38	0,169	0,167	29	0,2337588
101,59	101,55	0,169	0,167	30	0,2337593
101,87	101,80	0,169	0,167	31	0,2326719
102,11	101,85	0,169	0,167	32	0,23233
101,50	101,57	0,169	0,167	33	0,2337592
101,77	101,58	0,169	0,167	34	0,233107
102,58	102,39	0,170	0,167	35	0,2311401
101,28	101,09	0,169	0,167	36	0,2337596
102,42	102,32	0,169	0,167	37	0,2311408
101,25	101,05	0,169	0,167	38	0,2337602
101,44	101,52	0,169	0,167	39	0,2331074
101,33	101,24	0,169	0,167	40	0,2331071
101,55	101,38	0,169	0,167	41	0,2326719
100,15	99,85	0,169	0,167	42	0,2357053
101,14	101,10	0,169	0,167	43	0,2331078
101,15	101,12	0,169	0,167	44	0,2331076
101,28	101,01	0,169	0,167	45	0,2331075
101,90	101,71	0,169	0,167	46	0,2311411

101,72	101,41	0,169	0,167	47	0,2320176
101,37	101,48	0,169	0,167	48	0,232017
100,81	100,92	0,169	0,167	49	0,2331077
100,91	100,89	0,169	0,167	50	0,2326728
100,79	100,99	0,169	0,167	51	0,2326727
99,97	99,90	0,169	0,167	52	0,2348428
99,55	99,57	0,169	0,167	53	0,2357056
99,44	99,31	0,169	0,167	54	0,2356182
99,15	99,11	0,169	0,167	55	0,2363512
100,35	100,05	0,169	0,167	56	0,2335581
100,03	100,01	0,169	0,167	57	0,2341943
98,13	98,27	0,169	0,167	58	0,2382753
99,23	99,29	0,169	0,167	59	0,2357059
100,45	100,21	0,169	0,167	60	0,233108
99,08	99,11	0,169	0,167	61	0,2357063
98,43	98,19	0,169	0,167	62	0,2374223
99,18	99,07	0,169	0,167	63	0,2357059
99,23	99,08	0,169	0,167	64	0,2357061
98,86	98,77	0,169	0,167	65	0,236351
99,90	99,85	0,169	0,167	66	0,2337608
99,76	99,76	0,169	0,167	67	0,2337604
99,63	99,36	0,169	0,167	68	0,2341945
99,98	99,99	0,169	0,167	69	0,2331082
98,19	98,20	0,169	0,167	70	0,2374222
100,02	100,03	0,169	0,167	71	0,2331086
99,18	99,24	0,169	0,167	72	0,2348433
100,10	99,91	0,169	0,167	73	0,2331076
99,02	98,81	0,169	0,167	74	0,2357059
98,53	98,27	0,169	0,167	75	0,2367798
99,20	99,13	0,169	0,167	76	0,2348773
98,78	98,78	0,169	0,167	77	0,2357067
98,74	98,77	0,169	0,167	78	0,2357054
99,53	99,56	0,169	0,167	79	0,2341935
98,79	98,79	0,169	0,167	80	0,2357059
100,06	100,01	0,169	0,167	81	0,2326732
98,52	98,60	0,169	0,167	82	0,2363517
97,89	97,81	0,169	0,167	83	0,23785
98,91	98,79	0,169	0,167	84	0,235706
98,49	98,55	0,169	0,167	85	0,2362993
98,05	97,59	0,169	0,167	86	0,2378498
97,86	97,84	0,169	0,167	87	0,2378507
100,12	100,02	0,169	0,167	88	0,2326728
99,06	99,42	0,169	0,167	89	0,2348461
97,68	97,70	0,169	0,167	90	0,2382759
99,06	98,92	0,169	0,167	91	0,2348439
97,92	97,84	0,169	0,167	92	0,2378498
98,41	98,44	0,169	0,167	93	0,2363514
98,22	98,23	0,169	0,167	94	0,2367799
98,75	98,63	0,169	0,167	95	0,2357059
98,56	98,41	0,169	0,167	96	0,2357068
97,51	97,44	0,169	0,167	97	0,2382757
98,48	98,32	0,169	0,167	98	0,2363515
98,41	98,49	0,169	0,167	99	0,236352
98,81	98,52	0,169	0,167	100	0,2357061

98,39	98,43	0,169	0,167	101	0,2363516
98,41	98,45	0,169	0,167	102	0,2363511
98,42	98,33	0,169	0,167	103	0,2363513
97,87	97,80	0,169	0,167	104	0,2374221
98,64	98,43	0,169	0,167	105	0,2357061
98,69	98,61	0,169	0,167	106	0,235706
98,72	98,46	0,169	0,167	107	0,2357064
98,17	98,15	0,169	0,167	108	0,2367795
98,98	98,96	0,169	0,167	109	0,2348435
97,58	97,36	0,169	0,167	110	0,2382752
99,94	99,85	0,169	0,167	111	0,2326732
99,13	99,00	0,169	0,167	112	0,2348429
97,90	97,86	0,169	0,167	113	0,237422
98,44	98,27	0,169	0,167	114	0,2363514
97,72	97,59	0,169	0,167	115	0,2378494
98,38	98,40	0,169	0,167	116	0,2363512
97,33	97,21	0,169	0,167	117	0,2389136
97,13	97,17	0,169	0,167	118	0,2389137
99,14	99,08	0,169	0,167	119	0,2341941
98,99	98,94	0,169	0,167	120	0,2348429

Average	Average						Average
Inlet +	Inlet +						0,243
Outlet	Outlet	Average	Average	#1	#2		
Temp.	Temp.	99,38	98,75	System 1	System 2		SQRT
Meter 1	Meter 2	Proportional Rates		Vol.Std.	Vol.Std.		Delta-P
		PR1	PR2			Time	
Deg. R	Deg. R	%	%	(ft3)	(ft3)	min	(in H2O)2
534,1	534,5			0,173	0,171	0	0,2367672
534,2	534,5	101,09	100,30	0,173	0,171	1	0,241856
534,2	534,5	102,21	101,32	0,173	0,171	2	0,2393258
534,3	534,6	102,08	101,21	0,173	0,171	3	0,2399559
534,3	534,6	103,00	102,46	0,173	0,171	4	0,237838
534,3	534,6	100,72	100,18	0,173	0,171	5	0,2418564
534,3	534,6	101,39	100,57	0,173	0,171	6	0,2403837
534,3	534,7	101,51	100,63	0,173	0,171	7	0,2399607
534,3	534,7	99,60	99,10	0,173	0,171	8	0,2439459
534,4	534,7	101,36	100,60	0,173	0,171	9	0,2399616
534,4	534,7	100,55	99,95	0,173	0,171	10	0,2418569
534,4	534,8	100,51	99,78	0,173	0,171	11	0,2418567
534,5	534,8	99,94	99,18	0,173	0,171	12	0,2433216
534,4	534,8	101,33	100,75	0,173	0,171	13	0,2399282
534,5	534,8	100,97	100,09	0,173	0,171	14	0,2408044
534,5	534,9	99,67	99,19	0,173	0,171	15	0,2443622
534,6	535,0	100,00	99,48	0,173	0,171	16	0,2433216
534,7	535,0	100,72	100,16	0,173	0,171	17	0,2418583
534,7	535,0	102,10	101,34	0,173	0,171	18	0,2389025
534,7	535,1	100,76	100,24	0,173	0,171	19	0,2418544
534,7	535,1	100,35	99,64	0,173	0,171	20	0,242905
534,7	535,1	101,57	100,62	0,173	0,171	21	0,2403847
534,8	535,2	102,58	102,10	0,173	0,171	22	0,2374111
534,8	535,2	99,93	99,26	0,173	0,171	23	0,2443281
534,8	535,2	103,51	102,71	0,173	0,171	24	0,2356951
534,9	535,2	100,74	99,95	0,173	0,171	25	0,2418572
534,9	535,3	101,80	100,69	0,173	0,170	26	0,2399616
534,9	535,3	103,00	102,23	0,173	0,170	27	0,2363398
535,0	535,3	101,46	100,74	0,173	0,171	28	0,2403846
535,0	535,4	99,98	99,39	0,173	0,171	29	0,2433218
535,1	535,4	101,26	100,77	0,173	0,171	30	0,2403849
535,1	535,4	100,21	99,64	0,173	0,171	31	0,2429047
535,1	535,4	101,84	101,29	0,173	0,171	32	0,2389032
535,1	535,4	100,75	100,02	0,173	0,171	33	0,2418578
535,1	535,5	100,22	99,41	0,173	0,171	34	0,2433222
535,2	535,5	101,19	100,40	0,173	0,171	35	0,2408081
535,2	535,5	99,80	99,25	0,173	0,171	36	0,2439478
535,3	535,5	101,20	100,55	0,173	0,171	37	0,2403851
535,3	535,6	101,13	100,47	0,173	0,171	38	0,2408064
535,3	535,6	100,15	99,55	0,173	0,171	39	0,2429056
535,4	535,6	99,76	99,19	0,173	0,171	40	0,2439481
535,4	535,6	100,98	100,42	0,173	0,171	41	0,2408069
535,4	535,7	100,94	100,31	0,173	0,171	42	0,2408069
535,5	535,7	100,00	99,42	0,173	0,170	43	0,2429058
535,5	535,7	102,06	101,51	0,172	0,170	44	0,23784
535,6	535,8	100,02	99,48	0,172	0,170	45	0,2429056
535,6	535,8	100,43	99,68	0,172	0,170	46	0,2418583
535,6	535,8	99,54	98,70	0,172	0,170	47	0,2439483

535,6	535,8	99,78	98,96	0,172	0,170	48	0,2433226
535,6	535,8	100,81	100,17	0,172	0,170	49	0,2408067
535,7	535,9	100,03	99,34	0,172	0,170	50	0,2429051
535,8	535,9	100,01	99,44	0,172	0,170	51	0,2429039
535,8	535,9	101,08	100,38	0,172	0,170	52	0,240386
535,8	535,9	102,16	101,36	0,173	0,170	53	0,2378393
535,9	536,0	100,91	100,30	0,173	0,170	54	0,2408072
535,9	536,0	99,57	98,77	0,172	0,170	55	0,2439479
536,0	536,0	99,53	98,91	0,172	0,170	56	0,2439476
536,0	536,0	100,39	99,40	0,172	0,170	57	0,2418586
536,0	536,1	99,75	99,16	0,172	0,170	58	0,2433231
536,1	536,1	100,22	99,78	0,172	0,170	59	0,2418569
536,1	536,1	100,78	100,17	0,172	0,170	60	0,2408068
536,2	536,2	100,97	100,49	0,172	0,170	61	0,239963
536,2	536,2	101,09	100,42	0,172	0,170	62	0,2399627
536,3	536,2	99,58	99,00	0,172	0,170	63	0,243323
536,3	536,3	99,21	98,96	0,172	0,170	64	0,2439485
536,4	536,3	100,57	100,09	0,172	0,170	65	0,240808
536,4	536,3	100,54	99,84	0,172	0,170	66	0,2409822
536,4	536,4	99,68	99,05	0,172	0,170	67	0,2429064
536,5	536,4	99,85	99,12	0,172	0,170	68	0,2429066
536,5	536,4	100,14	99,30	0,172	0,170	69	0,2418592
536,6	536,5	98,88	98,33	0,172	0,170	70	0,2443649
536,6	536,5	99,06	98,36	0,172	0,170	71	0,2443645
536,6	536,5	100,05	99,35	0,172	0,170	72	0,2418596
536,7	536,5	99,62	98,94	0,172	0,170	73	0,2433241
536,7	536,6	99,47	99,00	0,172	0,170	74	0,2429134
536,7	536,6	98,73	97,87	0,172	0,170	75	0,2449872
536,8	536,6	99,16	98,39	0,172	0,170	76	0,2440028
536,8	536,6	100,48	99,79	0,172	0,170	77	0,2403879
536,8	536,7	99,18	98,72	0,172	0,170	78	0,2433249
536,9	536,7	98,98	98,67	0,172	0,170	79	0,2439807
536,9	536,7	98,39	97,92	0,172	0,170	80	0,2454023
536,8	536,7	99,25	98,73	0,172	0,170	81	0,2431711
536,8	536,7	99,20	98,57	0,172	0,170	82	0,2433253
536,8	536,7	99,22	98,59	0,172	0,170	83	0,2433256
536,8	536,7	100,35	99,73	0,172	0,170	84	0,2405375
536,8	536,7	99,68	99,29	0,172	0,170	85	0,2418619
536,8	536,7	98,12	97,60	0,172	0,170	86	0,2458154
536,9	536,7	99,25	98,37	0,172	0,170	87	0,2433255
536,9	536,7	98,42	97,85	0,172	0,170	88	0,2449882
536,9	536,7	99,64	99,12	0,172	0,170	89	0,2420466
536,9	536,7	98,43	97,76	0,172	0,170	90	0,2449881
536,9	536,7	99,22	98,58	0,172	0,170	91	0,2429085
536,9	536,7	98,04	97,22	0,172	0,170	92	0,2458155
536,9	536,7	98,97	98,46	0,172	0,170	93	0,2433255
536,9	536,7	99,61	98,98	0,172	0,170	94	0,2418615
536,9	536,7	99,02	98,63	0,172	0,170	95	0,2433253
536,9	536,7	98,27	97,66	0,172	0,170	96	0,2449887
536,9	536,7	99,10	98,49	0,172	0,170	97	0,2429083
537,0	536,8	98,57	98,02	0,172	0,170	98	0,2443662
537,0	536,8	99,81	98,90	0,172	0,170	99	0,2418611
537,0	536,8	100,27	99,69	0,172	0,170	100	0,2403922
537,0	536,8	99,21	98,42	0,172	0,170	101	0,2433258
537,0	536,8	98,98	98,41	0,172	0,170	102	0,2433256

537,0	536,8	98,83	98,08	0,172	0,170	103	0,243951
537,0	536,8	99,28	98,59	0,172	0,170	104	0,2429091
537,0	536,8	98,90	98,19	0,172	0,170	105	0,2439517
537,0	536,8	98,77	98,16	0,172	0,170	106	0,243951
537,0	536,8	98,94	98,16	0,172	0,170	107	0,2439515
537,0	536,8	98,70	98,25	0,172	0,170	108	0,2439505
537,0	536,8	99,18	98,51	0,172	0,170	109	0,2429093
537,0	536,8	98,65	98,03	0,172	0,170	110	0,2443668
537,0	536,8	98,65	98,08	0,172	0,170	111	0,2444735
537,0	536,8	99,53	98,95	0,172	0,170	112	0,2418715
537,0	536,8	99,12	98,60	0,172	0,170	113	0,2429089
537,0	536,8	98,99	98,39	0,172	0,170	114	0,2433254
537,0	536,8	98,39	97,48	0,172	0,170	115	0,2449884
537,0	536,8	98,83	98,17	0,172	0,170	116	0,2433253
537,0	536,8	98,12	97,59	0,172	0,170	117	0,2454029
537,0	536,8	99,04	98,53	0,172	0,170	118	0,2429084
537,0	536,8	98,58	97,92	0,172	0,170	119	0,243951
537,0	536,8	98,54	98,03	0,172	0,170	120	0,2439507
537,0	536,8	97,96	97,02	0,172	0,170	121	0,2458155
537,0	536,8	100,54	100,19	0,172	0,170	122	0,2393302
537,0	536,8	98,56	97,86	0,172	0,170	123	0,243951
537,0	536,8	97,87	97,21	0,172	0,170	124	0,2458159
537,0	536,8	98,23	97,74	0,172	0,170	125	0,2449881
537,0	536,8	98,77	98,12	0,172	0,170	126	0,2433255
537,0	536,8	98,87	98,25	0,172	0,170	127	0,2433261
537,0	536,8	99,35	98,67	0,172	0,170	128	0,2418986
536,9	536,8	98,65	98,00	0,172	0,170	129	0,2439509
537,0	536,8	99,93	99,58	0,172	0,170	130	0,240389
537,0	536,8	98,54	97,96	0,172	0,170	131	0,2439511
537,0	536,8	98,05	97,49	0,172	0,170	132	0,2449881
537,0	536,8	98,75	98,17	0,172	0,170	133	0,2437001
537,0	536,8	98,54	97,95	0,172	0,170	134	0,2439511
537,0	536,8	98,50	97,50	0,172	0,170	135	0,2443659
537,0	536,9	98,97	98,62	0,172	0,170	136	0,2429087
537,0	536,8	98,15	97,40	0,172	0,170	137	0,2449879
537,0	536,9	98,14	97,40	0,172	0,170	138	0,2449885
537,0	536,9	98,59	97,74	0,172	0,170	139	0,2439509
537,0	536,9	98,96	98,37	0,172	0,170	140	0,2429083
537,0	536,9	97,20	96,64	0,172	0,170	141	0,2474464
537,0	536,9	98,81	98,00	0,172	0,170	142	0,2433263
537,0	536,9	99,41	98,79	0,172	0,170	143	0,2418217
537,0	536,9	98,02	97,62	0,172	0,170	144	0,2449881
537,1	536,9	98,71	97,97	0,172	0,170	145	0,2433256
537,1	536,9	98,00	97,14	0,172	0,170	146	0,2454028
537,1	536,9	98,45	97,61	0,172	0,170	147	0,2443668
537,1	536,9	99,61	99,10	0,172	0,170	148	0,2411223
537,1	537,0	98,20	97,68	0,172	0,170	149	0,2449875
537,2	537,0	97,93	97,57	0,172	0,170	150	0,244989
537,2	537,0	98,09	97,32	0,172	0,170	151	0,2449882
537,2	537,0	99,45	98,66	0,172	0,170	152	0,2418619
537,2	537,0	97,82	97,29	0,172	0,170	153	0,2453977
537,2	537,0	98,74	97,97	0,172	0,170	154	0,2433261
537,2	537,0	98,03	97,51	0,172	0,170	155	0,245403
537,3	537,1	100,23	99,56	0,172	0,170	156	0,2399663
537,3	537,1	98,92	98,59	0,172	0,170	157	0,2429092

