

Certification Test Report

Monessen Hearth Systems Freestanding Wood Stove

Model: Encore

Prepared for: Monessen Hearth Systems
P.O. Box 501
Bethel, VT 05032

Prepared by: OMNI-Test Laboratories, Inc.
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Test Period: June 11-14, 2010

Report Date: July 2010

Report Number: 227-S-42-3

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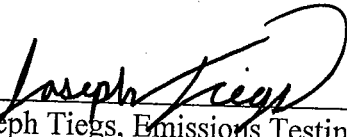
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Section 1

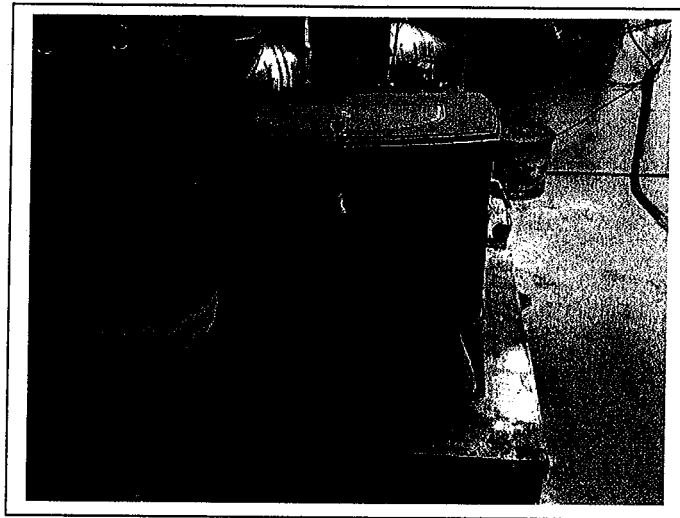
Fuel Photographs/Appliance Description/Drawings

Model: Encore
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Monessen Hearth Systems