537,3	537,1	98,03	97,58	0,172	0,170	158	0,2449888
537,4	537,2	98,47	97,66	0,172	0,170	159	0,2443667
537,4	537,2	98,30	97,69	0,172	0,170	160	0,2443666
537,4	537,2	97,57	96,82	0,172	0,170	161	0,2464351
537,4	537,2	98,95	98,38	0,172	0,170	162	0,2429101
537,5	537,3	98,03	97,54	0,172	0,170	163	0,2449891
537,5	537,3	98,62	97,97	0,172	0,170	164	0,243326
537,5	537,3	97,99	97,13	0,172	0,169	165	0,2454034
537,5	537,3	98,57	97,82	0,172	0,170	166	0,2439514
537,5	537,3	98,93	98,37	0,172	0,170	167	0,2429091
537,5	537,3	99,37	98,93	0,172	0,170	168	0,2418621
537,6	537,4	99,32	98,85	0,172	0,170	169	0,2418632
537,6	537,4	98,11	97,52	0,172	0,170	170	0,244989
537,6	537,4	98,80	98,19	0,172	0,170	171	0,2433261
537,6	537,4	98,34	97,68	0,172	0,170	172	0,244367
537,6	537,4	98,81	98,13	0,172	0,170	173	0,2433266
537,6	537,4	97,24	96,72	0,172	0,170	174	0,2468468
537,6	537,4	99,60	99,00	0,172	0,170	175	0,2408106
537,6	537,4	98,78	98,19	0,172	0,170	176	0,2433149
537,6	537,4	98,24	97,66	0,172	0,170	177	0,2443672
537,7	537,4	98,59	98,17	0,172	0,170	178	0,2433258
537,7	537,4	98,51	98,01	0,172	0,170	179	0,2439515
537,7	537,4	97,48	96,97	0,172	0,170	180	0,2458165
537,7	537,5	97,83	97,47	0,172	0,170	181	0,2454036
537,7	537,5	97,56	97,17	0,172	0,170	182	0,2458165
537,7	537,5	98,09	97,51	0,172	0,170	183	0,244989
537,8	537,5	98,57	97,73	0,172	0,170	184	0,243952
537,8	537,5	97,85	97,13	0,172	0,170	185	0,2458164
537,8	537,5	98,86	98,01	0,172	0,170	186	0,2433263
537,8	537,5	97,36	96,99	0,172	0,170	187	0,2464356
537,8	537,5	97,77	97,32	0,172	0,170	188	0,2458166
537,8	537,5	99,25	98,76	0,172	0,170	189	0,2418619
537,8	537,6	98,78	98,30	0,172	0,170	190	0,2429091
537,8	537,6	98,32	97,91	0,172	0,170	191	0,2443674
537,8	537,6	97,98	97,39	0,172	0,170	192	0,2449896
537,8	537,6	97,70	97,37	0,172	0,170	193	0,2457926
537,8	537,6	98,15	97,63	0,172	0,170	194	0,2443676
537,9	537,6	97,65	97,31	0,172	0,170	195	0,245817
537,9	537,6	98,86	97,85	0,172	0,170	196	0,2433268
537,9	537,6	99,93	99,42	0,172	0,170	197	0,2403899
537,9	537,7	98,85	98,32	0,172	0,170	198	0,2429102
538,0	537,7	98,64	98,27	0,172	0,170	199	0,2433265
537,9	537,7	98,06	97,56	0,172	0,170	200	0,244367
537,9	537,6	98,84	98,15	0,172	0,170	201	0,2429116
537,9	537,7	97,08	96,37	0,172	0,170	202	0,2474633
538,0	537,7	98,16	97,58	0,172	0,170	203	0,2443675
538,0	537,7	98,06	97,43	0,172	0,170	204	0,2449889
538,0	537,7	98,25	97,84	0,172	0,170	205	0,2443671
538,0	537,7	99,23	98,74	0,172	0,170	206	0,2418566
538,0	537,7	99,29	98,43	0,172	0,170	207	0,2418629
538,0	537,7	98,30	97,55	0,172	0,169	208	0,2443667
538,1	537,7	98,91	98,50	0,172	0,170	209	0,2433267

Average	Average						Average
Inlet +	Inlet +						0,238
Outlet	Outlet	Average	Average	#1	#2		
Temp.	Temp.	99,19	98,93	System 1	System 2		SQRT
Meter 1	Meter 2	Proportional Rates		Vol.Std.	Vol.Std.		Delta-P
		PR1	PR2			Time	
Deg. R	Deg. R	%	%	(ft3)	(ft3)	min	(in H2O)2
535,8	536,1			0,171	0,169	0	0,2341837
535,9	536,2	101,37	101,02	0,171	0,169	1	0,2348337
535,9	536,2	100,67	100,36	0,171	0,169	2	0,2363411
536,0	536,2	100,70	100,21	0,171	0,169	3	0,2363412
536,0	536,2	100,97	100,99	0,171	0,169	4	0,2356962
536,0	536,3	100,24	99,95	0,171	0,169	5	0,2367699
536,0	536,3	102,21	101,53	0,171	0,169	6	0,2320089
536,1	536,3	99,56	99,15	0,171	0,169	7	0,2377371
536,1	536,4	98,84	98,53	0,171	0,169	8	0,2393275
536,1	536,4	98,83	98,53	0,171	0,169	9	0,2389037
536,1	536,4	100,87	100,73	0,171	0,169	10	0,2341839
536,2	536,5	99,22	99,09	0,171	0,169	11	0,2378396
536,1	536,5	98,99	98,43	0,171	0,168	12	0,2388452
536,1	536,5	98,91	98,73	0,171	0,169	13	0,2389036
536,1	536,5	99,61	99,19	0,171	0,169	14	0,2374118
536,1	536,5	99,25	98,81	0,171	0,168	15	0,238265
536,2	536,5	100,11	99,87	0,171	0,169	16	0,2363406
536,2	536,5	99,32	99,16	0,171	0,169	17	0,2382655
536,3	536,6	100,09	99,91	0,171	0,169	18	0,2363417
536,3	536,6	100,41	100,06	0,171	0,169	19	0,2356961
536,4	536,7	99,58	99,07	0,171	0,168	20	0,2382655
536,4	536,7	99,47	99,50	0,171	0,169	21	0,2378394
536,4	536,7	100,86	100,60	0,171	0,169	22	0,2348333
536,4	536,7	101,04	100,82	0,171	0,169	23	0,2348333
536,4	536,7	100,28	100,04	0,171	0,169	24	0,2363418
536,4	536,7	99,95	99,64	0,171	0,169	25	0,2374125
536,4	536,7	99,37	99,27	0,171	0,169	26	0,2389043
536,4	536,8	100,39	100,05	0,171	0,169	27	0,236342
536,5	536,8	99,69	99,28	0,171	0,168	28	0,2382656
536,5	536,8	100,36	100,18	0,171	0,169	29	0,236342
536,5	536,8	99,36	99,10	0,171	0,169	30	0,2389782
536,6	536,8	99,93	99,62	0,171	0,169	31	0,2374139
536,6	536,9	99,46	99,18	0,170	0,168	32	0,2382803
536,6	536,9	100,36	100,09	0,170	0,168	33	0,2363428
536,6	536,9	100,43	99,90	0,171	0,168	34	0,2363328
536,7	537,0	99,54	99,26	0,171	0,168	35	0,2382662
536,7	537,0	99,80	99,65	0,171	0,169	36	0,2378404
536,8	537,1	99,11	98,66	0,171	0,169	37	0,2399633
536,8	537,1	100,31	99,81	0,171	0,168	38	0,2363425
536,8	537,1	100,99	100,67	0,170	0,168	39	0,2348342
536,8	537,1	99,86	99,43	0,171	0,168	40	0,2378468
536,8	537,1	101,03	100,81	0,171	0,169	41	0,2348361
536,8	537,1	99,64	99,50	0,171	0,169	42	0,2378408
536,8	537,1	99,66	99,32	0,171	0,169	43	0,2378408
536,9	537,1	100,08	100,00	0,170	0,168	44	0,2367714
536,9	537,1	101,26	100,88	0,170	0,168	45	0,2341858
537,0	537,2	99,98	99,59	0,171	0,168	46	0,2374139
537,0	537,2	99,26	99,18	0,171	0,169	47	0,2389057

537,0	537,2	99,50	99,16	0,170	0,169	48	0,2382672
537,1	537,3	99,49	99,08	0,170	0,168	49	0,2382672
537,1	537,3	99,78	99,37	0,171	0,168	50	0,2378416
537,2	537,4	99,07	98,77	0,171	0,168	51	0,2393266
537,2	537,4	100,32	99,96	0,171	0,168	52	0,2363434
537,2	537,4	99,46	99,14	0,170	0,168	53	0,2382673
537,3	537,4	98,70	98,36	0,170	0,168	54	0,2399651
537,3	537,4	100,42	100,07	0,171	0,168	55	0,2363437
537,3	537,5	99,63	99,44	0,171	0,169	56	0,237842
537,4	537,5	100,08	99,87	0,170	0,169	57	0,236772
537,4	537,5	100,22	99,86	0,170	0,168	58	0,236344
537,4	537,5	99,35	98,94	0,170	0,168	59	0,2382688
537,4	537,6	100,01	99,92	0,170	0,168	60	0,2367726
537,5	537,6	98,72	98,24	0,171	0,168	61	0,2403884
537,5	537,6	99,86	99,39	0,171	0,168	62	0,237414
537,5	537,6	98,58	98,27	0,171	0,168	63	0,2403887
537,6	537,7	100,27	100,15	0,170	0,168	64	0,2356986
537,6	537,7	100,80	100,81	0,170	0,168	65	0,2348358
537,6	537,7	99,73	99,30	0,170	0,168	66	0,2374145
537,7	537,7	99,70	99,59	0,170	0,168	67	0,2374143
537,7	537,8	99,29	98,99	0,170	0,168	68	0,2382677
537,6	537,8	99,71	99,56	0,170	0,168	69	0,237414
537,7	537,8	100,19	99,97	0,170	0,168	70	0,2363432
537,7	537,8	99,83	99,32	0,170	0,168	71	0,2374137
537,7	537,8	101,00	100,73	0,171	0,168	72	0,234835
537,8	537,8	100,03	99,94	0,170	0,169	73	0,2367715
537,8	537,8	98,96	98,59	0,170	0,168	74	0,2393299
537,8	537,9	99,06	98,80	0,170	0,168	75	0,2389055
537,9	537,9	100,27	100,06	0,170	0,168	76	0,2367145
537,9	537,9	99,02	98,76	0,170	0,168	77	0,238906
537,9	537,9	99,64	99,55	0,170	0,168	78	0,2374137
537,9	537,9	99,59	99,45	0,170	0,168	79	0,2372417
537,9	538,0	99,85	99,71	0,170	0,168	80	0,2367709
538,0	538,0	100,15	99,91	0,170	0,168	81	0,236343
538,0	538,0	101,46	101,18	0,170	0,168	82	0,2331014
538,0	538,1	99,76	99,43	0,170	0,168	83	0,236772
538,1	538,1	99,89	99,33	0,170	0,168	84	0,2367715
538,1	538,1	98,91	98,53	0,170	0,168	85	0,2389056
538,1	538,2	99,90	99,85	0,170	0,168	86	0,2363429
538,2	538,2	99,87	99,70	0,170	0,168	87	0,2367714
538,2	538,2	100,16	99,95	0,170	0,168	88	0,2356975
538,3	538,3	99,77	99,66	0,170	0,168	89	0,2367717
538,3	538,3	99,63	99,46	0,170	0,168	90	0,2367715
538,3	538,3	99,77	99,70	0,170	0,168	91	0,2367717
538,3	538,3	99,38	98,97	0,170	0,168	92	0,2376316
538,3	538,3	99,35	98,88	0,170	0,168	93	0,2378413
538,4	538,4	98,62	98,49	0,170	0,168	94	0,2393287
538,4	538,4	98,98	98,98	0,170	0,168	95	0,2382662
538,4	538,4	98,68	98,13	0,170	0,168	96	0,2393296
538,4	538,4	98,98	98,79	0,170	0,168	97	0,2382666
538,4	538,4	99,86	99,66	0,170	0,168	98	0,2363427
538,4	538,4	99,00	98,77	0,170	0,168	99	0,2382672
538,4	538,5	99,40	99,06	0,170	0,168	100	0,2374136
538,4	538,5	99,18	98,81	0,170	0,168	101	0,2374118
538,4	538,4	98,80	98,56	0,170	0,168	102	0,2389061

538,4	538,4	98,18	98,06	0,170	0,168	103	0,2399437
538,4	538,4	99,05	98,67	0,170	0,168	104	0,2382664
538,4	538,4	98,77	98,60	0,170	0,168	105	0,2382636
538,5	538,5	99,34	98,85	0,170	0,168	106	0,2374264
538,5	538,5	99,09	98,93	0,170	0,168	107	0,2378413
538,5	538,5	98,68	98,30	0,170	0,168	108	0,2389054
538,5	538,5	99,16	99,01	0,170	0,168	109	0,2374141
538,5	538,6	99,61	99,29	0,170	0,168	110	0,2367713
538,6	538,6	99,38	99,28	0,170	0,168	111	0,2367773
538,6	538,6	98,10	97,80	0,170	0,168	112	0,2399645
538,6	538,6	98,30	97,82	0,170	0,168	113	0,2399642
538,6	538,6	97,95	97,73	0,170	0,168	114	0,2403877
538,6	538,6	99,08	98,79	0,170	0,168	115	0,2378411
538,6	538,6	98,98	98,64	0,170	0,168	116	0,238267
538,6	538,7	98,20	97,78	0,170	0,168	117	0,2399646
538,6	538,7	98,59	98,50	0,170	0,168	118	0,2389055
538,6	538,7	99,14	98,90	0,170	0,168	119	0,2374153
538,6	538,7	98,12	97,69	0,170	0,168	120	0,2399647
538,6	538,7	98,85	98,63	0,170	0,168	121	0,2382815
538,6	538,7	98,87	98,81	0,170	0,168	122	0,2382675
538,6	538,7	98,53	98,25	0,170	0,168	123	0,2389059
538,6	538,7	99,42	99,09	0,170	0,168	124	0,2367718
538,6	538,7	98,63	98,36	0,170	0,168	125	0,2382675
538,7	538,7	97,90	97,66	0,170	0,168	126	0,239965
538,7	538,7	98,73	98,49	0,170	0,168	127	0,238267
538,7	538,7	97,98	97,76	0,170	0,168	128	0,239965
538,7	538,7	98,70	98,44	0,170	0,168	129	0,2383188
538,7	538,8	99,47	99,05	0,170	0,168	130	0,2367722
538,7	538,8	98,74	98,54	0,170	0,168	131	0,2382671
538,7	538,8	99,00	99,10	0,170	0,168	132	0,2374146
538,7	538,8	100,37	100,24	0,170	0,168	133	0,2341882
538,7	538,8	98,69	98,24	0,170	0,168	134	0,2382677
538,7	538,8	98,00	97,75	0,170	0,168	135	0,2399651
538,7	538,8	98,66	98,27	0,170	0,168	136	0,2382672
538,7	538,9	98,30	98,11	0,170	0,168	137	0,2389064
538,8	538,9	98,30	98,16	0,170	0,168	138	0,2389062
538,8	538,9	99,53	99,25	0,170	0,168	139	0,2363307
538,8	538,9	98,38	98,35	0,170	0,168	140	0,2389056
538,8	538,9	99,27	99,25	0,170	0,168	141	0,2367719
538,8	538,9	98,48	98,19	0,170	0,168	142	0,2389058
538,8	538,8	98,09	98,11	0,170	0,168	143	0,2393302
538,8	538,8	98,41	98,05	0,170	0,168	144	0,2389055
538,8	538,8	97,60	97,27	0,170	0,168	145	0,24081
538,8	538,8	100,16	99,65	0,170	0,168	146	0,2348353
538,8	538,8	98,81	98,67	0,170	0,168	147	0,2378457
538,8	538,8	98,50	98,23	0,170	0,168	148	0,2389061
538,8	538,8	100,74	100,85	0,170	0,168	149	0,2331008
538,7	538,8	99,24	98,87	0,170	0,168	150	0,2367716
538,7	538,8	98,48	98,31	0,170	0,168	151	0,238906
538,7	538,8	99,09	98,63	0,170	0,168	152	0,2374141
538,7	538,8	98,97	98,61	0,170	0,168	153	0,2374144
538,7	538,8	98,79	98,51	0,170	0,168	154	0,2378418
538,7	538,8	98,18	97,90	0,170	0,168	155	0,2393302
538,8	538,8	99,43	99,07	0,170	0,168	156	0,2363439
538,9	538,8	98,86	98,43	0,170	0,168	157	0,2378425