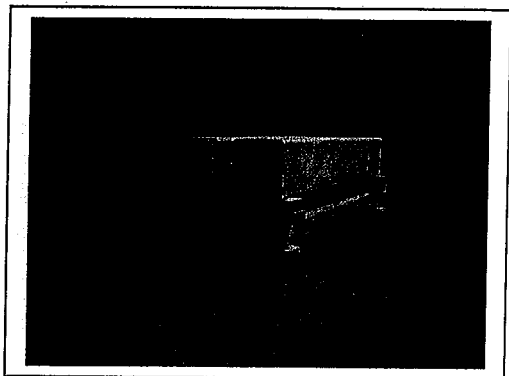
Encore

Test Dates: June 11-12, 2010

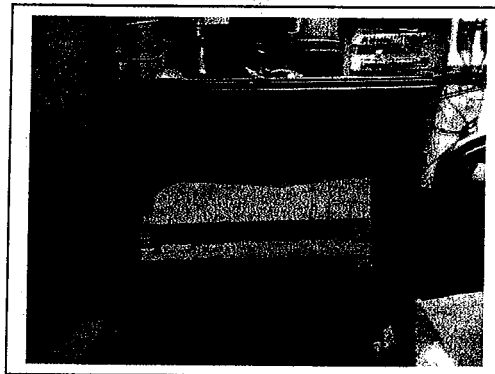


Monessen Hearth Systems Encore

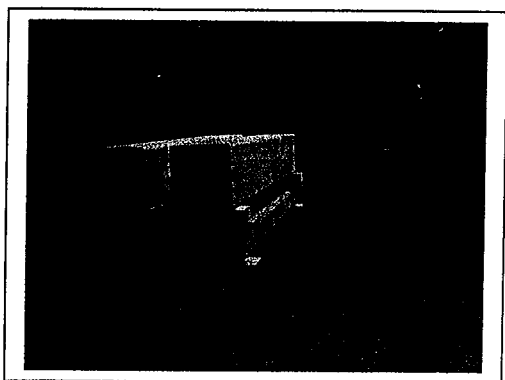
Run 1 – Fuel



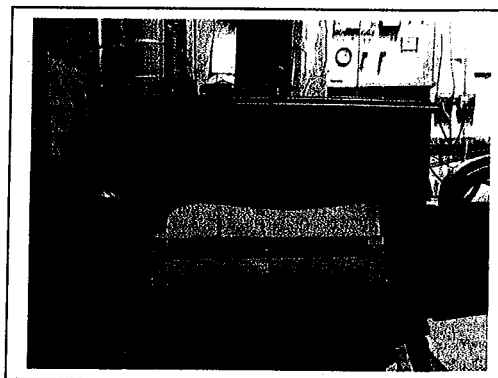
Run 1 – Newly Loaded Stove



Run 2 – Fuel

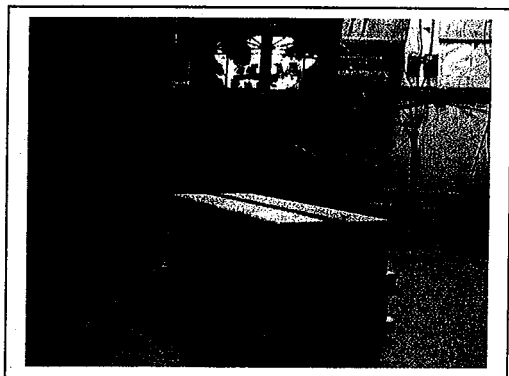


Run 2 – Newly Loaded Stove

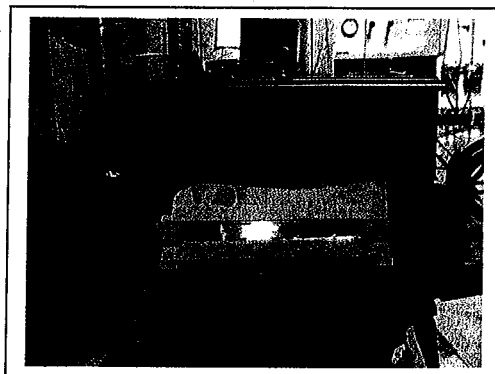


Monessen Hearth Systems Encore

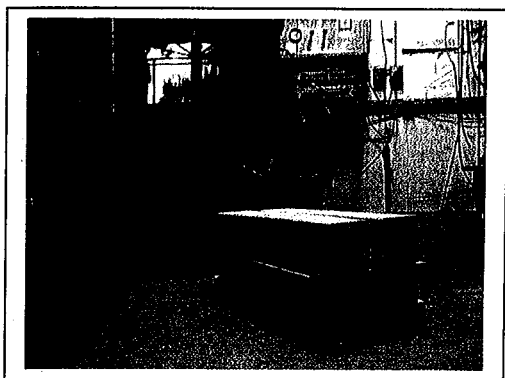
Run 3 – Fuel



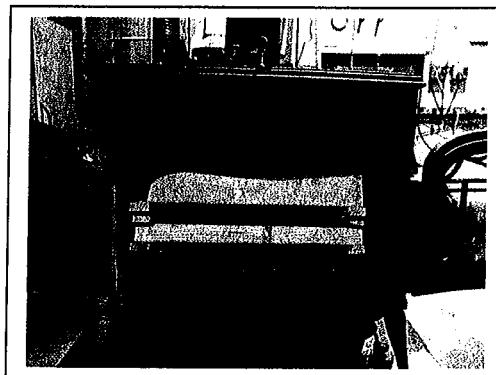
Run 3 – Newly Loaded Stove



Run 4 – Fuel

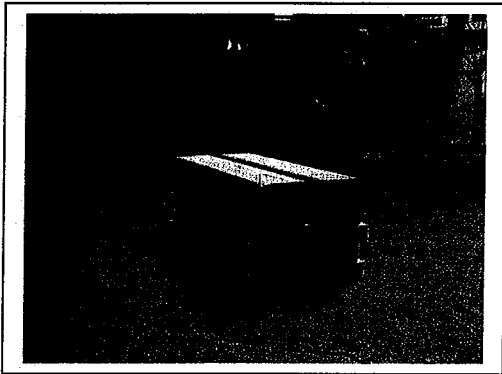


Run 4 – Newly Loaded Stove

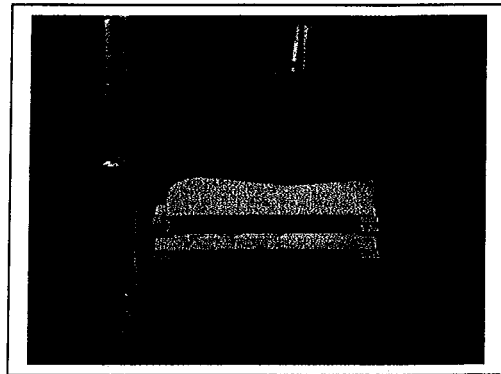


Monessen Hearth Systems Encore

Run 5 – Fuel



Run 5 – Newly Loaded Stove



WOOD HEATER DESCRIPTION

Appliance Manufacturer: Monessen Hearth Systems

Wood Stove Model: Encore

Type: Freestanding, radiant-type room heater

WOOD HEATER INFORMATION

Materials of Construction: The body of the Encore stove is constructed primarily of cast iron with a secondary combustion chamber constructed of ceramic materials.

Air Introduction System: Air enters the firebox through an opening located at the upper left corner of the front of the stove above the left fuel-loading door opening. Secondary air enters the stove through the bottom back of the stove and is channeled internally to the entrance of the ceramic combustion chamber located at the back of the firebox chamber.

Combustion Control Mechanisms: The primary combustion air inlet is controlled by a handle located at the upper-right side of the stove. The secondary combustion air inlet is located on the bottom of the firebox directly under the ceramic secondary combustion system.

Combustor: N/A.

Internal Baffles: A series of baffles are incorporated into the ceramic secondary combustion system. The flame path is forced to the bottom rear of the firebox where it enters the combustion chamber. The stove is fitted with a lever-actuated bypass to prevent spillage of combustion gases from the fuel-loading door when the fuel loading door is open.

Other Features: There is an optional convection air fan accessory.

Flue Outlet: The 8-inch diameter flue outlet is located at the top of the unit.

WOOD HEATER OPERATING INSTRUCTIONS

Specific Written Instructions: See Section 3 of this report. All markings and instruction materials were reviewed for content prior to printing.

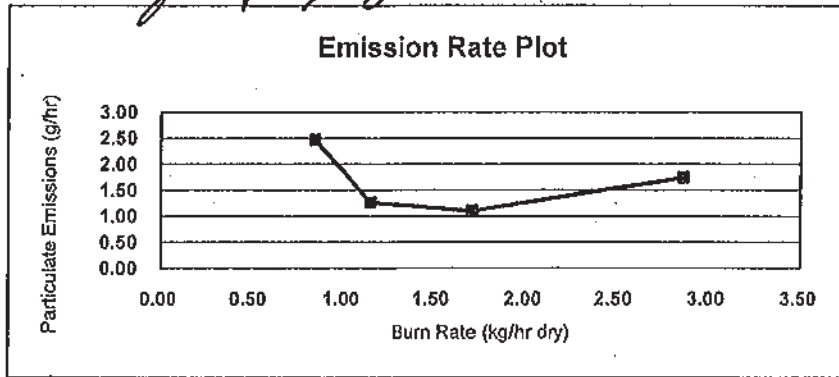
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Section 4

Test Data by Run

EPA Weighted Average Emissions EPA Method 28

Client: Monessen	Status: Final
Stove Model: Encore (Non-Cat)	Stove Type: Non-Catalytic Stove
Test Dates: 6/11/10-6/14/10	
Project Number: 227-S-42-3	
Tracking Number: 0	
Signature/Date: <i>Joseph Feijs</i> 7/27/10	Weighted Average (g/hr) 1.6



Run #	1	
Burn Rate (dry kg/hr)	0.84	
Category	2	
Overall Efficiency (%)	63%	
Emissions (g/hr)	2.47	
Cap (g/hr)	15	
Weighting Factor	0.490	28.26%
Heat Output (BTU/hr)	9975 ✓	

Run #	2	
Burn Rate (dry kg/hr)	1.15	
Category	2	
Overall Efficiency (%)	63%	
Emissions (g/hr)	1.26	
Cap (g/hr)	15	
Weighting Factor	0.596	34.38%
Heat Output (BTU/hr)	13656	

Run #	4	
Burn Rate (dry kg/hr)	1.71	
Category	3	
Overall Efficiency (%)	63%	
Emissions (g/hr)	1.1	
Cap (g/hr)	18	
Weighting Factor	0.491	28.33%
Heat Output (BTU/hr)	20307	

Run #	3	
Burn Rate (dry kg/hr)	2.86	
Category	4	
Overall Efficiency (%)	63%	
Emissions (g/hr)	1.74	
Cap (g/hr)	18	
Weighting Factor	0.157	9.03%
Heat Output (BTU/hr)	33963 ✓	

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Run 1

Wood Heater Test Data - EPA Method 5G

Manufacturer: Monessen
 Model: Encore Non-Cat
 Project No.: #REF!
 Tracking No.: 227-S-42-3
 Run: 1 non cat
 Test Date: 06/11/10

Burn Rate	0.84 kg/hr dry
Average Tunnel Temperature	93 degrees Fahrenheit
Average Gas Velocity in Dilution Tunnel - vs	14.7 feet/second
Average Gas Flow Rate in Dilution Tunnel - Qsd	9406.3 dscf/hour
Average Delta p	0.046 inches H2O
Average Delta H	0.00 inches H2O
Total Time of Test	400 minutes

	AVERAGE	SAMPLE TRAIN 1	SAMPLE TRAIN 2
Total Sample Volume - Vm	58.30 cubic feet	60.24 cubic feet	52.36 cubic feet
Average Gas Meter Temperature	79 degrees Fahrenheit	79 degrees Fahrenheit	79 degrees Fahrenheit
Total Sample Volume (Standard Conditions) - Vmstd	55.1 dscf	58.4 dscf	51.9 dscf
Total Particulates - mn		8.8 mg	8.1 mg
Particulate Concentration (dry-standard)	0.00015 grams/dscf	0.00015 grams/dscf	0.00016 grams/dscf
Particulate Emission Rate	1.44 grams/hour	1.42 grams/hour	1.47 grams/hour
Adjusted Emissions	2.47 grams/hour	2.43 grams/hour	2.50 grams/hour
Difference from Average		0.03 grams/hour	0.03 grams/hour
7.5% of the average emission rate	0.19		
Weighted Average Emission Rate Limit	4.10 grams/hour		
7.5% of the weighted average emission rate limit	0.31		
Results Are Acceptable			

Wood Heater Test Data - EPA Method 5G

Run: 1 non cat
 Manufacturer: Monessen
 Model: Encore Non-Cat
 Tracking No.: _____
 Project No.: 227-S-42-3
 Test Date: 11-Jun-10
 Beginning Clock Time: 11:15
 Recording Interval: 10 min.
 Total Sampling Time: 400 min.

Velocity Traverse Data								
	Pt.1	Pt.2	Pt.3	Pt.4	Pt.5	Pt.6	Pt.7	Pt.8
Initial dP	0.031	0.040	0.039	0.038	0.030	0.038	0.041	0.040
Initial Temp.	99	99	99	99	99	99	99	99

OMNI Equipment Numbers: _____ Test fuel charge adjustment performed at 340 min, door/bypass open 20 seconds.
 Refer to calibrations and off site test equipment sheets

PM Control Module:
 Dilution Tunnel MW(dry): 29.00 lb/lb-mole
 Dilution Tunnel MW(wet): 28.56 lb/lb-mole
 Dilution Tunnel H2O: 4.00 percent
 Dilution Tunnel Static: -0.142 "H2O
 Pitot Tube Cp: 0.99
 Meter Box Y Factor: 1 (1) 1.025 (2)
 Barometric Pressure: 29.57 Begin 29.57 Middle 29.57 End 29.57 Average "Hg

Signature/Date: [Signature] 7/12/10
 Tunnel Velocity: 14.69 ft/sec
 Initial Tunnel Flow: 139.8 scfm
 Average Tunnel Flow: 156.8 scfm
 Tunnel Area: 0.1963 ft²
 Post-Test Leak Check (1): 0 cfm@"Hg
 Post-Test Leak Check (2): 0 cfm@"Hg
 Fuel Moisture (dry basis %): 21.05
 Total Particulate (1): 8.8
 Total Particulate (2): 8.1

Elapsed Time	Particulate Sampling Data														Fuel Weight, lb		Wood Heater Temperature Data, oF														Stack	
	Gas Meter Cubic Feet (1)	Gas Meter Cubic Feet (2)	Sample Rate, cfm (1)	Sample Rate, cfm (2)	Orifice dH (1)	Orifice dH (2)	Meter oF (1)	Meter oF (2)	Meter Vac. In. Hg. (1)	Meter Vac. In. Hg. (2)	Dilution Tunnel Temp.	Dilution Tunnel dP	Pro. Rate (10%) (1)	Pro. Rate (10%) (2)	Scale Reading	Weight Change	Firebox Top	Firebox Bottom	Firebox Back	Firebox Left	Firebox Right	Catalyst Exit	Average Surface	Stack	Filter (1)	Filter (2)	Impinger exit (1)	Impinger exit (2)	Ambient	Draft In. H2O		
0	139.902	427.311			0.00	0.00	74.5	74.6	-0.6	-2.7	99	0.037			15.0		458	315	307	300	289		333.8	311	76	74			76	0.050		
10	141.425	428.740	0.15	0.14	0.00	0.00	78.6	78.6	-0.6	-2.7	98	0.047	101	109	14.4	-0.6	348	296	290	270	257		292.2	324	77	77			77	0.052		
20	142.985	430.116	0.16	0.14	0.00	0.00	78.6	78.9	-0.6	-2.7	98	0.047	104	105	13.7	-0.7	302	278	294	242	231		269.4	343	76	74			79	0.055		
30	144.535	431.422	0.15	0.13	0.00	0.00	78.7	79.3	-0.6	-2.7	100	0.044	107	103	13.0	-0.7	281	264	318	225	216		260.8	370	77	77			79	0.057		
40	146.090	432.811	0.16	0.14	0.00	0.00	78.7	79.4	-0.6	-2.7	102	0.046	105	108	12.3	-0.75	285	249	340	218	210		260.4	405	77	75			79	0.060		
50	147.690	434.145	0.16	0.13	0.00	0.00	78.8	79.4	-0.6	-2.7	102	0.046	108	104	11.3	-0.95	335	242	376	218	209		276.0	426	76	76			79	0.063		
60	149.185	435.430	0.15	0.13	0.00	0.00	78.8	79.4	-0.6	-2.7	105	0.046	101	100	10.3	-1	389	235	378	227	216		289.0	407	79	77			77	0.061		
70	150.675	436.695	0.15	0.13	0.00	0.00	78.8	79.4	-0.6	-2.7	98	0.047	99	97	9.5	-0.8	435	231	368	237	224		299.0	404	77	77			77	0.060		
80	152.172	437.970	0.15	0.13	0.00	0.00	78.8	79.4	-0.6	-2.7	102	0.046	101	99	8.7	-0.8	468	227	361	248	233		307.4	402	79	77			77	0.062		
90	153.660	439.245	0.15	0.13	0.00	0.00	78.8	79.4	-0.6	-2.7	103	0.046	100	99	7.9	-0.85	498	223	357	262	244		316.8	403	79	77			77	0.061		
100	155.160	440.525	0.15	0.13	0.00	0.00	78.8	79.4	-0.6	-2.7	103	0.046	101	99	7.1	-0.8	524	219	347	275	253		323.6	388	79	77			79	0.059		
110	156.652	441.814	0.15	0.13	0.00	0.00	78.8	79.4	-0.6	-2.7	103	0.048	99	98	6.3	-0.75	535	216	333	285	264		326.6	377	79	79			79	0.057		
120	158.151	443.112	0.15	0.13	0.00	0.00	78.8	79.4	-0.6	-2.7	101	0.047	100	100	5.7	-0.6	532	214	315	289	268		323.6	361	79	77			79	0.055		
130	159.643	444.425	0.15	0.13	0.00	0.00	78.8	79.4	-0.6	-2.7	101	0.048	98	100	5.1	-0.6	526	216	298	301	270		322.2	350	77	77			77	0.053		
140	161.144	445.715	0.15	0.13	0.00	0.00	78.8	79.4	-0.6	-2.7	98	0.048	99	98	4.6	-0.55	524	216	281	307	272		320.0	335	77	77			77	0.052		
150	162.636	447.000	0.15	0.13	0.00	0.00	78.8	79.4	-0.6	-2.7	96	0.047	99	98	4.2	-0.4	516	212	264	314	268		314.8	320	77	77			77	0.050		
160	164.133	448.297	0.15	0.13	0.00	0.00	78.8	79.4	-0.6	-2.7	96	0.047	99	99	3.8	-0.4	500	210	251	314	266		308.2	307	75	75			77	0.047		
170	165.630	449.580	0.15	0.13	0.00	0.00	78.8	79.4	-0.6	-2.7	94	0.048	98	97	3.5	-0.3	480	205	238	316	264		300.6	292	77	75			77	0.045		
180	167.127	450.867	0.15	0.13	0.00	0.00	78.8	79.4	-0.6	-2.7	94	0.049	97	96	3.2	-0.3	463	203	225	316	259		293.2	281	75	75			79	0.042		
190	168.670	452.125	0.15	0.13	0.00	0.00	78.8	79.4	-0.6	-2.7	94	0.047	102	96	2.9	-0.25	453	203	214	309	255		286.8	270	75	75			77	0.040		
200	170.215	453.473	0.15	0.13	0.00	0.00	78.8	79.4	-0.6	-2.7	92	0.046	103	104	2.7	-0.2	442	201	203	305	248		279.8	257	75	75			77	0.040		
210	171.715	454.835	0.15	0.14	0.00	0.00	78.8	79.4	-0.6	-2.7	92	0.046	100	105	2.5	-0.2	427	197	195	299	245		272.6	249	75	75			77	0.038		
220	173.207	456.133	0.15	0.13	0.00	0.00	78.8	79.4	-0.6	-2.7	92	0.046	100	100	2.4	-0.15	407	195	186	286	236		262.0	238	75	75			77	0.036		
230	174.710	457.430	0.15	0.13	0.00	0.00	78.8	79.4	-0.6	-2.7	90	0.046	100	100	2.2	-0.15	387	190	179	277	229		252.4	229	75	75			77	0.034		
240	176.191	458.725	0.15	0.13	0.00	0.00	78.8	79.4	-0.6	-2.7	87	0.049	96	96	2.1	-0.1	372	188	171	266	222		243.8	218	75	72			75	0.033		
250	177.703	460.035	0.15	0.13	0.00	0.00	78.8	79.4	-0.6	-2.7	87	0.046	101	100	2.0	-0.1	361	184	164	255	216		236.0	210	73	75			77	0.031		
260	179.195	461.339	0.15	0.13	0.00	0.00	78.8	79.4	-0.6	-2.7	85	0.048	97	98	1.9	-0.1	350	181	156	246	214		229.4	203	72	72			75	0.029		
270	180.697	462.640	0.15	0.13	0.00	0.00	78.8	79.4	-0.6	-2.7	85	0.048	98	97	1.8	-0.1	339	177	151	239	209		223.0	196	72	72			74	0.028		
280	182.197	463.955	0.15	0.13	0.00	0.00	78.8	79.4	-0.6	-2.7	85	0.048	98	98	1.8	0	339	175	147	237	207		221.0	190	72	72			79	0.027		
290	183.690	465.375	0.15	0.14	0.00	0.00	78.8	79.4	-0.6	-2.7	84	0.047	98	107	1.6	-0.2	337	172	140	237	202		217.6	183	72	72			74	0.025		
300	185.185	466.685	0.15	0.13	0.00	0.00	78.8	79.4	-0.6	-2.7	85	0.044	102	102	1.5	-0.1	332	168	140	237	198		215.0	178	72	72			76	0.025		
310	186.685	467.940	0.15	0.13	0.00	0.00	78.8	79.4	-0.6	-2.7	80	0.044	101	98	1.4	-0.1	328	168	135	237	193		212.2	176	72	74			76	0.024		
320	188.150	469.285	0.15	0.13	0.00	0.00	78.8	79.4	-0.6	-2.7	84	0.046	97	103	1.3	-0.1	321	167	133	234	189		208.8	172	71	71			78	0.024		
330	189.678	470.538	0.15	0.13	0.00	0.00	78.8	79.4	-0.6	-2.7	84	0.044	104	98	1.3	0	314	169	131	232	184		206.0	169	71	71			75	0.023		
340	191.190	471.845	0.15	0.13	0.00	0.00	78.8	79.4	-0.6	-2.7	84	0.042	105	104	1.1	-0.2	302	165	131	226	180		200.8	172	72	72			76	0.023		
350	192.690	473.110	0.15	0.13	0.00	0.00	78.8	79.4	-0.6	-2.7	84	0.044	102	99	0.8	-0.3	299	163	135	217	173		197.4	191	73	71			75	0.026		
360	194.182	474.403	0.15	0.13	0.00	0.00	78.8	79.4	-0.6	-2.7	86	0.046	99	99	0.6	-0.2	317	172	146	210	174		203.8	206	73	73			80	0.028		
370	195.667	475.700	0.15	0.13	0.00	0.00	78.8	79.4	-0.6	-2.7	89	0.044	101	102	0.4	-0.2	332	176	155	211	176		210.0	217	74	74			80	0.030		
380	197.160	477.020	0.15	0.13	0.00	0.00	78.8	79.4	-0.6	-2.7	87	0.046	99	101	0.2	-0.2	343	175	160	211	183		214.4	218	74	79			79	0.029		
390	198.650	478.345	0.15	0.13	0.00	0.00	78.8	79.4	-0.6	-2.7	87	0.046	99	101	0.1	-0.1	355	179	160	212	192		219.6	218	75	75			79	0.030		
400	200.145	479.675	0.15	0.13	0.00	0.00	78.8	79.4	-0.6	-2.7	88	0.044	102	104	0.0	-0.1	370	181	162	216	199		225.6	218	75	75			79	0.030		
Avg/Total	60.243	52.364	0.15	0.13	0.00	0.00	78.68	79.25			92.78	0.046	100.54	100.52									108		75.15	74.80	#DIV/0!	#DIV/0!		0.041		