538,9	538,9	97,73	97,66	0,170	0,168	158	0,2403888
538,9	538,9	98,38	98,07	0,170	0,168	159	0,238908
538,9	538,9	97,63	97,39	0,170	0,168	160	0,2408107
538,9	538,9	98,32	98,11	0,170	0,168	161	0,2389071
538,9	538,9	98,06	97,57	0,170	0,168	162	0,2399655
538,9	538,9	99,99	99,90	0,170	0,168	163	0,2348365
538,9	538,9	99,48	99,22	0,170	0,168	164	0,2362016
538,9	538,9	99,04	98,75	0,170	0,168	165	0,2374144
538,8	538,9	97,78	97,41	0,170	0,168	166	0,2403889
538,9	538,9	101,01	100,49	0,170	0,168	167	0,2331006
538,9	538,9	99,40	98,94	0,170	0,168	168	0,2363445
538,9	538,9	98,75	98,13	0,170	0,167	169	0,2382683
538,9	538,9	99,89	99,46	0,170	0,168	170	0,2356987
539,0	539,0	98,16	97,98	0,170	0,168	171	0,2393308
539,0	539,0	98,36	97,97	0,170	0,168	172	0,2393308
539,0	539,0	98,04	97,92	0,170	0,168	173	0,2393307
539,0	539,0	98,65	98,24	0,170	0,168	174	0,2382683
539,0	539,0	97,50	97,35	0,170	0,168	175	0,2407587
539,0	539,0	98,37	98,20	0,170	0,168	176	0,2389068
539,0	539,0	98,70	98,71	0,170	0,168	177	0,2378425
539,0	539,0	98,32	98,05	0,170	0,168	178	0,2389063
539,0	539,0	99,37	98,86	0,170	0,168	179	0,2367723
539,1	539,0	98,90	98,38	0,170	0,168	180	0,2379338
539,1	539,0	98,99	98,66	0,170	0,168	181	0,2374141
539,1	539,0	98,56	98,50	0,170	0,168	182	0,2382486
539,1	539,0	98,24	98,04	0,170	0,168	183	0,2393306
539,1	539,0	98,01	97,72	0,170	0,168	184	0,2393306
539,1	539,0	99,38	99,03	0,170	0,167	185	0,2363441
539,1	539,1	98,12	97,96	0,170	0,168	186	0,2393303
539,1	539,1	97,90	97,61	0,170	0,168	187	0,2399659
539,1	539,1	98,65	98,50	0,170	0,168	188	0,2378423
539,1	539,1	98,72	98,57	0,170	0,168	189	0,238268
539,1	539,1	98,32	98,06	0,170	0,168	190	0,2389063
539,2	539,1	99,20	99,07	0,170	0,168	191	0,2364405
539,2	539,2	98,55	98,23	0,170	0,168	192	0,2382685
539,2	539,2	98,22	98,02	0,170	0,168	193	0,2393307
539,2	539,2	98,79	98,31	0,170	0,168	194	0,2378428
539,2	539,2	99,50	99,17	0,170	0,167	195	0,235699
539,2	539,2	97,91	97,96	0,170	0,168	196	0,239966
539,3	539,3	98,25	98,21	0,170	0,168	197	0,2389063
539,3	539,2	97,75	97,44	0,170	0,168	198	0,2403891
539,3	539,3	98,05	97,75	0,170	0,168	199	0,2393307
539,3	539,3	98,08	97,79	0,170	0,168	200	0,2393315
539,3	539,3	98,50	98,42	0,170	0,168	201	0,2380421
539,3	539,3	99,24	99,04	0,170	0,168	202	0,236773
539,3	539,3	97,92	97,59	0,170	0,168	203	0,2399656
539,3	539,3	98,10	97,94	0,170	0,168	204	0,2393536
539,3	539,3	99,21	99,01	0,170	0,168	205	0,236773
539,3	539,3	98,09	97,87	0,170	0,168	206	0,2393307
539,3	539,3	98,54	98,39	0,170	0,168	207	0,2382688
539,4	539,3	98,18	97,70	0,170	0,168	208	0,239331
539,4	539,4	98,90	98,89	0,170	0,168	209	0,2374154
539,4	539,4	98,84	98,49	0,170	0,168	210	0,2378433
539,4	539,4	98,71	98,76	0,170	0,168	211	0,2378432
539,4	539,5	98,25	97,67	0,170	0,168	212	0,2393317

539,5	539,5	98,03	98,01	0,170	0,168	213	0,2393313
539,4	539,4	97,83	97,25	0,170	0,168	214	0,24039
539,5	539,4	98,28	97,92	0,170	0,168	215	0,2393317
539,5	539,4	98,43	98,24	0,170	0,168	216	0,238269
539,5	539,5	98,41	98,00	0,170	0,168	217	0,2389078
539,5	539,5	97,86	97,39	0,170	0,167	218	0,2399671
539,5	539,5	98,73	98,69	0,170	0,168	219	0,2378433
539,5	539,5	99,28	99,04	0,170	0,168	220	0,2367744
539,6	539,5	98,80	98,88	0,170	0,168	221	0,2378434
539,6	539,5	98,89	98,77	0,170	0,168	222	0,2374159

Average	Average	Average						Average
15,64	Inlet +	Inlet +						0,242
	Outlet	Outlet	Average	Average	#1	#2		
Tunnel	Temp.	Temp.	99,30	98,61	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
15,258	536,6	536,8			0,170	0,168	0	0,2374089
15,614	536,8	536,9	98,91	98,37	0,170	0,168	1	0,2429031
15,681	536,8	536,9	98,39	97,72	0,170	0,168	2	0,243948
15,548	536,8	537,0	99,41	98,38	0,170	0,168	3	0,2418586
15,681	536,8	537,0	98,46	97,75	0,170	0,168	4	0,2439478
15,641	536,9	537,0	98,72	97,76	0,170	0,168	5	0,2433228
15,738	536,9	537,1	97,86	97,37	0,170	0,168	6	0,244986
15,678	536,9	537,1	98,43	97,76	0,170	0,168	7	0,2439486
15,449	536,9	537,1	99,88	99,03	0,170	0,168	8	0,2403863
15,678	536,9	537,1	98,35	97,54	0,170	0,168	9	0,2439486
15,678	536,9	537,2	98,40	97,66	0,170	0,168	10	0,2439488
15,638	536,9	537,2	98,59	97,98	0,170	0,168	11	0,2433235
15,652	536,9	537,2	99,00	98,37	0,170	0,168	12	0,2429062
15,675	536,9	537,2	99,15	98,53	0,170	0,168	13	0,2428887
15,656	536,9	537,2	99,94	99,35	0,170	0,168	14	0,2418595
15,771	536,9	537,3	99,43	98,40	0,170	0,168	15	0,2433238
15,747	537,0	537,3	99,69	99,04	0,170	0,168	16	0,2429064
15,594	537,0	537,3	100,80	99,89	0,170	0,168	17	0,2403873
15,664	537,0	537,3	100,29	99,63	0,170	0,168	18	0,2414401
15,680	537,1	537,3	100,45	99,83	0,170	0,168	19	0,2414402
15,701	537,2	537,4	100,31	99,34	0,170	0,168	20	0,2418597
15,805	537,2	537,5	99,55	98,94	0,170	0,168	21	0,2433236
15,614	537,3	537,5	100,99	100,26	0,170	0,168	22	0,2403869
15,804	537,3	537,5	99,72	98,94	0,170	0,168	23	0,2433239
15,692	537,4	537,6	100,52	99,68	0,170	0,168	24	0,2414402
15,855	537,4	537,6	99,52	98,57	0,170	0,168	25	0,2439491
15,859	537,5	537,7	99,40	98,57	0,170	0,168	26	0,2439493
15,835	537,6	537,7	99,80	98,97	0,170	0,168	27	0,2433239
15,808	537,7	537,8	99,88	99,26	0,170	0,168	28	0,2429012
15,553	537,8	537,9	101,59	101,02	0,170	0,168	29	0,2389051
15,811	537,9	537,9	100,01	99,18	0,170	0,168	30	0,2429069
15,624	537,9	538,0	101,23	100,48	0,170	0,168	31	0,2399634
15,721	538,0	538,0	100,59	99,73	0,170	0,168	32	0,2414396
15,730	538,1	538,1	100,54	99,85	0,170	0,168	33	0,2414404
15,728	538,2	538,1	100,61	99,92	0,170	0,168	34	0,2414404
15,731	538,3	538,2	100,67	99,77	0,170	0,168	35	0,2414403
15,597	538,3	538,2	101,05	100,22	0,170	0,168	36	0,2399641
15,636	538,4	538,3	101,07	100,38	0,170	0,168	37	0,2399665
15,633	538,5	538,4	101,23	100,62	0,170	0,168	38	0,2399648
15,497	538,6	538,4	101,18	100,57	0,170	0,168	39	0,2389052
15,654	538,7	538,5	100,95	100,15	0,170	0,168	40	0,2403878
15,692	538,8	538,6	99,79	99,31	0,170	0,168	41	0,24186
15,622	538,9	538,6	101,07	100,38	0,170	0,168	42	0,2399642
15,677	538,9	538,7	100,74	99,92	0,170	0,168	43	0,2408094
15,621	539,0	538,7	101,06	100,36	0,170	0,168	44	0,2399643
15,572	539,1	538,8	101,04	100,49	0,169	0,168	45	0,2393321
15,633	539,2	538,9	100,45	99,74	0,170	0,168	46	0,2408088
15,791	539,3	538,9	99,60	98,86	0,170	0,168	47	0,2429077
15,680	539,3	539,0	100,10	99,37	0,170	0,167	48	0,2414411
15,702	539,4	539,0	99,86	99,13	0,170	0,167	49	0,2418605
15,600	539,4	539,1	100,69	99,89	0,169	0,167	50	0,2399646
15,584	539,5	539,2	100,54	100,01	0,169	0,167	51	0,2399649
15,526	539,5	539,2	100,77	100,32	0,169	0,168	52	0,23933
15,592	539,6	539,3	100,41	99,73	0,169	0,168	53	0,240388

15,780	539,7	539,3	99,09	98,48	0,169	0,167	54	0,2433247
15,682	539,8	539,4	99,65	98,97	0,169	0,167	55	0,2418611
15,652	539,8	539,5	99,81	99,09	0,169	0,167	56	0,241442
15,677	539,9	539,5	99,64	98,89	0,169	0,167	57	0,2418609
15,674	539,9	539,6	99,50	98,91	0,169	0,167	58	0,2418605
15,603	540,0	539,6	99,80	99,42	0,169	0,167	59	0,2408102
15,764	540,0	539,6	98,87	98,23	0,169	0,167	60	0,2433255
15,571	540,0	539,6	100,10	99,35	0,169	0,167	61	0,2403881
15,758	540,0	539,7	98,89	98,08	0,169	0,167	62	0,2433258
15,650	540,1	539,7	99,24	98,66	0,169	0,167	63	0,2418623
15,557	540,1	539,7	99,97	99,36	0,169	0,167	64	0,240389
15,647	540,2	539,8	99,51	98,37	0,169	0,167	65	0,2418611
15,547	540,2	539,8	100,01	99,11	0,169	0,167	66	0,2403883
15,542	540,3	539,9	99,80	99,28	0,169	0,167	67	0,2403885
15,469	540,3	539,9	100,31	99,66	0,169	0,167	68	0,2393327
15,547	540,3	539,9	99,48	98,98	0,169	0,167	69	0,2408095
15,585	540,3	539,9	99,30	98,55	0,169	0,167	70	0,2414419
15,540	540,3	539,9	99,47	98,76	0,169	0,167	71	0,2408101
15,578	540,4	540,0	99,09	98,63	0,169	0,167	72	0,2414418
15,736	540,4	540,0	98,00	97,41	0,169	0,167	73	0,2439514
15,666	540,4	540,1	98,58	97,85	0,169	0,167	74	0,2429097
15,500	540,4	540,1	99,60	98,73	0,169	0,167	75	0,2403886
15,524	540,5	540,1	99,25	98,67	0,169	0,167	76	0,2408105
15,588	540,5	540,2	98,90	98,32	0,169	0,167	77	0,241863
15,558	540,5	540,2	99,03	98,23	0,169	0,167	78	0,2414422
15,649	540,5	540,2	98,31	97,60	0,169	0,167	79	0,2429097
15,656	540,5	540,2	98,67	97,93	0,169	0,167	80	0,2429097
15,722	540,5	540,2	97,93	97,22	0,169	0,167	81	0,243951
15,587	540,5	540,2	98,85	98,07	0,169	0,167	82	0,2418617
15,655	540,5	540,2	98,46	98,05	0,169	0,167	83	0,2429087
15,587	540,5	540,2	98,86	98,20	0,169	0,167	84	0,2418614
15,464	540,5	540,2	99,57	98,85	0,169	0,167	85	0,2399662
15,586	540,5	540,2	98,85	98,24	0,169	0,167	86	0,241862
15,680	540,5	540,2	98,24	97,58	0,169	0,167	87	0,2433267
15,559	540,5	540,2	98,98	98,58	0,169	0,167	88	0,2414426
15,787	540,5	540,2	97,54	96,79	0,169	0,167	89	0,2449888
15,518	540,5	540,2	99,36	98,77	0,169	0,167	90	0,2408109
15,585	540,5	540,2	98,87	98,09	0,169	0,167	91	0,2418622
15,679	540,5	540,2	98,48	97,56	0,169	0,167	92	0,243327
15,587	540,5	540,3	98,69	98,18	0,169	0,167	93	0,2419598
15,548	540,5	540,3	99,00	98,46	0,169	0,167	94	0,2414426
15,639	540,5	540,3	98,53	97,70	0,169	0,167	95	0,2429096
15,706	540,4	540,3	97,94	97,27	0,169	0,167	96	0,2439516
15,571	540,4	540,3	98,85	98,20	0,169	0,167	97	0,2418627
15,543	540,4	540,3	99,07	98,63	0,169	0,167	98	0,2414428
15,637	540,5	540,3	98,19	97,46	0,169	0,167	99	0,2429094
15,704	540,5	540,3	97,89	97,28	0,169	0,167	100	0,2439519
15,569	540,5	540,3	98,75	98,14	0,169	0,167	101	0,2418624
15,569	540,5	540,3	98,81	98,06	0,169	0,167	102	0,2418618
15,568	540,4	540,3	98,73	98,34	0,169	0,167	103	0,2418624
15,500	540,4	540,3	99,21	98,65	0,169	0,167	104	0,2408108
15,540	540,4	540,2	98,94	98,36	0,169	0,167	105	0,2414425
15,861	540,4	540,2	96,81	96,35	0,169	0,167	106	0,2464357
15,502	540,4	540,2	99,24	98,55	0,169	0,167	107	0,2408519
15,660	540,4	540,2	98,25	97,47	0,169	0,167	108	0,2433266
15,700	540,4	540,3	97,87	97,04	0,169	0,167	109	0,2439515
15,565	540,4	540,3	98,71	98,22	0,169	0,167	110	0,2418623
15,701	540,4	540,3	97,95	97,07	0,169	0,167	111	0,243974
15,765	540,4	540,3	97,45	96,83	0,169	0,167	112	0,2449775
15,658	540,4	540,3	98,19	97,55	0,169	0,167	113	0,2433268
15,496	540,5	540,3	99,00	98,34	0,169	0,167	114	0,2408105

15,631	540,4	540,3	98,24	97,80	0,169	0,167	115	0,2429098
15,630	540,4	540,3	98,25	97,73	0,169	0,167	116	0,2429105
15,790	540,4	540,3	97,34	96,47	0,169	0,167	117	0,2454042
15,656	540,4	540,3	97,91	97,16	0,169	0,167	118	0,2433268
15,467	540,4	540,3	99,29	98,54	0,169	0,167	119	0,2403898
15,655	540,4	540,3	98,13	97,46	0,169	0,167	120	0,2433271
15,534	540,4	540,3	98,81	98,34	0,169	0,167	121	0,2414426
15,534	540,3	540,2	98,92	98,11	0,169	0,167	122	0,241456
15,761	540,3	540,2	97,48	96,76	0,169	0,167	123	0,2449891
15,560	540,3	540,2	98,78	97,93	0,169	0,167	124	0,2418627
15,694	540,3	540,2	97,84	97,11	0,169	0,167	125	0,2439543
15,559	540,3	540,2	98,54	98,05	0,169	0,167	126	0,2418626