PRINT

**Final Laboratory Report - Method 5G Dual Train
Dilution Tunnel Particulate Calculations**

Client Name: <u>Monessa</u>	Equipment Numbers: _____	Run #: <u>Run 1 non-cat</u>
Model: <u>Encore</u>	<u>Refer to calibrations and off site test</u>	Train #: <u>A</u>
Project No.: <u>227-S-42-3</u>	<u>equipment sheets</u>	Date: <u>06/11/10</u>
Tracking No.: _____	_____	

Sample Component	Reagent	Filter # or Probe #	Weights		
			Final, mg	Tare, mg	Particulate, mg
A. Front filter catch	Filter	F688	124.2	116.2	8.0
B. Rear filter catch	Filter	F687	111.1	110.6	0.5
C. Probe catch	Probe	B	84218.8	84218.5	0.3

Total Particulate, mg :	8.8
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Component	Equations:
A. Front filter catch	Final (mg) - Tare (mg) = Particulate, mg
B. Rear filter catch	Final (mg) - Tare (mg) = Particulate, mg
C. Probe catch	Final (mg) - Tare (mg) = Particulate, mg

Analyst: Joseph Siegel Date: 7/12/10

PRINT

Final Laboratory Report - Method 5G Dual Train Dilution Tunnel Particulate Calculations

Client Name: <u>Monessen</u>	Equipment Numbers: _____	Run #: <u>Run 1 non-cat</u>
Model: <u>Encore</u>	Refer to calibrations and off site test _____	Train #: <u>B</u>
Project No.: <u>227-S-42-3</u>	equipment sheets _____	Date: <u>06/11/10</u>
Tracking No.: _____	_____	

Sample Component	Reagent	Filter # or Probe #	Weights		
			Final, mg	Tare, mg	Particulate, mg
A. Front filter catch	Filter	F686	132.6	125.0	7.6
B. Rear filter catch	Filter	F685	116.4	115.9	0.5
C. Probe catch	Probe	F	78331.8	78331.8	0.0

Total Particulate, mg :	8.1
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Component	Equations:
A. Front filter catch	Final (mg) - Tare (mg) = Particulate, mg
B. Rear filter catch	Final (mg) - Tare (mg) = Particulate, mg
C. Probe catch	Final (mg) - Tare (mg) = Particulate, mg

Analyst: Joseph Siegel Date: 7/27/10

STOVE TEMPERATURE TEST DATA - METHOD 5G

Page of

Client/Model: Manesent/Encore Project #: 227-5-91-3 Tracking #:

Date: 6/11/200 Test Crew: JF

Run #: 1

OMNI Equipment ID #: Refer to calibrations and off site equipment sheets

Preburn Test	Coal Bed: target = 321 Data: 321 0 =										Range: 3 - 3.75			Actual: Coal Bed: 3.5		
	Time	Fuel Weight	Delta Weight	Stack Draft	Ambient	Top	Bottom	Back	Left	Right	Flue	Catalyst				
0	14			.067	73	541	429	260	283	264	425					
10	12.8	1.2		.057	73	484	416	265	302	264	380					
20	12.0	.8		.050	74	482	370	295	292	259	294					
30	11.85	.6		.061	75	418	342	206	275	249	388					
40	9.75	1.6		.069	75	384	321	319	254	239	453					
50	8.10	1.65		.070	74	384	326	383	246	243	463					
60	6.55	1.55		.07	76	448	318	422	262	295	472					
70	5.5	1.05		.059	75	453	312	444	262	264	448					
80	4.95	0.55		.066	75	477	285	478	277	273	392					
90	4.55	0.4		.072	76	493	333	368	286	282	353					
00	3.7	.85		.072	76	490	347	321	293	287	337					
10	3.5	.2		.049	76	465	315	355	298	285	322					
20																
30																
40																
50																
60																
70																
80																
90																
AVG																

↑ missed a couple of readings at beginning
 Did not leave space for them
 Joseph Siego

Date: 6/11/200

FUEL DATA

Client: Manessen
 Model: Encore 42-3
 Project #: 227 Tracking #: _____
 Date: 6/11/2010 Test Crew: JF Run #: 1
 OMNI Equipment ID #: Refer to calibrations and off site equipment sheets
 FUEL LOAD PREPARED BY: Dan (Dimensions and moisture checked by JF)
 FUEL: DOUGLAS-FIR SPECIES, UNTREATED, AIR-DRIED, STANDARD GRADE OR BETTER,
 DIMENSIONAL LUMBER.

PRE-BURN FUEL
MOISTURE CONTENT (METER -- DRY BASIS)

CALIBRATION: Cal Value (1) = 12% Actual Reading 12
 Cal Value (2) = 22% Actual Reading 22.3

Piece	Length	Readings			Type
1	<u>6in</u> ft	<u>23.2</u>	<u>21.3</u>	<u>22.3</u>	<u>2x4</u>
2	<u>6in</u> ft	<u>21.7</u>	<u>18.6</u>	<u>19.3</u>	<u>2x4</u>
3	<u>6in</u> ft	<u>20.4</u>	<u>22.3</u>	<u>18.3</u>	<u>2x4</u>

Length of cut pieces: 6 inches Pre-Burn Fuel Average Moisture: 20.82
 Time (clock): 8:35 Room Temperature (F): 71 Initials: JF

TEST FUEL

FUEL TYPE AND AMOUNT: 2x4 2 4x4 2
 CALCULATED LOAD WEIGHT: 12.6-16.4 ACTUAL LOAD WEIGHT: 4.85 (2x4)
10.15 (4x4)
15.00 Total
 FUEL PIECE LENGTH: 19 1/2"

MOISTURE CONTENT (METER -- DRY BASIS)

PIECE	READINGS			TYPE
1	<u>21.3</u>	<u>21.6</u>	<u>22.3</u>	<u>2x4</u>
2	<u>21.9</u>	<u>23.2</u>	<u>21.4</u>	<u>2x4</u>
3	<u>19.9</u>	<u>18.4</u>	<u>18.6</u>	<u>4x4</u>
4	<u>23.2</u>	<u>21.3</u>	<u>19.5</u>	<u>4x4</u>
5	_____	_____	_____	_____
6	_____	_____	_____	_____
7	_____	_____	_____	_____
8	_____	_____	_____	_____
9	_____	_____	_____	_____
10	_____	_____	_____	_____

OVERALL TEST FUEL LOAD MOISTURE AVERAGE: 21.05
 Time (clock): 8:45 Room Temperature (F): 71 Initials: JF

Technician signature: Joseph Siegel Date: 6/11/2010

Run Notes

Client: Monessen

Model: Encore

Project #: 227-S-42-3

Tracking #: _____

Run #: 1 Date: 6/11/2010

Test Crew: Joseph A Tiegs

OMNI Equipment ID #(s): Refer to calibrations and off site test equipment sheets

PREBURN

DESCRIBE OR SKETCH AIR OR THERMOMSTAT SETTINGS BELOW:
(SETTINGS MUST BE ACCURATE AND REPRODUCIBLE)

PRIMARY:

fully closed

SECONDARY: fixed

TERTIARY: N/A

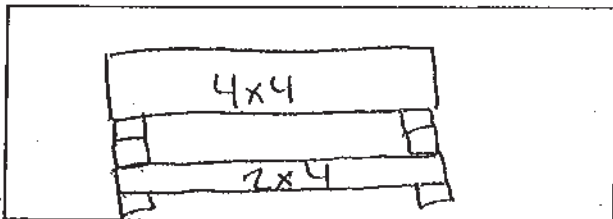
FAN: yes

PREBURN SETTINGS AND ACTIVITIES

TIME	AIR (THERMO) CHANGES PRIMARY/SECONDARY/TERTIARY	FAN SETTING CHANGE	ADD FUEL + WT.	ADD FUEL - WT.	RAKE COAL	COMMENT
7.8min	opened bypass when doors open	-	-	.2	✓	stirring coal
8.3min	"	-	-	.3	✓	"
10.0min	"	-	-	.2	✓	"
12.0min	"	-	-	.15	✓	"

TEST

TEST FUEL CONFIGURATION SKETCH
(INDICATE VIEW ANGLE)



DESCRIBE OR SKETCH TEST SETTINGS BELOW:
(SETTINGS MUST BE ACCURATE AND REPRODUCIBLE)

PRIMARY:

fully closed

START UP PROCEDURES

BYPASS: closed @ 60

FUEL LOADING: done @ 45 sec

DOOR: closed @ 60 sec

PRIMARY AIR: set @ 0 sec

OTHER: _____

SECONDARY: fixed

TERTIARY: N/A

FAN: yes

Technician signature: Joseph Tiegs

Date: 6/11/2010

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Supplemental Data EPA 5G/5H

Client: Monessen

Model: Encore

Project #: 2278-42-3 Tracking #: _____

Date: 6/11/2010 Run #: 1 Booth: _____

Test Crew: JF Start Time: start kindling 8:23 start pre burn test: 11:15 Stop Time: 5:50 PM JF

OMNI Equipment #(s): _____

Gas Analyzer Train Leak Check:

Stack:

Dilution Tunnel (Method 5G Only):

Initial: _____

Initial: _____

Final: _____

Final: _____

Calibrations: Span Gas _____ CO₂: _____ O₂: _____ CO: _____ CO₂(DT): _____

	N ₂ Span	N ₂ Span	N ₂ Span	N ₂ Span	N ₂ Span	N ₂ Span	N ₂ Span
Time							
O ₂							
CO ₂							
CO							
CO ₂ (DT)							

Stack Diameter (inches): 6 in

Air Velocity (ft/min): Initial: ~~13.07 ft/sec~~ <50 ft/min JF Final: ~~14.58 ft/sec~~ <50 ft/min JF

Scale Audit (lbs): Pretest: 10 Post Test: 10

Induced Draft: %Smoke Capture: 100%

Pitot Tube Leak Test: Pre: ✓ JF Post: ✓ JF

Flue Pipe Cleaned Prior to First Test in Series: Date: 6/16 Initials: JF

	Initial	Middle	Ending
Pb (in/Hg)	30.12 <u>29.57 JF</u>	30.12 <u>29.57 JF</u>	30.12 <u>29.07 JF</u>
Room Temp (°F)	<u>71.76 JF</u>	<u>73.79 JF</u>	<u>75.79 JF</u>

Technician signature: Joseph Jiegs Date: 6/11/2010

*Model: Encore
Monessen Hearth Systems
P.O. Box 501
Bethel, VT 05032*

Run 2

Wood Heater Test Data - EPA Method 5G

Manufacturer: Monessen
 Model: Encore Non-Cat
 Project No.: #REF!
 Tracking No.: 227-S-42-3
 Run: 2 non cat
 Test Date: 06/12/10

Burn Rate	1.15 kg/hr dry
Average Tunnel Temperature	92 degrees Fahrenheit
Average Gas Velocity in Dilution Tunnel - vs	14.2 feet/second
Average Gas Flow Rate In Dilution Tunnel - Qsd	9078.8 dscf/hour
Average Delta p	0.043 inches H2O
Average Delta H	0.00 inches H2O
Total Time of Test	290 minutes

	AVERAGE	SAMPLE TRAIN 1	SAMPLE TRAIN 2
Total Sample Volume - Vm	40.23 cubic feet	42.86 cubic feet	37.60 cubic feet
Average Gas Meter Temperature	71 degrees Fahrenheit	70 degrees Fahrenheit	72 degrees Fahrenheit
Total Sample Volume (Standard Conditions) - Vmstd	40.0 dscf	42.1 dscf	37.8 dscf
Total Particulates - m		2.4 mg	3.2 mg
Particulate Concentration (dry-standard)	0.00007 grams/dscf	0.00006 grams/dscf	0.00008 grams/dscf
Particulate Emission Rate	0.64 grams/hour	0.52 grams/hour	0.77 grams/hour
Adjusted Emissions	1.26 grams/hour	1.05 grams/hour	1.46 grams/hour
Difference from Average		0.21 grams/hour	0.21 grams/hour
7.5% of the average emission rate	0.09		
Weighted Average Emission Rate Limit	4.10 grams/hour		
7.5% of the weighted average emission rate limit	0.31		
Results Are Acceptable			

Wood Heater Test Data - EPA Method 5G

Run: 2 non cat
 Manufacturer: Monessen
 Model: Encore Non-Cat
 Tracking No.:
 Project No.: 227-S-42-3
 Test Date: 12-Jun-10
 Beginning Clock Time: 10:25
 Recording Interval: 10 min.
 Total Sampling Time: 290 min.

	Pt.1	Pt.2	Pt.3	Pt.4	Pt.5	Pt.6	Pt.7	Pt.8
Initial dP	0.034	0.040	0.046	0.046	0.033	0.045	0.047	0.043
Initial Temp.	94	94	94	94	94	94	94	94

OMNI Equipment Numbers: Refer to off site test equipment and calibrations

PM Control Module:
 Dilution Tunnel MW(dry): 29.00 lb/lb-mole
 Dilution Tunnel MW(wet): 28.56 lb/lb-mole
 Dilution Tunnel H2O: 4.00 percent
 Dilution Tunnel Static: -0.149 "H2O
 Pitot Tube Cp: 0.99
 Meter Box Y Factor: 1 (1) 1.025 (2)
 Barometric Pressure: Begin Middle End Average
 29.57 29.54 29.51 29.54 "Hg

Signature/Date: Joseph [Signature] 6/17/10
 Tunnel Velocity: 14.18 ft/sec.
 Initial Tunnel Flow: 148.8 scfm
 Average Tunnel Flow: 151.3 scfm
 Tunnel Area: 0.1963 ft²
 Post-Test Leak Check (1): 0 cfm@"Hg
 Post-Test Leak Check (2): 0 cfm@"Hg
 Fuel Moisture (dry basis %): 20.89
 Total Particulate (1): 2.4
 Total Particulate (2): 3.2