Average	Average						Average
Inlet +	Inlet +						0,238
Outlet	Outlet	Average	Average	#1	#2		
Temp.	Temp.	99,36	98,96	System 1	System 2		SQRT
Meter 1	Meter 2	Proportional Rates		Vol.Std.	Vol.Std.		Delta-P
		PR1	PR2			Time	
Deg. R	Deg. R	%	%	(ft3)	(ft3)	min	(in H2O)2
537,2	537,4			0,169	0,167	0	0,2363426
537,3	537,5	101,54	100,96	0,169	0,167	1	0,2356966
537,4	537,6	101,36	100,75	0,169	0,167	2	0,2363422
537,5	537,6	101,85	101,36	0,169	0,167	3	0,2352664
537,5	537,6	101,34	100,73	0,169	0,167	4	0,236771
537,5	537,7	101,21	100,68	0,169	0,167	5	0,2356968
537,5	537,7	100,75	100,28	0,169	0,167	6	0,2363427
537,5	537,7	100,85	100,25	0,169	0,167	7	0,2363424
537,5	537,7	100,83	100,69	0,169	0,167	8	0,2356968
537,5	537,7	100,88	100,15	0,169	0,167	9	0,2359845
537,5	537,7	100,58	99,91	0,169	0,167	10	0,2367712
537,6	537,8	99,47	99,01	0,169	0,167	11	0,2389047
537,6	537,8	100,65	100,16	0,169	0,167	12	0,2363431
537,6	537,8	101,72	101,11	0,169	0,167	13	0,2341857
537,6	537,8	101,02	100,54	0,169	0,167	14	0,2356975
537,6	537,9	100,56	100,10	0,169	0,167	15	0,2367712
537,6	537,9	100,93	100,57	0,169	0,167	16	0,2356978
537,6	537,9	100,73	100,39	0,169	0,167	17	0,2363426
537,6	537,9	99,97	99,71	0,169	0,167	18	0,2382867
537,7	537,9	100,98	100,67	0,169	0,167	19	0,2356969
537,7	538,0	101,08	100,85	0,169	0,167	20	0,2356984
537,7	538,0	100,85	100,46	0,169	0,167	21	0,2363426
537,8	538,0	101,39	100,96	0,169	0,167	22	0,2352672
537,8	538,0	99,91	99,56	0,169	0,167	23	0,2382665
537,8	538,0	100,73	100,46	0,169	0,167	24	0,2367709
537,8	538,0	100,00	99,63	0,169	0,167	25	0,2382669
537,8	538,1	101,16	100,51	0,169	0,167	26	0,2356973
537,8	538,1	99,53	99,03	0,169	0,167	27	0,2393289
537,8	538,1	101,23	100,88	0,169	0,167	28	0,235697
537,9	538,1	100,52	100,06	0,169	0,167	29	0,2370936
537,9	538,1	101,11	100,69	0,169	0,167	30	0,2356974
537,9	538,1	101,08	100,66	0,169	0,167	31	0,2356971
537,9	538,2	101,32	100,79	0,169	0,167	32	0,2352662
537,9	538,2	99,45	99,08	0,169	0,167	33	0,2399641
537,9	538,2	101,27	100,75	0,169	0,167	34	0,2355836
537,9	538,2	99,75	99,31	0,169	0,167	35	0,2388866
537,9	538,2	99,72	99,33	0,169	0,167	36	0,2389049
538,0	538,2	101,07	100,71	0,169	0,167	37	0,2355626
538,0	538,2	101,13	100,81	0,169	0,167	38	0,2352666
538,0	538,2	99,68	99,45	0,169	0,167	39	0,238905
538,0	538,2	100,31	99,96	0,169	0,167	40	0,2374129
538,0	538,3	100,99	100,75	0,169	0,167	41	0,2356973
538,0	538,2	100,51	100,06	0,169	0,167	42	0,2367707
538,0	538,3	101,18	100,48	0,169	0,167	43	0,2356972
538,1	538,3	100,62	100,03	0,169	0,167	44	0,2367711
538,1	538,3	100,37	99,91	0,169	0,167	45	0,2374133
538,1	538,3	101,28	100,86	0,169	0,167	46	0,2352668
538,1	538,3	100,27	99,78	0,169	0,167	47	0,237413

538,1	538,3	100,80	100,31	0,169	0,167	48	0,2363425
538,1	538,3	100,93	100,58	0,169	0,167	49	0,2356974
538,1	538,3	99,93	99,71	0,169	0,167	50	0,2382667
538,2	538,3	101,15	100,67	0,169	0,167	51	0,235697
538,2	538,3	99,95	99,56	0,169	0,167	52	0,2382669
538,2	538,3	100,30	99,88	0,169	0,167	53	0,2374136
538,2	538,4	100,51	100,04	0,169	0,167	54	0,2367712
538,2	538,4	100,87	100,48	0,169	0,167	55	0,2356975
538,3	538,4	100,58	100,17	0,169	0,167	56	0,236343
538,3	538,4	100,56	100,28	0,169	0,167	57	0,2367713
538,4	538,5	99,66	99,28	0,169	0,167	58	0,2389216
538,4	538,5	100,18	99,78	0,169	0,167	59	0,2374268
538,5	538,6	99,88	99,55	0,169	0,167	60	0,2382673
538,5	538,6	99,34	98,96	0,169	0,167	61	0,2393299
538,5	538,6	99,95	99,59	0,169	0,167	62	0,238267
538,5	538,6	100,76	100,41	0,169	0,167	63	0,236343
538,5	538,6	99,58	99,23	0,169	0,167	64	0,2390545
538,5	538,6	100,40	100,06	0,169	0,167	65	0,237414
538,5	538,6	100,41	100,26	0,169	0,167	66	0,2367718
538,5	538,6	99,83	99,48	0,169	0,167	67	0,2382672
538,6	538,6	100,00	99,53	0,169	0,167	68	0,2382675
538,6	538,7	100,49	100,32	0,169	0,167	69	0,2367723
538,6	538,6	99,72	99,23	0,169	0,167	70	0,2389061
538,6	538,7	99,62	99,27	0,169	0,167	71	0,2389053
538,6	538,7	99,40	99,06	0,169	0,167	72	0,2393297
538,6	538,7	100,85	100,45	0,169	0,167	73	0,2356977
538,6	538,7	99,72	99,50	0,169	0,167	74	0,2382672
538,7	538,7	100,47	100,23	0,169	0,167	75	0,2365546
538,7	538,8	100,25	99,76	0,169	0,167	76	0,2374127
538,8	538,8	98,96	98,52	0,169	0,167	77	0,2399641
538,8	538,8	100,05	99,76	0,169	0,167	78	0,2374137
538,9	538,9	99,96	99,51	0,169	0,167	79	0,237414
538,9	538,9	100,49	99,98	0,169	0,167	80	0,2363431
538,9	538,9	100,68	100,12	0,169	0,167	81	0,2356977
538,9	538,9	99,57	99,32	0,169	0,167	82	0,2382669
538,9	538,9	99,51	99,11	0,169	0,167	83	0,2382668
538,9	538,9	99,41	99,04	0,169	0,167	84	0,2382672
538,8	538,8	99,32	98,94	0,169	0,167	85	0,2382672
538,9	538,9	99,09	98,66	0,169	0,167	86	0,2389054
538,9	538,9	99,38	99,07	0,169	0,167	87	0,2382671
538,9	538,9	99,69	99,22	0,169	0,167	88	0,2374142
539,0	538,9	100,03	99,94	0,169	0,167	89	0,2365742
539,0	539,0	99,10	98,72	0,169	0,167	90	0,2389065
539,0	539,0	99,00	98,58	0,169	0,167	91	0,2390193
539,0	539,0	99,97	99,72	0,169	0,167	92	0,236772
539,0	539,0	98,63	98,28	0,169	0,167	93	0,2399649
538,9	539,0	99,20	98,83	0,169	0,167	94	0,2382667
538,9	538,9	98,79	98,46	0,169	0,167	95	0,23933
538,9	538,9	99,76	99,58	0,168	0,167	96	0,2367719
538,9	538,9	98,86	98,53	0,169	0,167	97	0,2393297
538,9	538,9	100,36	100,30	0,169	0,167	98	0,235268
538,9	538,9	99,37	98,84	0,169	0,167	99	0,2382667
538,9	538,9	98,22	97,73	0,169	0,166	100	0,2403884
538,9	538,9	98,82	98,56	0,168	0,166	101	0,2389061
538,9	538,9	99,06	98,64	0,169	0,167	102	0,2382666

538,9	538,9	99,79	99,24	0,169	0,166	103	0,2367714
538,9	538,9	98,90	98,34	0,169	0,166	104	0,238905
538,9	538,9	98,84	98,32	0,169	0,166	105	0,2389053
538,9	538,9	98,51	98,45	0,169	0,167	106	0,2393297
538,9	538,9	98,78	98,65	0,169	0,167	107	0,2389054
538,9	538,9	98,53	98,16	0,169	0,167	108	0,2399648
538,9	538,9	99,48	98,96	0,169	0,167	109	0,2374137
538,9	538,9	98,20	97,76	0,169	0,166	110	0,2403881
538,9	538,9	98,38	97,85	0,169	0,166	111	0,239965
538,9	538,9	98,45	98,21	0,169	0,167	112	0,2399254
538,9	538,9	99,34	99,23	0,169	0,167	113	0,2374139
538,8	538,9	99,47	99,15	0,169	0,167	114	0,2374138
538,8	538,8	98,75	98,10	0,169	0,167	115	0,2393294
538,9	538,9	98,15	97,78	0,169	0,167	116	0,2403876
538,9	538,9	98,19	97,76	0,169	0,167	117	0,2403877
538,8	538,9	98,28	98,01	0,169	0,167	118	0,2399642
538,9	538,9	99,38	98,94	0,169	0,167	119	0,2374139
538,9	538,8	98,44	97,84	0,169	0,167	120	0,2399762
538,8	538,8	98,81	98,45	0,169	0,167	121	0,2389054
538,8	538,8	98,86	98,24	0,169	0,167	122	0,2389052
538,9	538,9	98,76	98,33	0,169	0,167	123	0,2389055
538,9	538,9	98,65	98,27	0,169	0,167	124	0,2389053
538,8	538,8	99,12	98,76	0,169	0,167	125	0,2382664
538,8	538,8	100,48	99,95	0,169	0,167	126	0,2352673
538,8	538,8	98,72	98,27	0,169	0,167	127	0,2393295
538,8	538,8	99,58	99,18	0,169	0,167	128	0,2367711
538,8	538,8	98,91	98,59	0,169	0,167	129	0,2389052
538,8	538,8	99,91	99,40	0,169	0,167	130	0,2363431
538,7	538,7	99,53	99,26	0,169	0,167	131	0,2367712
538,7	538,7	98,87	98,34	0,169	0,167	132	0,2389047
538,8	538,7	97,97	97,85	0,169	0,167	133	0,2408089
538,7	538,7	98,79	98,72	0,169	0,167	134	0,2389055
538,7	538,7	98,60	98,29	0,169	0,167	135	0,2393291
538,8	538,7	100,06	99,78	0,169	0,167	136	0,2356974
538,7	538,7	98,44	97,81	0,169	0,167	137	0,2399642
538,7	538,7	98,75	98,12	0,169	0,166	138	0,2389051
538,7	538,7	98,01	97,55	0,169	0,166	139	0,2403875
538,7	538,7	97,91	97,43	0,169	0,166	140	0,240809
538,7	538,7	98,71	98,34	0,169	0,167	141	0,2389054
538,7	538,7	98,43	98,25	0,169	0,167	142	0,2393297
538,6	538,7	98,74	98,13	0,169	0,167	143	0,2393299
538,6	538,6	99,00	98,64	0,169	0,167	144	0,2382666
538,6	538,6	98,63	98,32	0,169	0,167	145	0,2393293
538,6	538,6	99,01	98,54	0,169	0,167	146	0,2389055
538,6	538,6	98,27	97,80	0,169	0,167	147	0,2399641
538,6	538,6	98,59	98,42	0,169	0,167	148	0,2393295
538,7	538,6	98,39	97,77	0,169	0,167	149	0,2399645
538,6	538,6	98,31	97,89	0,169	0,166	150	0,2393294
538,6	538,6	99,61	99,32	0,169	0,167	151	0,2367713
538,7	538,6	99,37	98,91	0,169	0,167	152	0,237413
538,7	538,6	98,22	98,06	0,169	0,167	153	0,2403887
538,7	538,6	99,01	98,52	0,169	0,167	154	0,2382664
538,6	538,6	98,37	98,05	0,169	0,167	155	0,2399646
538,6	538,6	98,00	97,48	0,169	0,167	156	0,2403878
538,6	538,6	98,42	97,97	0,169	0,166	157	0,2393289

538,6	538,6	99,27	99,00	0,169	0,167	158	0,2374135
538,6	538,5	97,72	97,36	0,169	0,167	159	0,2414404
538,5	538,5	98,09	97,62	0,169	0,167	160	0,2403875
538,6	538,5	99,22	99,01	0,169	0,167	161	0,2374135
538,6	538,5	98,13	97,94	0,169	0,167	162	0,2399637
538,6	538,5	97,67	97,32	0,169	0,167	163	0,2414404
538,5	538,5	98,27	98,17	0,169	0,167	164	0,2393287
538,5	538,5	98,83	98,73	0,169	0,167	165	0,2382666
538,5	538,5	98,19	97,89	0,169	0,167	166	0,2399629
538,5	538,5	99,03	98,70	0,169	0,167	167	0,2382664
538,6	538,5	97,86	97,45	0,169	0,167	168	0,2411834
538,6	538,5	98,59	98,11	0,169	0,167	169	0,2390322
538,6	538,5	98,55	98,11	0,169	0,167	170	0,239329
538,6	538,5	100,14	99,82	0,169	0,167	171	0,235267
538,6	538,5	98,91	98,41	0,169	0,167	172	0,2382661
538,6	538,5	98,20	97,79	0,169	0,167	173	0,2399643
538,6	538,6	98,45	98,11	0,169	0,167	174	0,2393275
538,6	538,6	99,29	98,86	0,169	0,167	175	0,237413
538,6	538,6	98,25	97,77	0,169	0,167	176	0,2399637
538,6	538,6	98,23	97,72	0,169	0,167	177	0,2408081
538,6	538,6	97,82	97,56	0,169	0,167	178	0,2408083
538,5	538,5	97,83	97,41	0,169	0,167	179	0,2408084
538,5	538,5	98,18	97,78	0,169	0,167	180	0,2399642
538,5	538,5	97,53	97,29	0,169	0,167	181	0,2414404
538,5	538,5	99,54	99,17	0,169	0,167	182	0,2367713
538,5	538,5	98,32	97,74	0,169	0,167	183	0,2399643
538,5	538,5	98,01	97,88	0,169	0,167	184	0,2403875
538,5	538,5	98,05	97,49	0,169	0,167	185	0,2408087
538,5	538,5	98,02	97,68	0,169	0,167	186	0,2403871
538,5	538,5	98,30	97,93	0,169	0,167	187	0,2399639
538,5	538,5	98,08	97,59	0,169	0,167	188	0,2403873
538,5	538,5	99,02	98,63	0,169	0,167	189	0,2382664
538,5	538,5	97,93	97,60	0,169	0,167	190	0,2403877
538,5	538,4	98,10	97,53	0,169	0,167	191	0,2403876
538,4	538,4	98,57	98,02	0,169	0,167	192	0,2393294
538,4	538,4	98,28	97,75	0,169	0,167	193	0,2399643
538,5	538,4	96,94	96,34	0,169	0,166	194	0,2429075
538,6	538,5	98,90	98,17	0,169	0,166	195	0,2382671
538,6	538,5	98,78	98,62	0,169	0,167	196	0,2382661
538,6	538,6	98,45	98,10	0,169	0,167	197	0,2393305
538,6	538,6	98,03	97,71	0,169	0,167	198	0,2403876
538,5	538,6	98,02	97,48	0,169	0,167	199	0,2403876
538,5	538,6	98,14	97,90	0,169	0,167	200	0,2399645
538,5	538,5	97,56	97,24	0,169	0,167	201	0,2414405
538,5	538,5	98,47	97,99	0,169	0,167	202	0,2393286
538,5	538,5	98,21	97,86	0,169	0,167	203	0,2399643
538,5	538,5	98,35	97,65	0,169	0,167	204	0,2399644
538,5	538,5	98,12	97,57	0,169	0,166	205	0,2403873
538,5	538,5	97,67	97,13	0,169	0,167	206	0,2414408
538,5	538,5	97,90	97,28	0,169	0,166	207	0,2408085
538,5	538,5	98,64	98,04	0,169	0,166	208	0,2393294
538,5	538,5	99,74	99,31	0,169	0,167	209	0,2363423
538,5	538,5	99,06	98,42	0,169	0,167	210	0,2382658
538,5	538,5	97,60	97,11	0,169	0,167	211	0,2414404
538,5	538,5	98,00	97,78	0,169	0,167	212	0,2403873

538,5	538,5	97,93	97,33	0,169	0,167	213	0,2408081
538,5	538,5	98,08	97,86	0,169	0,167	214	0,2399641
538,4	538,5	98,12	97,62	0,169	0,167	215	0,2399645
538,4	538,5	98,12	97,86	0,169	0,167	216	0,2403873

APPENDIX 5: Participants

Danick Power ing.
v-p operation
Services Polytests inc.
450.741.3636
www.polytests.com

Maxime Martin
Technicien
Services Polytests inc.
450.741.3636
www.polytests.com

Dave Bryant
Hearthstone

APPENDIX 7: Operator's manual



Green Mountain 40

(Model 8640)

Woodstove

OWNER'S MANUAL

Installation And Operating Instructions



We recommend that our products be installed and serviced by professionals who are certified in the U.S. by NFI (National Fireplace Institute).

www.nficertified.org



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

**PLEASE READ THIS ENTIRE OWNER'S MANUAL BEFORE YOU INSTALL AND USE YOUR
NEW GREEN MOUNTAIN 40 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.**

NOTES ON STOVE OPERATION AND EFFICIENCY

Rating:

You have purchased a Hearthstone Green Mountain 40 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 0.9 gr/hr. emission rate and under specific test conditions has been shown to deliver heat at rates ranging from 10,000 to 30,000 Btu (output).

This wood heater has a manufacturer-set minimum allowable low burn rate that must not be altered. It is against federal regulations to alter this setting or otherwise operate this wood heater in a manner inconsistent with operating instructions in this manual.

Please refer to the Warranty section of this manual for registration instructions. In case of warranty claims, please contact the point of original sale or the nearest authorized Hearthstone dealer. Our dealer network processes all warranty claims. Authorized Hearthstone dealers can be located at www.hearthstonestoves.com.

This heater is designed to burn natural wood only. Higher efficiencies and lower emissions generally result when burning air-dried seasoned hardwoods, as compared to softwoods or to green or freshly cut hardwoods. **DO NOT BURN:** *Garbage, lawn clippings, material containing rubber (including tires), materials containing plastic, waste petroleum products paints or paint thinners, asphalt products, materials containing asbestos, construction or demolition debris, railroad ties, pressure treated wood, manure or animal remains, salt water driftwood or other previously salt water saturated materials, unseasoned wood, paper products, cardboard, plywood or particleboard.* This prohibition against burning these materials does not prohibit the use of fire starters made from paper, cardboard, sawdust, wax and similar substances for the purpose of starting a fire in an affected wood heater. Burning these materials may result in a release toxic fumes or render the heater ineffective and cause smoke.

Following the maintenance guidelines set forth in this manual will help 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 potential impacts to efficiency.

Proper draft is important to the efficient operation of your heater. Refer to the Normal Operation section of this manual for information regarding adequate draft. Both excessive and sub-minimum draft can affect the efficiency of your wood heater. Excessive draft can lead to over-consumption of fuel, lower overall heating capacity of the stove and potential over firing. Low draft can result in inefficient burns, low heat output, expulsion of smoke into the living area when stove doors are opened and an increased potential for build-up of flammable materials in the flue.

Efficiency:

Efficiency was measured and weighted using EPA Method 28R and CSA B415-10 methodology. A weighted average was used to calculate the overall efficiency across all of the 4 burn rate categories using the higher heating value (HHV). The weighted average efficiency is 78% (HHV).

To maximize the efficiency of your wood stove make sure it is sized properly for the space you plan to heat. An oversized stove will often be forced to burn at a lower and dirtier burn rate. Consult with your dealer for sizing and correctly placing the stove in your home. An incorrectly placed stove can greatly reduce efficiency. Maximizing the efficiency of your stove will heat your house quickly, burn cleaner and use less wood.

Refer to the Choosing Firewood section of this manual for appropriate fuel selection. Seasoned firewood is typically at or near 20% moisture content. This can be measured with any number of hand-held moisture meters available through your local hearth shop. Follow instructions included in the meter you purchase to measure fuel wood moisture content. Burn only dry, seasoned wood as using wet wood will greatly reduce your efficiency.

CO Emissions:

The Green Mountain 40 has the following CO emission rates by burn level: Category 1 (low) – 26 g/hr., Category 2 (med. low) – 56 g/hr., Category 3 (med. high) – 51 g/hr. and Category 4 – 94 g/hr. Wet wood or unapproved fuel described above can greatly affect the emissions of a wood burning stove.

Smoke/Fire/CO Detectors:

It is highly recommended that smoke and CO detectors be installed throughout the heated space when a wood burning heater is installed. Be certain to install these devices not only in the area where the wood appliance is located, but also in bedrooms, hallways leading to other areas of the house and all common areas of the heated space. Check the batteries in these devices and assure operation by performing whatever test operations are recommended by the manufacturer.

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INTRODUCTION

Thank you for purchasing a Green Mountain 40 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 Green Mountain 40 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 Green Mountain 40 woodstove burns very efficiently, and produces a large amount of heat. However, you should not consider your Green Mountain 40 the primary heat source for your home. The Green Mountain 40'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 Green Mountain 40 Model 8640 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 Green Mountain 40 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 Green Mountain 40 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 8)
- 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 #96-53400

PERIODIC CHECKLIST

Perform each of these tasks at the specified intervals.

At the End of Every Week:

- Empty ashes from the firebox, sooner if the firebox is full.

At the Beginning of Every Other Month:

- Depending upon your use of the stove, visually inspect the chimney connector and chimney for creosote. (see page 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

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:

40,000 BTUs per hour of cordwood (based on independent laboratory test results).

Floor Size of Heated Area:

Up to a maximum of 1,500 square feet. Factors unique to your home can reduce the square footage the stove will heat. Home insulation value, number and efficiency of windows, floor plan, stove placement, quality of the fuel and other conditions may limit the heating ability of the stove.

Firebox Capacity:

1.32 cubic feet.

Maximum Log Length: Up To 16" (40.6cm).

Emissions: 0.9 g/hr.

Burn Time: Up to 8+ hrs. (*Heat Life™*: Up to 10 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 3/8" (77.2cm)

Width: 23 1/4" (59.1cm)

Depth: 19 3/8" (49.2cm)

Weight: 464 lbs. (210 kg)

Connector Size: 6" (152 mm) diameter

Metal Chimney: 6" (152 mm) inside diameter

Masonry Chimney: 6" (152 mm) inside diameter (round flue), 8" x 8" (203 x 203 mm) (square flue)

Crate Dimensions: H-40" W-29" L-36" or 102x74x 92cm

Optional Equipment:

Outside Air Kit 96-53400

Blower 96-57400

Rear Heat Shield 96-68400

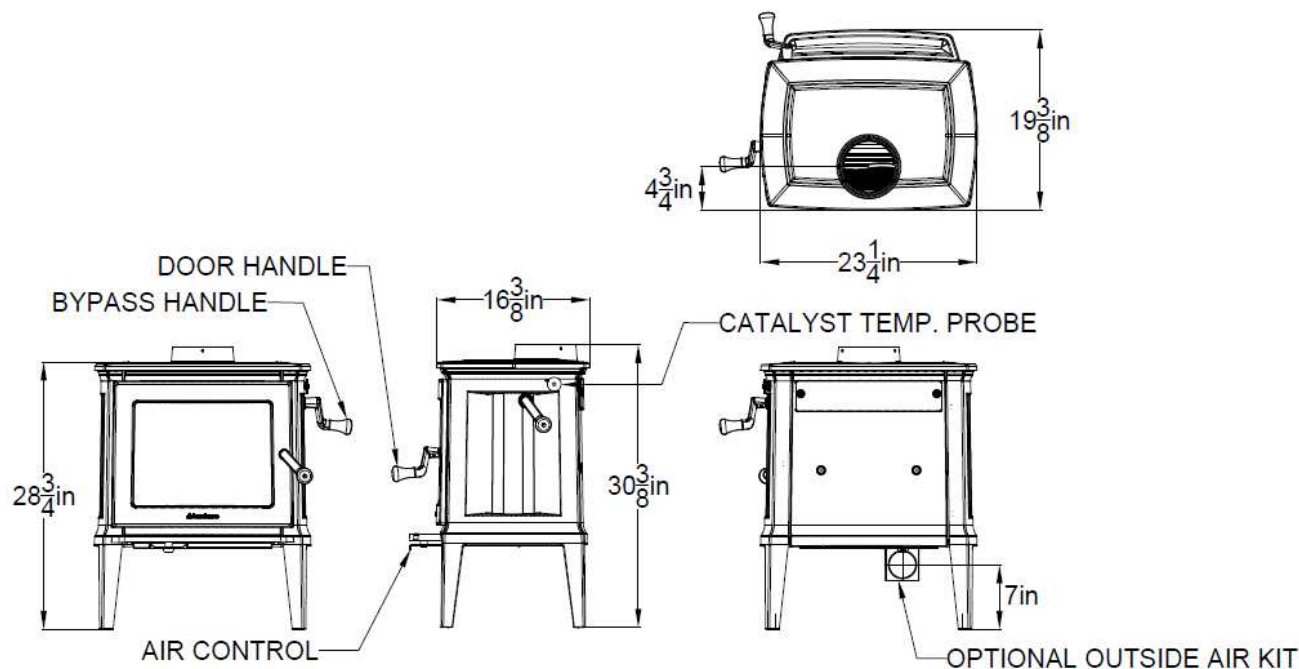


Figure 1 – Green Mountain 40 Dimensions

INSTALLATION

UNPACKING

Hearthstone packages your Green Mountain 40 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 Green Mountain 40, 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.

PACK LIST

Green Mountain 40 Model 8640 Woodstove
Owner's Manual

The label is attached by a cable to the bottom of the stove. Take care when lifting the stove not to damage the label or cable. After final positioning of the stove, the label may be stored in the holding clip on the bottom shield of the stove.

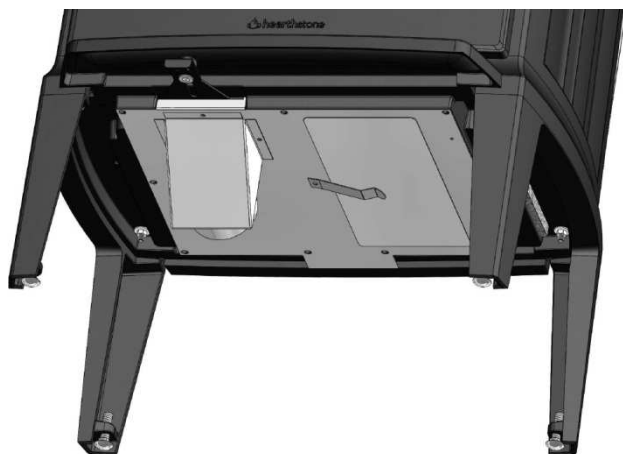


Figure 2 - Label Location

INSTALLING YOUR STOVE

Choose a place to install your Green Mountain 40 woodstove. Consider the location of your stove for optimum heating efficiency. In general, it is better to place your stove in a main living area, rather than in a basement or other confined space.

Inspect this location to make sure that the stove and stovepipes will have the required clearance from combustible materials that are near the stove. Combustibles include walls, floor, ceiling, and chimney chase. You must carefully consider the clearances to all of these combustibles before actually connecting your stove.

If the floor is made of combustible material, then a non-combustible floor protector is required between the floor and the stove. An example of a non-combustible floor protector is a hearth constructed with a continuous layer of tile, brick, slate, glass or another non-combustible facing. There is no R-value requirement.

If you use a rear connector pipe, ensure it is listed with Underwriter's Laboratories. Check the listing of your pipe with UL for the correct clearances.

The diagrams in this manual represent typical installations, but are specific to the Simpson Dura-Vent DVL brand.

Clearances to NFPA Code 211 Protected Surfaces

You can reduce the clearances to combustible surfaces by using any National Fire Protection Agency (NFPA) approved wall protection system. Please refer to NFPA Code 211 for specifications and complete details. You can obtain this information directly from the NFPA.

National Fire Protection Agency

Batterymarch Park
Quincy, MA 02269
1-800-344-3555
1-617-770-3000
www.nfpa.org

HEARTH REQUIREMENTS & FLOOR PROTECTION

Ensure you protect combustible flooring with a covering of noncombustible material. The Green Mountain 40 does not require an insulated hearth pad. The minimum floor protection must be met under the stove and extend beyond the stove as follows:

The minimum floor protection for US installations is 33in x 31-1/2in.

The minimum floor protection for installations in Canada is 43in x 40in.

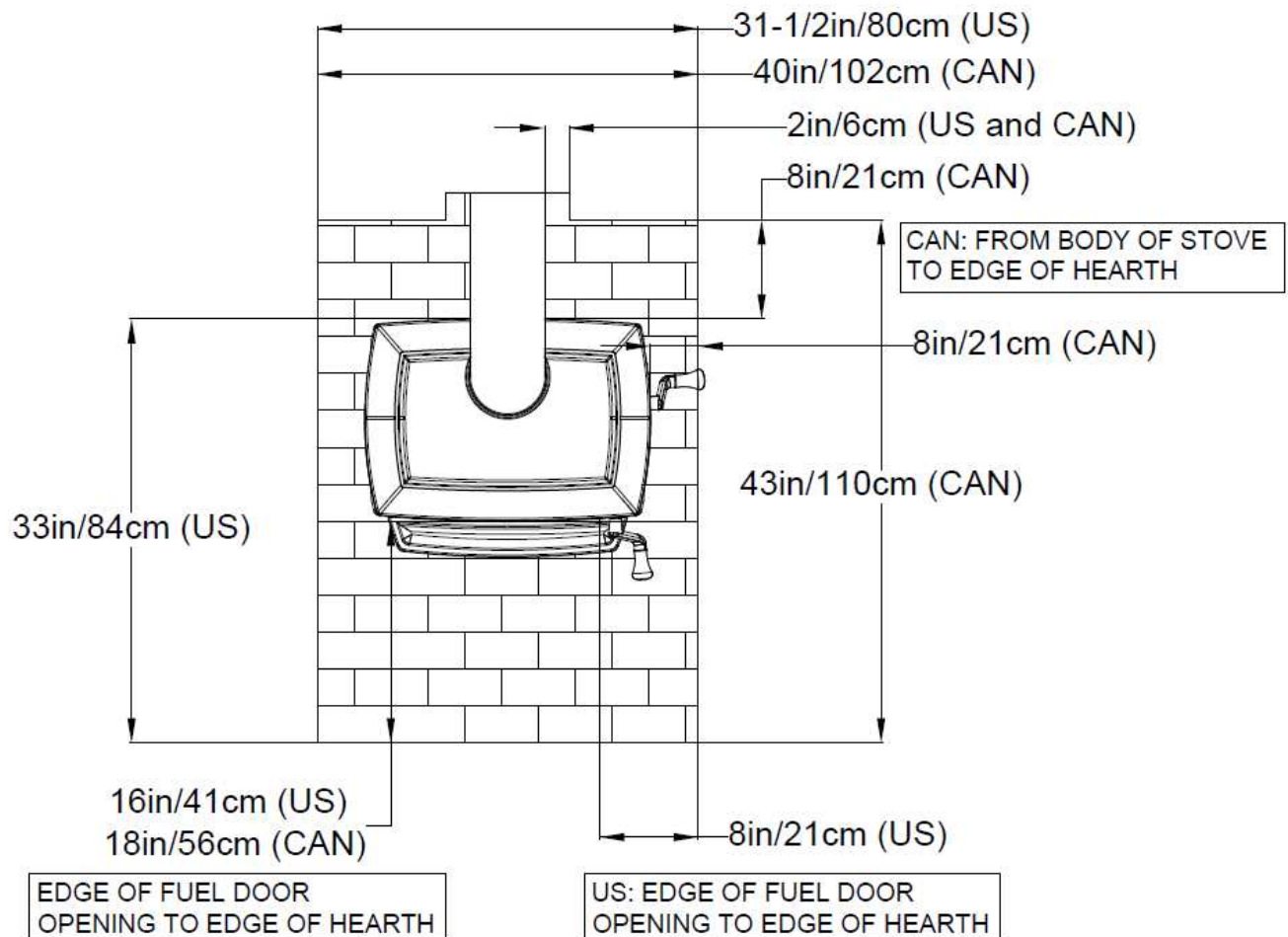


Figure 3 – Hearth Dimensions

COMBUSTIBLE SURFACE REQUIRED CLEARANCES

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

It is very important to follow minimum clearances for chimney connectors to combustibles such as walls and ceilings when installing the stove near combustible surfaces.