Elapsed Time	Particulate Sampling Data														Fuel Weight, lb		Wood Heater Temperature Data, oF														Stack Draft In. H2O
	Gas Meter Cubic Feet (1)	Gas Meter Cubic Feet (2)	Sample Rate, cfm (1)	Sample Rate, cfm (2)	Orifice dH (1)	Orifice dH (2)	Meter oF (1)	Meter oF (2)	Meter Vac. In. Hg. (1)	Meter Vac. In. Hg. (2)	Dilution Tunnel Temp.	Dilution Tunnel dP	Pro. Rate (10%) (1)	Pro. Rate (10%) (2)	Scale Reading	Weight Change	Firebox Top	Firebox Bottom	Firebox Back	Firebox Left	Firebox Right	Catalyst Exit	Average Surface	Stack	Filter (1)	Filter (2)	Impinger exit (1)	Impinger exit (2)	Ambient		
0	200.283	479.677			0.00	0.00	71	71	-0.5	-2.8	94	0.042			14.8		470	332	269	297	282		330.0	308	69	69			69	0.050	
10	201.705	481.015	0.14	0.13	0.00	0.00	70.5	71	-0.5	-2.8	90	0.045	94	101	14.3	-0.5	353	303	253	264	251		284.8	305	71	71			71	0.051	
20	203.210	482.335	0.15	0.13	0.00	0.00	70	71.2	-0.5	-2.8	90	0.046	99	99	13.7	-0.6	306	282	258	234	228		261.6	332	71	69			69	0.055	
30	204.700	483.633	0.15	0.13	0.00	0.00	70	71.4	-0.5	-2.8	90	0.044	100	99	13.0	-0.7	290	264	275	215	212		251.2	364	69	69			69	0.058	
40	206.179	484.937	0.15	0.13	0.00	0.00	70.1	71.5	-0.5	-2.8	99	0.043	101	102	12.0	-1	347	245	308	210	213		264.6	453	71	71			71	0.067	
50	207.650	486.248	0.15	0.13	0.00	0.00	70.2	71.5	-0.5	-2.8	103	0.045	99	100	10.7	-1.3	401	230	351	217	221		284.0	473	71	71			71	0.070	
60	209.124	487.556	0.15	0.13	0.00	0.00	70.2	71.6	-0.5	-2.8	105	0.045	99	100	9.3	-1.4	453	221	384	229	234		304.2	485	73	73			71	0.072	
70	210.598	488.872	0.15	0.13	0.00	0.00	70.2	71.6	-0.5	-2.8	105	0.046	98	100	8.1	-1.2	488	212	399	247	253		319.8	483	73	71			69	0.072	
80	212.070	490.185	0.15	0.13	0.00	0.00	70.2	71.6	-0.5	-2.8	108	0.044	100	102	7.0	-1.1	527	208	408	260	271		334.8	490	73	73			71	0.069	
90	213.540	491.495	0.15	0.13	0.00	0.00	70.2	71.6	-0.5	-2.8	107	0.044	100	102	5.9	-1.1	544	204	408	276	284		343.2	477	74	74			72	0.068	
100	215.015	492.803	0.15	0.13	0.00	0.00	70.2	71.6	-0.5	-2.8	106	0.044	101	102	5.0	-0.9	550	204	399	290	295		347.6	460	73	73			69	0.068	
110	216.490	494.102	0.15	0.13	0.00	0.00	70.2	71.6	-0.5	-2.8	100	0.046	98	98	4.2	-0.8	538	211	378	302	302		346.2	417	74	74			70	0.065	
120	217.965	495.395	0.15	0.13	0.00	0.00	70.2	71.6	-0.5	-2.8	95	0.042	102	102	3.5	-0.7	553	209	350	308	304		344.8	387	72	72			72	0.061	
130	219.437	496.678	0.15	0.13	0.00	0.00	70.2	71.6	-0.5	-2.8	96	0.043	101	100	3.1	-0.4	539	210	324	314	305		338.4	372	73	73			73	0.059	
140	220.918	497.973	0.15	0.13	0.00	0.00	70.2	71.6	-0.5	-2.8	95	0.042	102	102	2.7	-0.4	534	209	304	317	304		333.6	356	72	72			70	0.056	
150	222.396	499.272	0.15	0.13	0.00	0.00	70.2	71.6	-0.5	-2.8	94	0.043	101	101	2.3	-0.4	525	209	287	324	300		329.0	343	72	70			72	0.054	
160	223.871	500.553	0.15	0.13	0.00	0.00	70.2	71.6	-0.5	-2.8	91	0.044	99	98	1.9	-0.4	519	209	272	322	296		323.6	328	70	70			72	0.052	
170	225.354	501.823	0.15	0.13	0.00	0.00	70.2	71.6	-0.5	-2.8	89	0.044	100	97	1.7	-0.2	510	209	255	320	291		317.0	309	70	70			70	0.049	
180	226.836	503.123	0.15	0.13	0.00	0.00	70.2	71.6	-0.5	-2.8	87	0.042	102	102	1.5	-0.2	495	209	237	313	284		307.6	293	70	70			72	0.046	
190	228.318	504.401	0.15	0.13	0.00	0.00	70.2	71.6	-0.5	-2.8	87	0.044	99	98	1.3	-0.2	478	209	222	307	279		299.0	279	70	70			70	0.044	
200	229.856	505.672	0.15	0.13	0.00	0.00	70.2	71.6	-0.5	-2.8	87	0.042	106	100	1.2	-0.1	458	207	211	298	272		289.2	268	70	70			70	0.042	
210	231.386	507.000	0.15	0.13	0.00	0.00	70.2	71.6	-0.5	-2.8	85	0.042	105	104	1.1	-0.1	443	205	200	291	263		280.4	259	70	70			70	0.040	
220	232.865	508.345	0.15	0.13	0.00	0.00	70.2	71.6	-0.5	-2.8	84	0.041	102	106	0.9	-0.2	434	202	194	287	256		274.6	252	70	70			70	0.039	
230	234.224	509.523	0.14	0.12	0.00	0.00	70.2	71.6	-0.5	-2.8	82	0.040	95	94	0.8	-0.1	424	202	190	280	250		269.2	244	70	70			70	0.039	
240	235.730	510.796	0.15	0.13	0.00	0.00	70.2	71.6	-0.5	-2.8	82	0.042	103	99	0.7	-0.1	406	198	181	274	243		260.4	239	68	68			70	0.038	
250	237.210	512.077	0.15	0.13	0.00	0.00	70.2	71.6	-0.5	-2.8	82	0.040	104	102	0.5	-0.2	391	196	176	267	234		252.8	230	67	67			69	0.036	
260	238.698	513.352	0.15	0.13	0.00	0.00	70.2	71.6	-0.5	-2.8	82	0.039	105	103	0.4	-0.1	383	194	168	261	231		247.4	229	70	68			70	0.036	
270	240.220	514.638	0.15	0.13	0.00	0.00	70.2	71.6	-0.5	-2.8	82	0.040	106	102	0.3	-0.1	378	190	164	256	226		242.8	224	68	68			70	0.035	
280	241.657	515.922	0.14	0.13	0.00	0.00	70.2	71.6	-0.5	-2.8	82	0.041	99	101	0.1	-0.2	378	185	157	254	224		239.6	222	69	67			72	0.034	
290	243.145	517.280	0.15	0.14	0.00	0.00	70.2	71.6	-0.5	-2.8	83	0.042	102	106	0.0	-0.1	376	181	153	250	222		236.4	218	68	70			72	0.032	
Avg/Total	42.862	37.603	0.15	0.13	0.00	0.00	70.22	71.53			92.07	0.043	100.78	100.76									94		70.70	70.43	#DIV/0!	#DIV/0!		0.052	

PRINT

Final Laboratory Report - Method 5G Dual Train Dilution Tunnel Particulate Calculations

Client Name: <u>Monessen</u>	Equipment Numbers: _____	Run #: <u>Run 2 non-cat</u>
Model: <u>Encore</u>	Refer to calibrations and off site test	Train #: <u>A</u>
Project No.: <u>227-S-42-3</u>	equipment sheets	Date: <u>06/12/10</u>
Tracking No.: _____	_____	

Sample Component	Reagent	Filter # or Probe #	Weights		
			Final, mg	Tare, mg	Particulate, mg
A. Front filter catch	Filter	F684	113.4	111.0	2.4
B. Rear filter catch	Filter	F683	125.6	125.6	0.0
C. Probe catch	Probe	I	77920	77919.6	0.1

Total Particulate, mg :	2.5
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Component	Equations:
A. Front filter catch	Final (mg) - Tare (mg) = Particulate, mg
B. Rear filter catch	Final (mg) - Tare (mg) = Particulate, mg
C. Probe catch	Final (mg) - Tare (mg) = Particulate, mg

Analyst: *Joseph J. Siegel* Date: 7/27/10

PRINT

Final Laboratory Report - Method 5G Dual Train Dilution Tunnel Particulate Calculations

Client Name: Monessen
 Model: Encore
 Project No.: 227-S-42-3
 Tracking No.: _____

Equipment Numbers: _____
 Refer to calibrations and off site test
 equipment sheets

Run #: Run 2 non-cat
 Train #: B
 Date: 06/12/10

Sample Component	Reagent	Filter # or Probe #	Weights		
			Final, mg	Tare, mg	Particulate, mg
A. Front filter catch	Filter	F682	119.2	116.5	2.7
B. Rear filter catch	Filter	F681	110.3	109.8	0.5
C. Probe catch	Probe	E	82979.3	82979.3	0.0

Total Particulate, mg :	3.2
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Component	Equations:
A. Front filter catch	Final (mg) - Tare (mg) = Particulate, mg
B. Rear filter catch	Final (mg) - Tare (mg) = Particulate, mg
C. Probe catch	Final (mg) - Tare (mg) = Particulate, mg

Analyst: *Joseph J. [Signature]*

Date: 7/12/10

STOVE TEMPERATURE TEST DATA - METHOD 5G

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Client/Model: Monesse/Breore Project #: 277-8-42-3 Tracking #:
 Date: 6/12/2010 Test Crew: JF Run #: 2 non-cat
 OMNI Equipment ID #: Refer to calibrations and off site test equipment sheets

Time	Fuel Weight	Delta Weight	Stack Draft	TEMPERATURES (oF)						Flue	Catalyst
				Ambient	Top	Bottom	Back	Left	Right		
0	14.0		0.014	71	512	375	252	282	362	466	
10	12.68	1.31	0.061	70	518	382	265	287	365	347	
20	11.90	0.9	0.054	70	497	352	226	276	331	307	
30	0.6	0.9	0.060	71	460	330	211	265	309	362	
40	9.1	1.5	0.058	70	402	317	222	252	178	339	
50	7.4	1.7	0.069	71	439	313	266	253	268	452	
60	6.2	1.2	0.07	71	416	303	364	250	259	465	
70	5.5	0.7	0.064	71	461	303	387	259	266	461	
80	4.9	0.6	0.061	71	491	311	368	272	275	379	
90	4.4	0.5	0.061	71	494	314	353	281	279	376	
100	4.0	0.4	0.056	72	479	304	342	290	281	367	
110	3.8	0.2	0.052	71	490	316	312	297	283	327	
20	3.7	0.1	0.048	76	482	328	280	299	292	303	
30	3.5										
40											
50											
60											
70											
80											
90											
AVG											