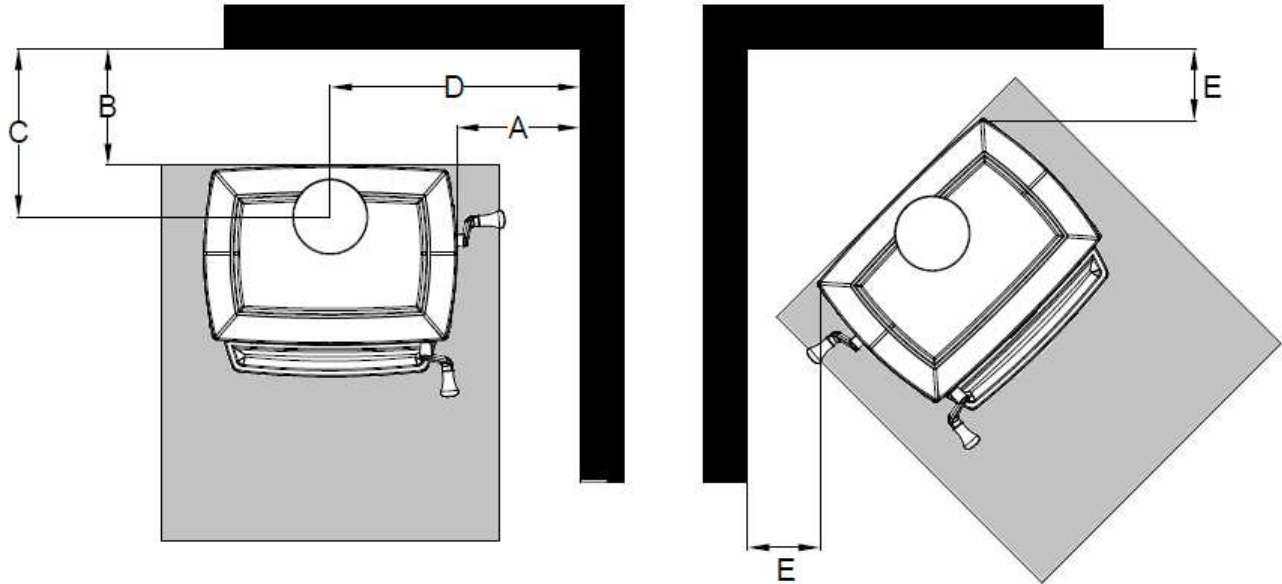


Figure 4 – Clearance to Combustibles

	Parallel				Corner
Clearances	A	B	C	D	E
Single wall Connector — No Rear Heat Shield	20"-50.8cm	18"-45.8cm	23"-58.5cm	32.25"-82.0cm	10"-25.4cm
Single Wall Connector — With Rear Heat Shield	20"-50.8cm	12"-30.5cm	17"-44.5cm	32.25"-82.0cm	10"-25.4cm
Double Wall Connector — No Rear Heat Shield	15"-38.1cm	18"-45.8cm	23"-58.5cm	27.25"-69.2cm	10"-25.4cm
Double Wall Connector — With Rear Heat Shield	15"-38.1cm	6"-15.3cm	11"-28.0cm	27.25"-69.2cm	10"-25.4cm
Alcove W/DbI Wall Conn — With Rear Heat Shield	14"-35.6cm	17"-43.2cm		26.25"-66.8cm	10"-25.4cm

Alcove Clearances (inches)	Unprotected Surfaces	Protected Surfaces (NFPA-211)
Minimum alcove width	62" – 157.5cm	See NFPA-211
Maximum alcove depth	52" – 132.0cm	See NFPA-211
Min. Alcove ceiling from floor with single wall connector	62" – 157.5cm	See NFPA-211
Min. Alcove ceiling from floor with double wall connector	62" – 157.5cm	See NFPA-211

FOR REAR HEAT SHIELD, USE KIT #96-68400

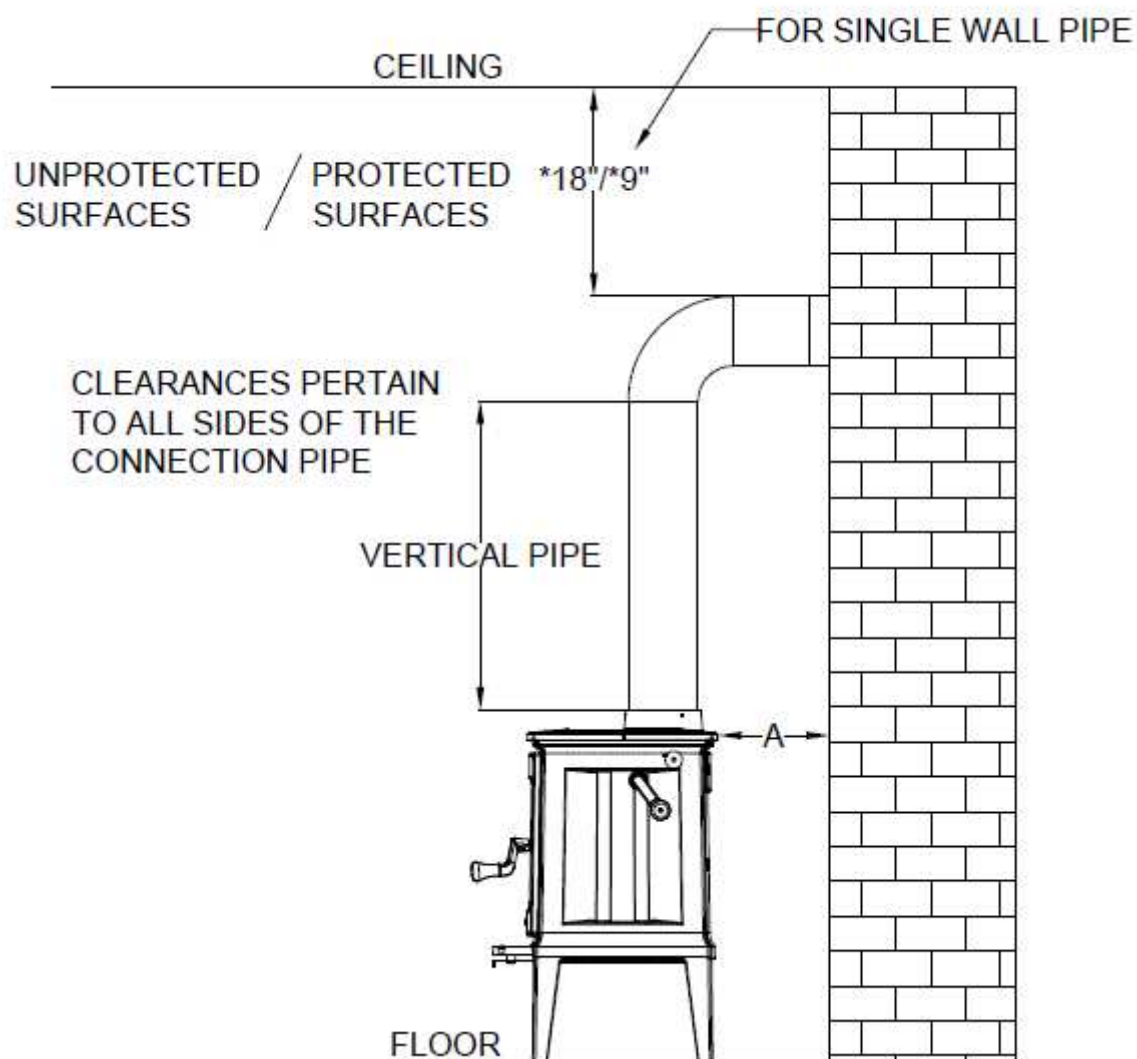


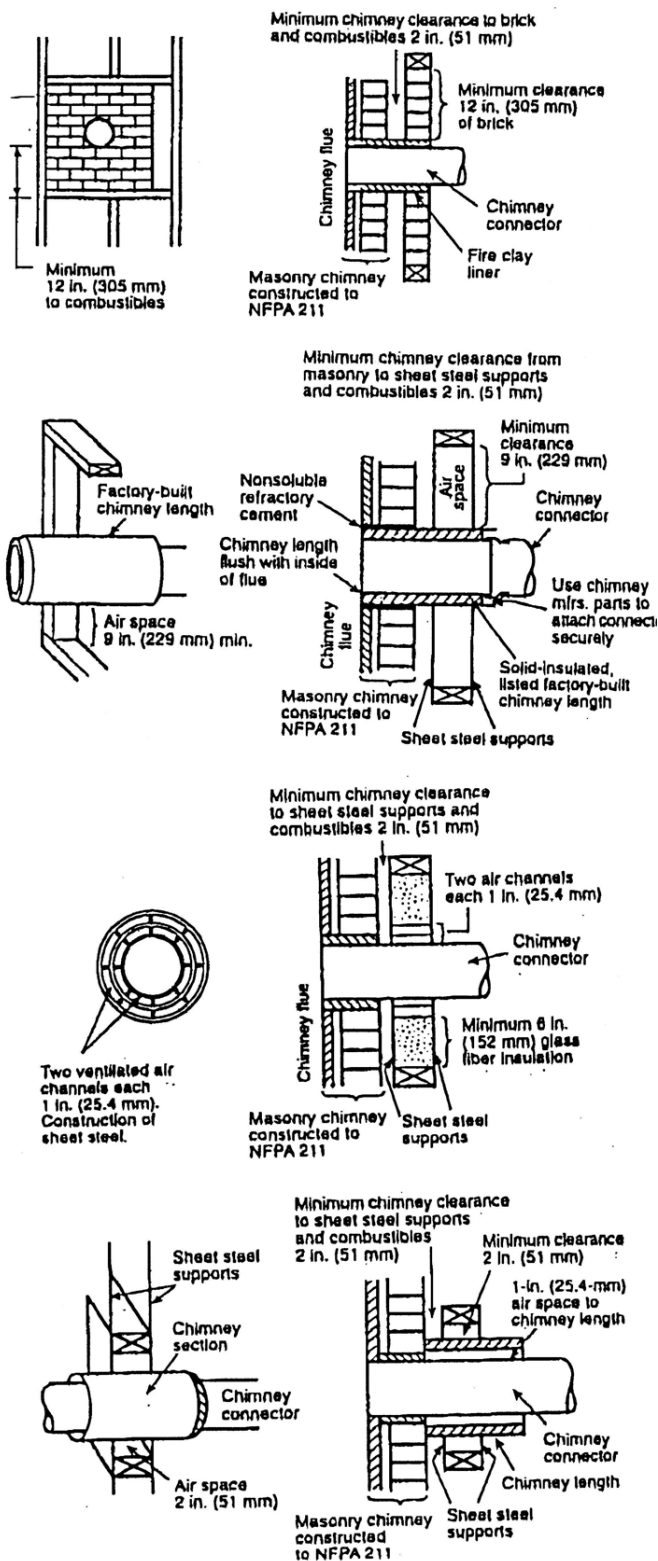
Figure 5 Chimney Connector Clearances

Vertical Pipe Length Before Elbow	Single Wall Pipe		Double Wall Pipe	
	With Heat Shield**	Without Heat Shield**	With Heat Shield**	Without Heat Shield**
	A	A	A	A
18" or More	12" (30.5cm)	18" (45.8cm)	6" (15.3cm)	18" (45.8cm)
Less Than 18"	16" (40.7cm)	22" (55.8cm)	10" (25.4cm)	22" (55.8cm)
Direct Rear Exit	12" (30.5cm)	18" (45.8cm)	6" (15.3cm)	18" (45.8cm)

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

** Rear Heatshield, kit #96-68400

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 combustibile wall with a minimum of 12in. brick separation from clay liner to combustibles. The fire clay liner shall run from outer surface of brick wall to, but not beyond, the inner surface of chimney flue liner and shall be firmly cemented in place.
- B. Solid-insulated, listed factory-built chimney length of the same inside diameter as the chimney connector and having 1in. or more of insulation with a minimum 9in. air space between the outer wall of the chimney length and combustibles.
- C. Sheet steel chimney connector, minimum 24 gauge in thickness, with a ventilated thimble, minimum 24 gauge in thickness, having two 1in. air channels, separated from combustibles by a minimum of 6in of glass fiber insulation. Opening shall be covered, and thimble supported with a sheet steel support, minimum 24 gauge in thickness.
- D. Solid insulated, listed factory-built chimney length with an inside diameter 2in. larger than the chimney connector and having 1in. or more of insulation, serving as a pass-through for a single wall sheet steel chimney connector of minimum 24 gauge thickness, with a minimum 2in. air space between the outer wall of chimney section and combustibles. Minimum length of chimney section shall be 12in. chimney section spaced 1in. away from connector using sheet steel support plates on both ends of chimney section. Opening shall be covered, and chimney section supported on both sides with sheet steel supports securely fastened to wall surfaces of minimum 24-gauge thickness. Fasteners used to secure chimney section shall not penetrate chimney flue liner.

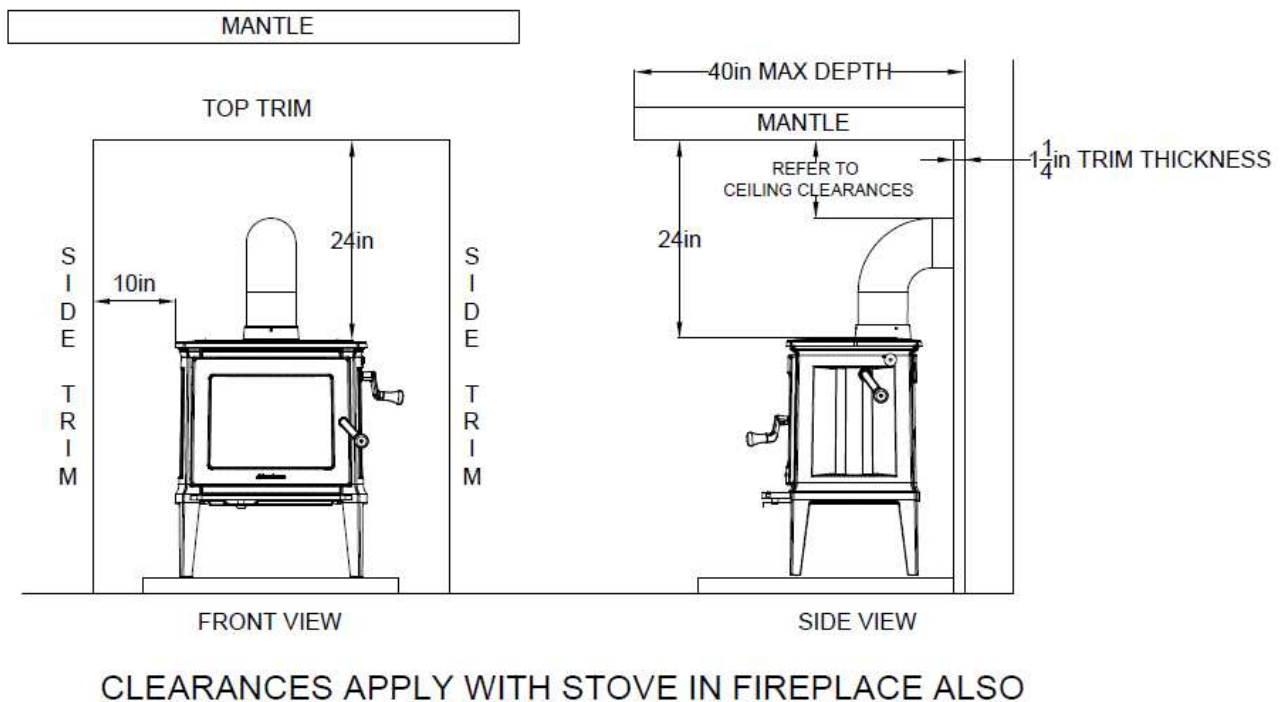


Figure 6 Trim and Mantle Clearances

OUTSIDE AIR SUPPLY

(Optional Kit #96-53400)

You can connect an outside air source directly to this stove using an optional outside air kit. The advantage of providing outside air directly to the stove is that the air used by the stove for combustion is taken from outside the residence rather than from within the room where the stove is located.

The outside air kit for this stove allows for the direct connection of the stove's air intake to a minimum 3" (76 mm) diameter duct (supplied by others)* which leads to the outside of the house. When considering placement of the duct from the outside of the house to the hearth, keep in mind the need to avoid structural members of the house. The outside air kit attaches to the underside of the stove. Refer to the instructions provided with the kit for installation.

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

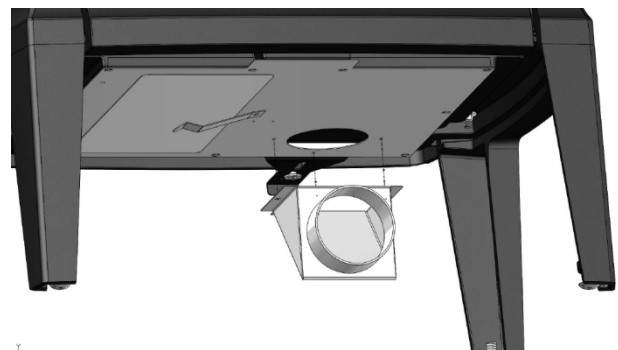


Figure 7 – Outside Air Kit Detail

The International Residential Code (IRC) does not allow the outside air duct to terminate higher than the appliance. Some building officials restrict vertical rise in the duct's termination. Hearthstone recommends the termination be at the same level, or lower than the air intake on the stove.

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.

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 Ameritec 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.

To protect against the possibility of a house fire, you *must properly install and constantly maintain the venting system*. Upon inspection, immediately replace rusted, cracked, or broken components.

- The *chimney connector* is the stovepipe from the woodstove to the chimney. The chimney

connector stovepipe is 6" (152 mm) diameter, 24 MSG or 25 MSG blued steel connector pipe. *Do not use aluminum or galvanized steel pipe* - they cannot withstand the extreme temperatures of a wood fire.

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

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

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

INSTALLING A VENTING SYSTEM

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 Green Mountain 40. 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 Green Mountain 40 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 Green Mountain 40 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 Green Mountain 40 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 Green Mountain 40. The Green Mountain 40 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 Green Mountain 40 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.

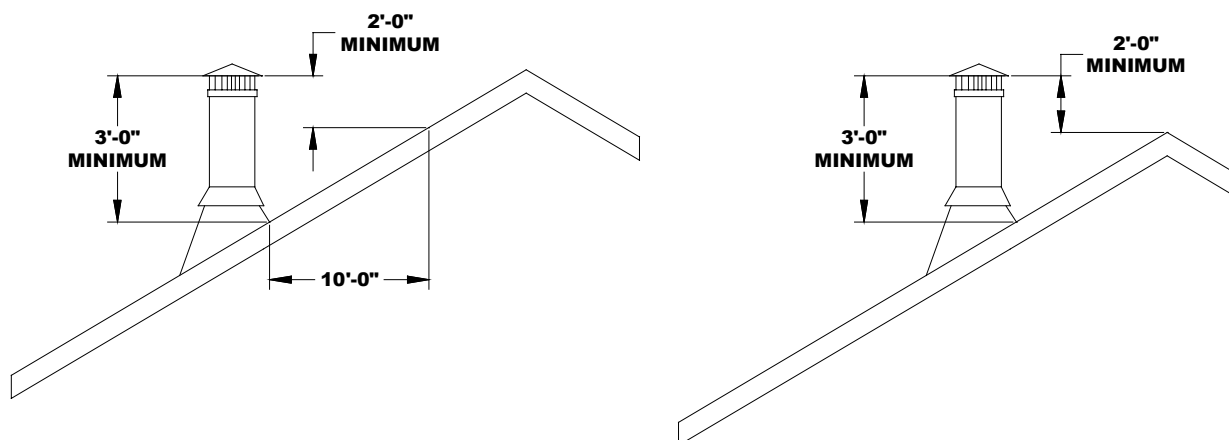
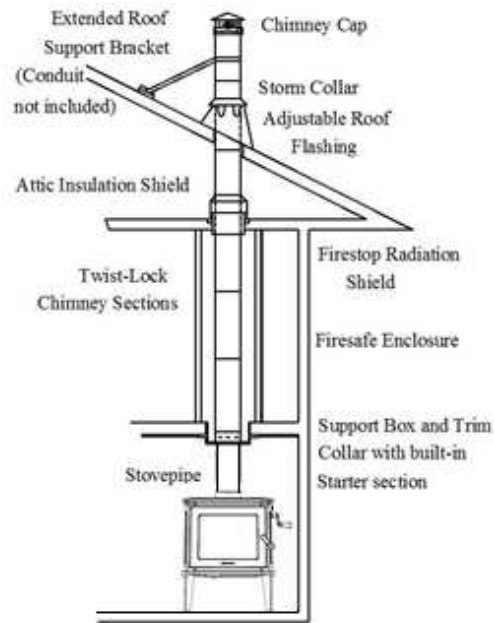
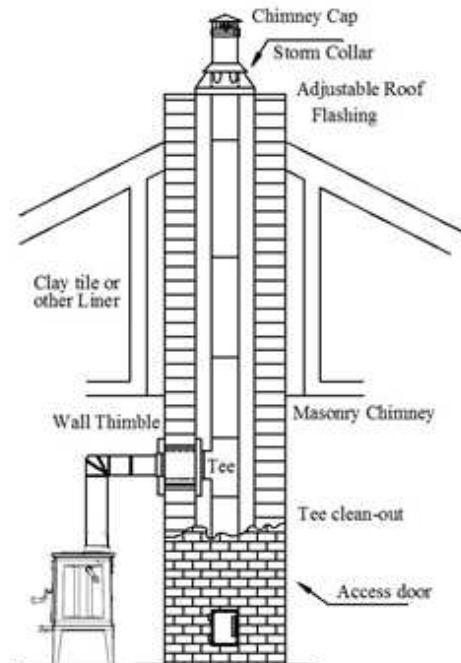


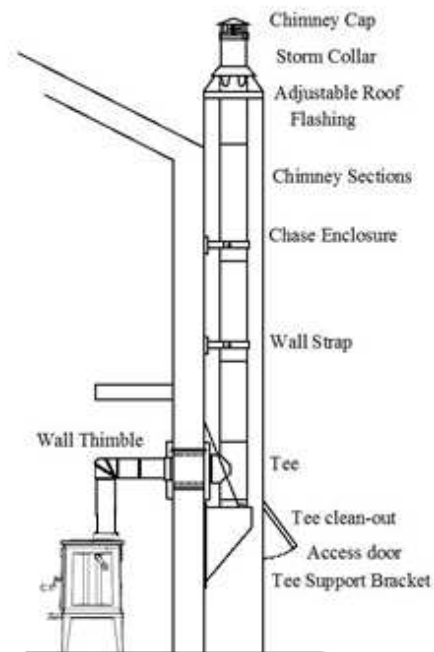
Figure 8 – Chimney Height Requirements



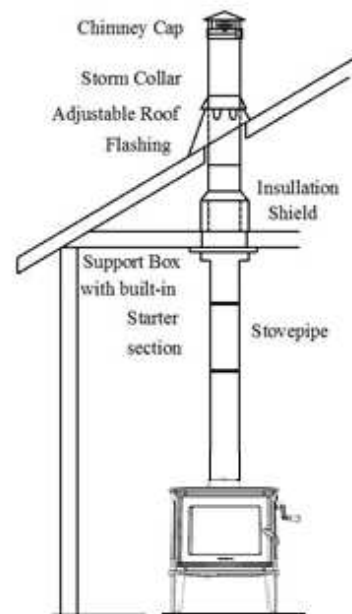
Two story house installation with attic.



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 Configurations

INSTALLING IN A MOBILE HOME

Follow these special requirements for installing your stove in a mobile home.

- Install the stove in accordance with 24 CFR, Part 3280 (HUD)
- An outside air kit must be used in all mobile home installations. See page 12 for details.
- Permanently attach the stove to your mobile home's floor. Use the shipping clips that came with the stove and fasteners long enough to attach securely to the subfloor. (The clips and fastener heads may be painted to minimize visibility).

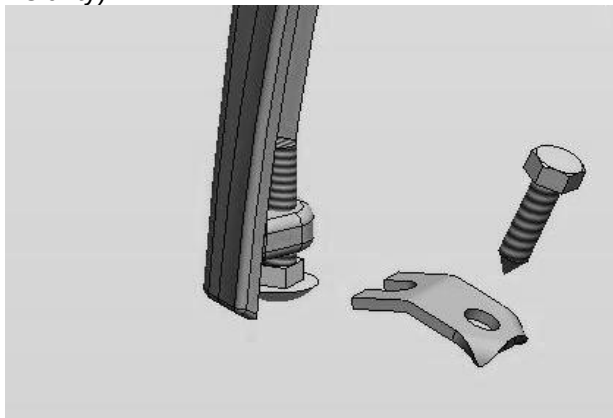


Figure 8 - Lock Down Detail

- Install a Mobile Home Chimney & Connector Kit*.
Each kit must include:
Stainless spark arrester cap, storm collar, Adjustable vented flashing – 0/12 – 6/12, Two 24" chimney pipes, 24" support box with built-in starter section and trim.
* (any UL or ULC approved equipment is acceptable)
- **WARNING: DO NOT INSTALL IN A SLEEPING ROOM IN A MOBILE HOME.**
- **CAUTION: MAINTAIN THE STRUCTURAL INTEGRITY OF THE MOBILE HOME WALLS, FLOOR, CEILING, AND ROOF WHEN INSTALLING AND USING YOUR STOVE.**

- 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)

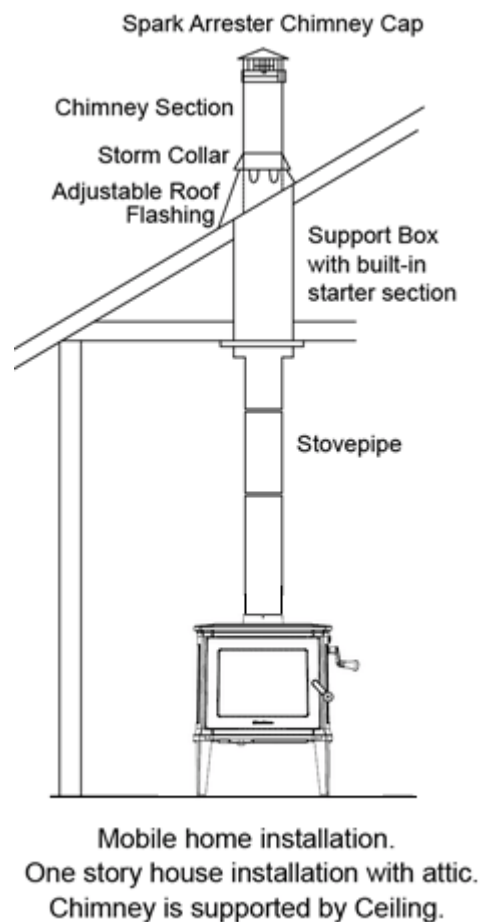


Figure - 9

- **CAUTION: REMOVE THE CHIMNEY WHEN TRANSPORTING THE MOBILE HOME!**

OPERATION

Once your Green Mountain 40 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 11). 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.

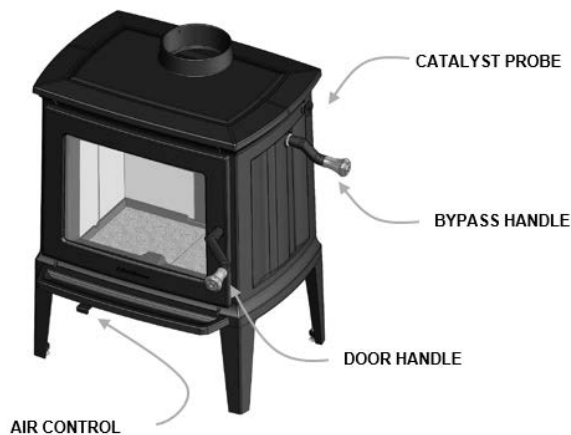


Figure 10 - Controls & Features

FRONT DOOR HANDLE: The firebox door allows you to load wood into your stove; a wood handle operates the door. To open the door, pull up on the handle and swing the door away from the stove. To latch the door, push the door tightly towards the firebox then continue to push the handle in and down until it latches shut. Gently pull on the door handle to make sure it is properly latched.

PRIMARY AIR CONTROL: The primary air control lever is located under the ash lip. The primary air control allows you to regulate the amount of air

entering the firebox. Generally, the more air allowed into the firebox, the faster the rate of burn and the higher the heat output; conversely, less air creates a slower burn, with lower heat output. For maximum airflow, pull the lever out as far as possible; move the lever inwards as far as possible for minimum airflow (does not close completely).

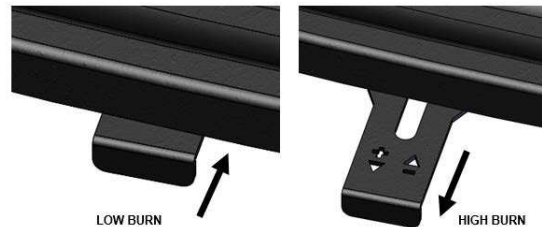


Figure 11 – Air Control

BYPASS HANDLE: The bypass handle controls the bypass door inside the stove. When the handle is pointed towards the front of the stove, the bypass door is open, and when the handle is pointed towards the rear of the stove, the bypass door is closed. The bypass door directs the flow of combustion products through or around the catalytic combustor. When the bypass handle is open, combustion products are directed around the catalytic combustor. The bypass handle should be open when first 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.

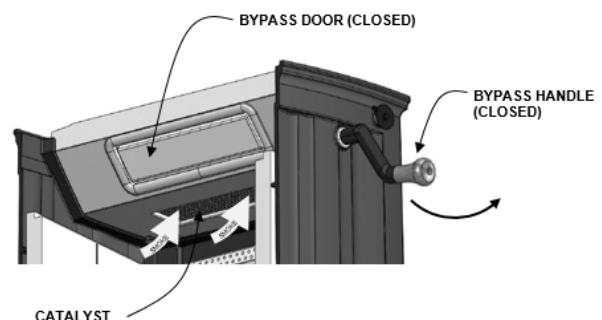


Figure 12 – Bypass Closed

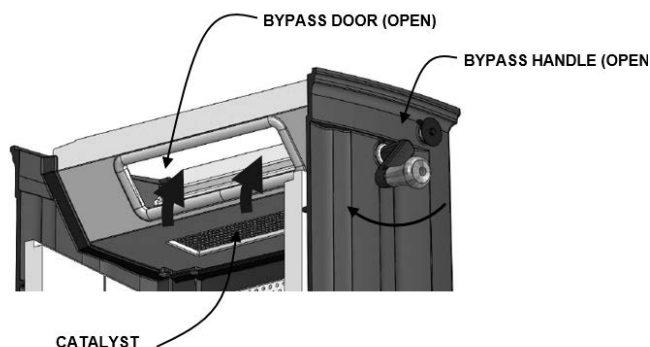


Figure 13 – Bypass Open

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 Green Mountain 40 typically operates in the 800 °F to 1300 °F range.



Figure 14 – Catalyst Probe

CHOOSING FIREWOOD

Burn only natural firewood (known as cordwood) in the Green Mountain 40 Model 8640 Wood Heater. This stove is not designed to burn other fuels.

- **CAUTION: DO NOT USE CHEMICALS OR FLAMMABLE FLUIDS TO START THE FIRE. DO NOT USE CHARCOAL, PELLETS, COAL, ARTIFICIAL LOGS OR ANY OTHER MATERIALS AS FUEL; THEY ARE NOT SAFE. DO NOT BURN GARBAGE OR FLAMMABLE FLUIDS.**
- **THE USE OF UNAUTHORIZED FUEL SUCH AS COAL COULD PRODUCE HIGH LEVELS OF CARBON DIOXIDE IN THE LIVING SPACE. AT HIGH LEVELS CARBON DIOXIDE COULD RESULT IN PERSONAL INJURY OR DEATH.**

The quality of your firewood directly affects heat output, duration of burn and performance of your stove. Softwoods generally burn hotter and faster, while hardwoods burn longer and produce better coals. Density and moisture content are two critical factors to consider when purchasing wood 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 towards you, away from the firebox.
- 3) Light the paper under the kindling. Leave the door slightly ajar momentarily until the kindling has started to burn and draft begins to pull.
- 4) Close the door and allow the fire to burn. Keep the door closed while the stove is in use.
- 5) KEEP A WATCHFUL EYE ON YOUR STOVE to maintain a steady, low-heat fire. Your first fire should make the stove warm but **not hot to the touch**. Visible steam, or boiling moisture and hissing indicate the soapstone is too hot. At most, a few small chunks of wood should be

added to the fire to reach safe break-in temperatures.

- 6) Once the stove is warm but **not hot to the touch**, close the primary air control by pushing it fully inward toward the stove to allow the fire to die out completely.
- 7) Let the stove return to room temperature.

Your first fire and first fire each season thereafter should be built and maintained as outlined above. Your patience will be rewarded by a properly seasoned stove.

- NOTE: The cool flue gas temperatures present during the break-in procedure may cause rapid creosote build-up. The door glass may also get dirty. A good hot fire will clean it. We recommend a visual inspection (and cleaning if necessary) of your stovepipe and chimney once the break-in procedure is completed.

NORMAL OPERATION

BUILDING A FIRE FOR EVERYDAY USE

- 1) Open the bypass handle. Open the front door and place five or six double sheets of tightly twisted newspaper in the center of the firebox. Arrange kindling in a tee-pee configuration over the newspaper. Use approximately 10 pieces of kindling, 1/2" (13 mm) in diameter and 10" to 16" (254 mm to 406 mm) long.
- 2) Fully open the primary air control by pulling the lever completely out, away from the firebox.
- 3) Light the paper under the kindling. Leave the front door slightly ajar momentarily until the kindling begins to burn and draft begins to pull.
- 4) Close the door and allow the fire to burn.
- 5) Once the kindling is burning, open the front door and add logs, small at first, to build the fire up. Ensure you keep the logs away from the glass in front in order for the air-wash system to work properly. Keep the front door closed while the stove is in use.
- 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 Green Mountain 40 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 inward toward the stove. (See figure 13). This closes the air shutter to its minimum opening. A low burn rate over extended periods is not advisable as it can promote the accumulation of creosote. Inspect the venting system frequently if using low burn rates consistently.

MEDIUM LOW BURN: With the primary air control in the low position, pull the air control forward (a little less than 1/4"). A medium-low burn rate is the typical setting and is preferable if the stove is unattended. At this burn rate, a little goes a long way.

MEDIUM HIGH BURN: With the primary air control in the low position, pull the air control forward (a little less than 3/8")

HIGH BURN: Completely open the primary air control by moving it all the way outward toward the operator. Fully load the firebox with wood on a bed of hot coals or on an actively flaming fire. To minimize creosote accumulation, run the stove on high once or twice daily for 35 to 45 minutes to fully heat the stovepipe and chimney.

CAUTION: Do not burn fuel other than cordwood in your stove.

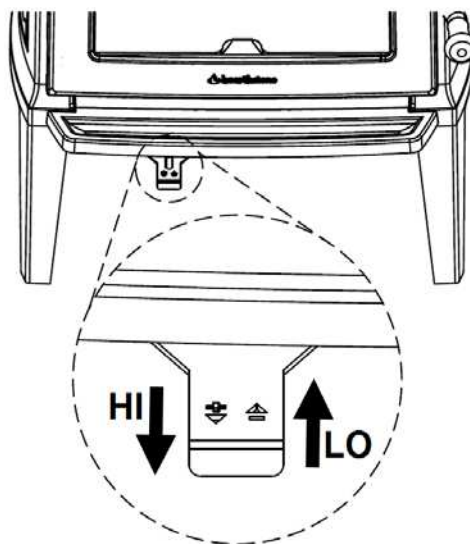


Figure 15 – Air Control Position

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 or anything other than natural cordwood.
- **OPERATOR ERROR:** Ensure all the gaskets are in good condition. Replace worn out or compressed gaskets. Do not burn the stove with the door in the partially open 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 ~~EXCPET FOR OPEN DOOR~~**

REMOVAL AND DISPOSAL OF ASHES

You can leave a thin layer of ashes in the firebox if preferred. Allow fire to die down or go out

completely. It is important to prevent ashes from building up around the front door opening or they will spill out, or they can pack into the gasket channel and prevent proper sealing. To remove ashes, use a fireplace shovel. Avoid removing large live coals by pushing them to the side and removing only the finer ash with a shovel.

Disposal of ashes - Ashes should be placed directly into a metal container with a tight fitting lid. Do not place any other items or trash into the metal container. Do not pour water into the container. Replace the container's lid and allow the ashes to cool. Never place the ash disposal container on a combustible surface or vinyl flooring, as the container could be hot!

Pending disposal, place the closed ash container on a noncombustible floor or on the ground outside, well away from all combustible materials, liquid fuels, or vehicles. Retain ashes in the closed container until all coals thoroughly cool.

If the ashes are disposed of by burial in soil or otherwise locally dispersed, they should be retained in the closed container until all cinders have thoroughly cooled.

NEVER place ashes in wooden or plastic containers, in trashcans with other trash, or in paper or plastic bags, no matter how long the fire has been out. Coals within a bed of ashes can remain hot for several days once removed from the firebox.

MAINTENANCE

CATALYTIC COMBUSTOR INSPECTION AND REPLACEMENT PROCEDURES

- **WARNING: THIS WOOD HEATER CONTAINS A CATALYTIC COMBUSTOR, WHICH NEEDS PERIODIC INSPECTION AND REPLACEMENT FOR PROPER OPERATION. IT IS AGAINST FEDERAL REGULATIONS TO OPERATE THIS WOOD HEATER IN A MANNER INCONSISTENT WITH OPERATING INSTRUCTIONS IN THIS MANUAL, OR IF THE CATALYTIC ELEMENT IS DEACTIVATED OR REMOVED**

It is important to periodically monitor the operation of the catalytic combustor to ensure that it is functioning properly and to determine when it needs to be replaced. A non-functioning combustor will result in a loss of heating efficiency, and an increase in creosote and emissions. Following is a list of items that should be checked on a periodic basis

-Combustors should be visually inspected at least three times during the heating season to determine if physical degradation has occurred. Actual removal of the combustor is not recommended unless more detailed inspection is warranted because of decreased performance. If any of these conditions exists, refer to Catalyst Troubleshooting section of this owner's manual.

-This catalytic (or hybrid) heater is equipped with a 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 catalyst is 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 combustor (bypass mode).

1. Light stove in accordance with operator's instructions
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 protector by sliding it to the left or right, and then rotating it towards you.
3. Lift up on the right side baffle, and gently pull the left side baffle down and out of the stove

CAUTION - Do not force the baffle pieces. Gently adjust the baffle orientation until each side can be removed freely from the stove.



Figure 16 - Removing/Replacing the Baffle for Inspection



Figure 18 (cont.) - Removing/Replacing the Baffle for Inspection

4. Use a small vacuum nozzle or soft bristled brush to remove any accumulated ash or soot on the face of the catalyst.
5. Inspect the catalyst for any unusual warping, corrosion, or plugged openings.
6. If any unusual conditions are found, remove the catalyst blocks – See replacing the catalyst.
7. Replace the baffles and baffle protector. Installation is the opposite of removal.
8. Ensure that the baffle pieces are pushed together at the center joint.

REMOVING OR REPLACING THE CATALYST

1. Allow the stove and ashes to fully cool.
2. Loosen, but do not remove the screws securing the rear heatshield. (If stove is so equipped).
3. Remove the heat shield by sliding the screw heads through the slots in the heatshield.

4. Remove the 2 bolts securing the cast iron catalyst access cover, and remove the cover.
5. Inspect the catalysts for visible damage or fly ash. If fly ash exists, gently brush the catalyst off with a narrow soft-bristle brush, or vacuum with a crevice tool.
6. If fly ash exists, or if there is suspected catalyst performance issues, fully remove the catalysts by gently pulling upwards from the ribs in the cast iron, and then pulling outwards through the catalyst access opening.
7. Remove any remaining gasket material from the opening and from the catalyst.
8. Inspect the catalyst for any fly ash or clogging, and remove with a soft bristled brush or vacuum crevice tool.
9. Re-install Interam gasket material on the catalysts. Masking tape can be used to hold the gasket in place on the catalyst. It will burn away when the stove gets hot.

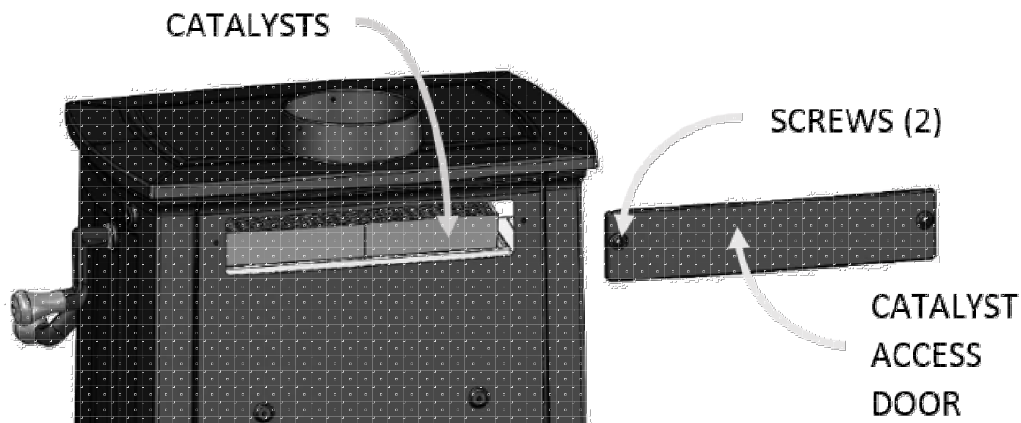


Figure 19 – Catalyst Access Door

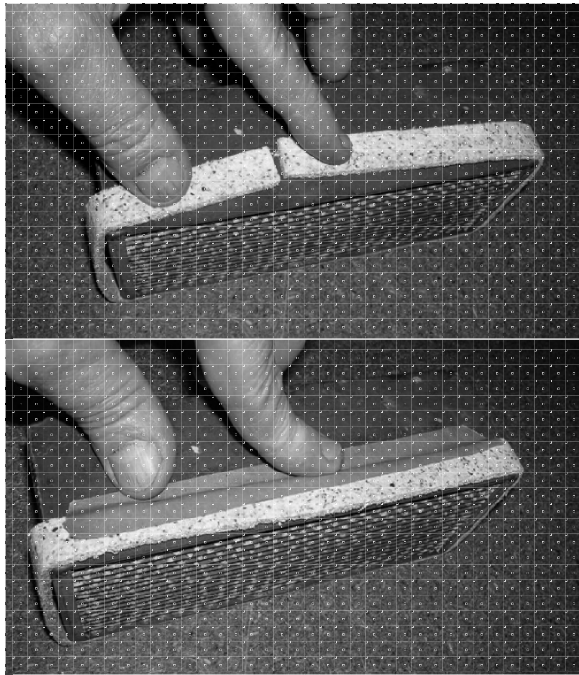


Figure 20 – Installing Interam on Catalyst

10. Return the catalysts to their positions in the stove, and replace the catalyst access door and heat shield
11. Heat the stove slowly during your next fire to allow the Interam gasket to fully expand and seal the catalyst

REPLACING THE REFRACTORY STONE AND SECONDARY RISER ASSEMBLY

1. Allow the stove and ashes to fully cool.
2. Open the front door of the stove and fully clean any ash in the firebox
3. Remove the baffle following the instructions in "Inspecting the Catalyst and Removing/Replacing the baffle."
4. Remove the side stones one at a time by tipping them towards the inside of the firebox from the top.
5. With side stones and baffle removed, the secondary riser assembly and rear stones can be lifted up and out of the stove.
6. Installation is the reverse of disassembly. Make sure that the secondary riser tube is seated in the pocket at the rear of the bottom casting.

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.**

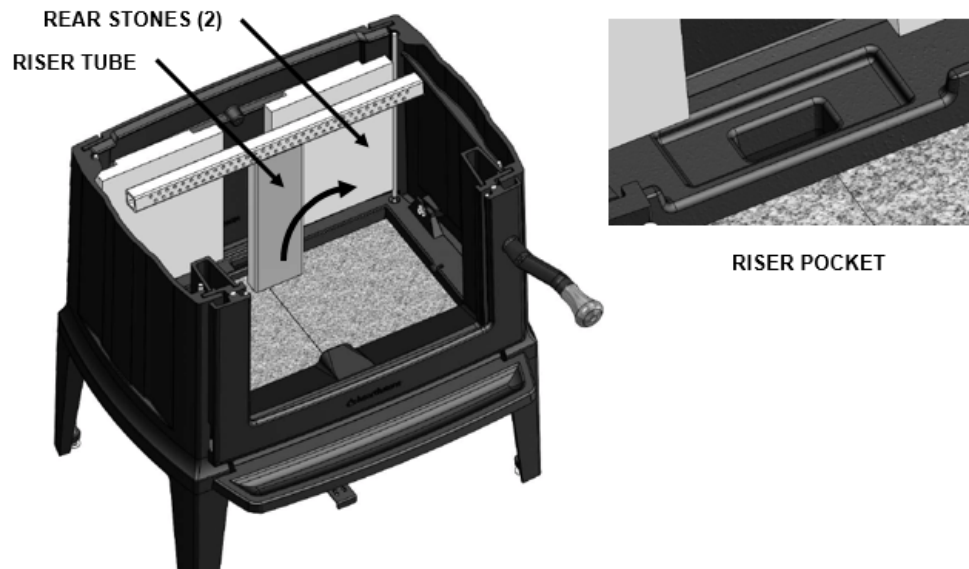


Figure 21 - REMOVING RISER AND REAR STONES

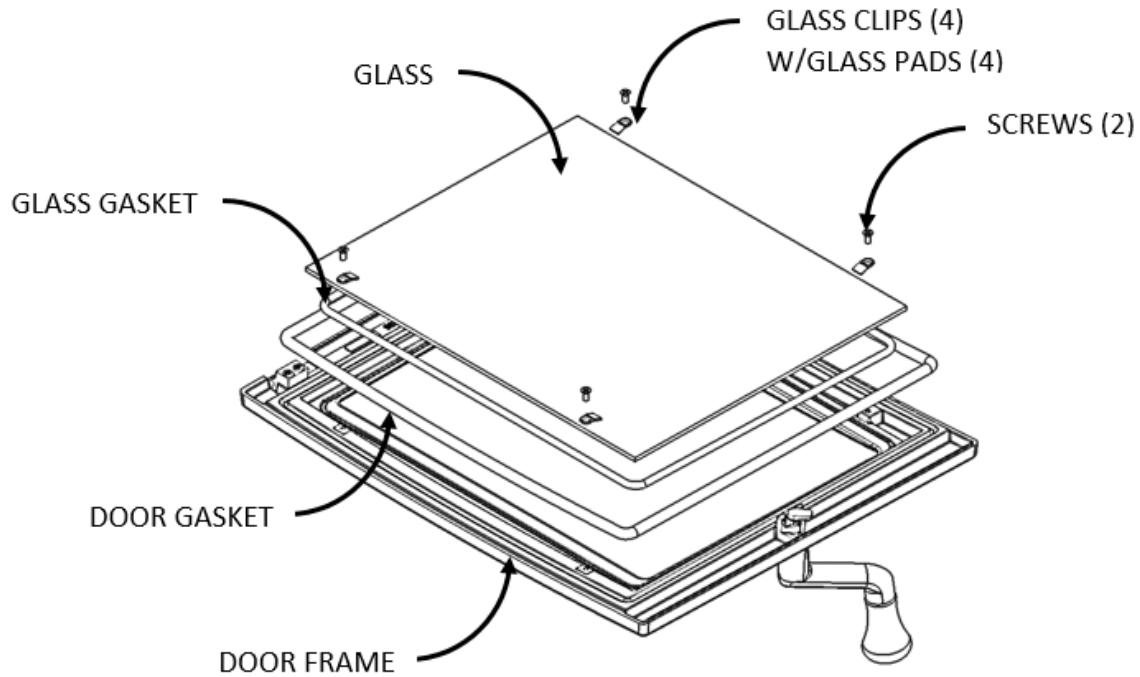


Figure 22: Front Door assembly

1. Follow the instructions included with the replacement glass kit.
 2. Remove the door.
 3. Remove the screws from the glass clips (use penetrating oil if necessary) – Set aside for reinstallation.
 4. Carefully lift the damaged glass off the door and discard.
 5. Remove any remaining glass and old gasket material.
 6. Clean the screw holes and place a small amount of anti-seize compound in each one.
 7. Install a new glass gasket in the glass gasket groove.
 8. Place the new glass onto the door.
 9. **Important! Center the glass** and ensure that the edges of the glass are parallel with the edges of the opening.
 10. Check glass position again (centered, and parallel), then screw the glass retainer clips with the glass pads back on the door using a crisscross pattern. Tighten the screws no more than 1/8th of a turn after they seat. The glass will break at this point if not positioned correctly.
 11. Apply a light film of anti-seize lubricant on the door's hinge pins if needed.
 12. Install the door.
 13. After 5 or 6 fires, check the glass retainer screws, and retighten if necessary.
- Required Glass Kit:** Part Number: 90-58300. Use only 4mm x 329mm x 395mm 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. 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. 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: 90-58300.

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/CREOSOTE)	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

[illegible]

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

SAFETY LABEL

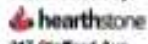
CONTACT YOUR LOCAL BUILDING OFFICIALS ABOUT RESTRICTIONS AND INSTALLATION INSPECTION IN YOUR AREA

Lined Room Heater, Solid Fuel Type

Also Suitable for Mobile Home Installation Pursuant to JUM84-HUD



Manufactured by:



317 Stafford Ave.
Monticello, VT 05661

MODEL NAME:
GREEN MOUNTAIN 40

MODEL NUMBER: 8640

SERIAL NUMBER:
[REDACTED]

Conforms to UL STD 1482 - Certified to ULC STD S627

WARNING:

Do not use grate or elevate the Solid fuel 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: HARD WOOD ONLY.

"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 8mm ceramic glass.

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

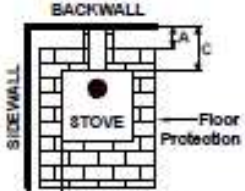
THIS APPLIANCE USES A CATALYTIC CONVERTER (P/N 333-XXXX)

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.

Minimum Clearance to Combustible Materials*



A - 18" (41 cm)
B - 17" (43 cm)
C - 17 1/2" (45 cm)

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

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

OPTIONAL COMPONENTS:
Outside Air Kit Part # 333-XXXX
Blower Kit Part # 333-XXXX

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

U.S. ENVIRONMENTAL PROTECTION AGENCY

Particulate Emissions: 1.0 g/hr. Tested to: EPA Method 20R

Certified to comply with 2025 or 10 wood particulate emission standards.

Date of Manufacture

JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
■	■	■	■	■	■	■	■	■	■	■	■

MADE IN USA

DO NOT REMOVE OR COVER THIS LABEL. 3309-333



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: XXXXX-XXXX

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.

APPENDIX 9: Test load photographs

Run 1





Run 3



Run 4



Run 5