Coal Bed: target 3.7 Range: 2.9 - 3.7 Actual: 3.5
 Data: 0 =

Technician signature: Joseph J. [Signature] Date: 6/12/2010

FUEL DATA

Client: Monessen

Model: Encore 42-3

Project #: 423 Tracking #: _____

Date: 6/12/2010 Test Crew: JF Run #: 2 noncat

OMNI Equipment ID #: Refer to calibrations and off-site test equipment sheets

FUEL LOAD PREPARED BY: Dan (checked dimensions and moisture by JF)

FUEL: DOUGLAS-FIR SPECIES, UNTREATED, AIR-DRIED, STANDARD GRADE OR BETTER, DIMENSIONAL LUMBER.

PRE-BURN FUEL					
MOISTURE CONTENT (METER -- DRY BASIS)					
CALIBRATION:	Cal Value (1) = 12%	Actual Reading	<u>12</u>		
	Cal Value (2) = 22%	Actual Reading	<u>22.3</u>		
Piece	Length	Readings			Type
1	<u>6in</u> ft	<u>18.8</u>	<u>20.3</u>	<u>18.7</u>	<u>2x4</u>
2	<u>6in</u> ft	<u>18.6</u>	<u>18.6</u>	<u>19.1</u>	<u>2x4</u>
3	<u>6in</u> ft	<u>18.0</u>	<u>18.3</u>	<u>18.3</u>	<u>2x4</u>
Length of cut pieces: <u>6</u> inches		Pre-Burn Fuel Average Moisture: <u>18.74</u>			
Time (clock): <u>7:39</u>		Room Temperature (F): <u>69</u>	Initials: <u>JF</u>		

TEST FUEL				
FUEL TYPE AND AMOUNT:	<u>2x4</u> <u>2</u>	<u>4x4</u> <u>2</u>		
CALCULATED LOAD WEIGHT:	<u>12.6 - 15.4</u>	ACTUAL LOAD WEIGHT:	<u>4.785</u> (2x4) <u>10.05</u> (4x4) <u>14.83</u> Total	
FUEL PIECE LENGTH:	<u>19 1/2"</u>			
MOISTURE CONTENT (METER -- DRY BASIS)				
PIECE	READINGS			TYPE
1	<u>21.1</u>	<u>21.2</u>	<u>21.1</u>	<u>2x4</u>
2	<u>20.2</u>	<u>21.4</u>	<u>19.4</u>	<u>2x4</u>
3	<u>19.4</u>	<u>20.1</u>	<u>17.7</u>	<u>4x4</u>
4	<u>22.8</u>	<u>23.3</u>	<u>23.0</u>	<u>2x4</u>
5	_____	_____	_____	_____
6	_____	_____	_____	_____
7	_____	_____	_____	_____
8	_____	_____	_____	_____
9	_____	_____	_____	_____
10	_____	_____	_____	_____
OVERALL TEST FUEL LOAD MOISTURE AVERAGE: <u>20.89</u>				
Time (clock): <u>7:42</u>		Room Temperature (F): <u>68</u>	Initials: <u>JF</u>	

Technician signature: Joseph J. J... Date: 6/12/2010

Run Notes

Client: Monsessen

Model: Encore

Project #: 227-S-42-3

Tracking #: _____

category 2

Run #: 2 non cat Date: 6/12/2010

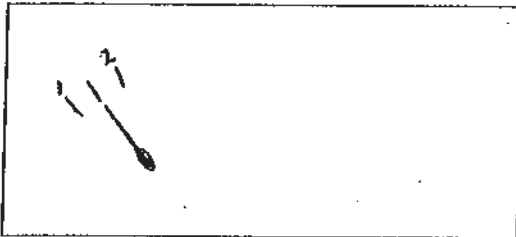
Test Crew: Joseph A. Tieggs

OMNI Equipment ID #(s): Refer to calibrations and off site test equipment sheets

PREBURN

DESCRIBE OR SKETCH AIR OR THERMOMSTAT SETTINGS BELOW:
(SETTINGS MUST BE ACCURATE AND REPRODUCIBLE)

PRIMARY:



SECONDARY: fixed

TERTIARY: N/A

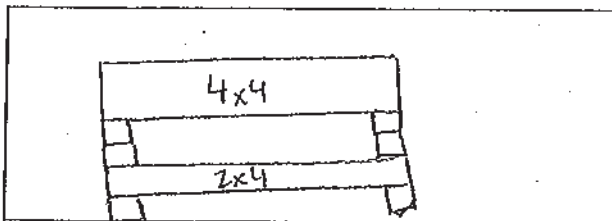
FAN: yes

PREBURN SETTINGS AND ACTIVITIES

TIME	AIR (THERMO) CHANGES PRIMARY/SECONDARY/TERTIARY	FAN SETTING CHANGE	ADD FUEL + WT.	ADD FUEL - WT.	RAKE COAL	COMMENT
25min	opened by pass when door opened	-	-	-	✓	stirred coals
45min	" "	-	-	.2	✓	"
83min	" "	-	-	.10	✓	"

TEST

TEST FUEL CONFIGURATION SKETCH
(INDICATE VIEW ANGLE)



START UP PROCEDURES

BYPASS: closed @ 0 sec

FUEL LOADING: Done @ 46 sec

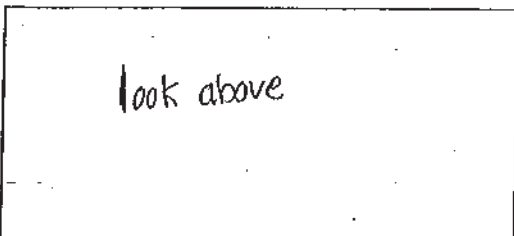
DOOR: closed @ 60 sec

PRIMARY AIR: set @ 0 sec

OTHER: _____

DESCRIBE OR SKETCH TEST SETTINGS BELOW:
(SETTINGS MUST BE ACCURATE AND REPRODUCIBLE)

PRIMARY:



SECONDARY: fixed

TERTIARY: N/A

FAN: yes

Technician signature: Joseph Tieggs

Date: 6/12/2010

4-19 OF 4-87

Supplemental Data EPA 5G/5H

Client: Monessen

Model: Encore

Project #: 227-8-423 Tracking #: _____

Date: 6/12/2010 Run #: 2 Booth: _____

Test Crew: JF ^{Kindling: 7:30 preburn: 8:20} Start Time: 10:25 Stop Time: 3:16

OMNI Equipment #(s): Refer to calibrations and off site test equipment sheets

Gas Analyzer Train Leak Check:

Stack: Initial: _____ Final: _____
 Dilution Tunnel (Method 5G Only): Initial: _____ Final: _____
 Calibrations: Span Gas CO₂: _____ O₂: _____ CO: _____ CO₂(DT): _____

Time	N ₂ Span	N ₂ Span	N ₂ Span	N ₂ Span	N ₂ Span	N ₂ Span	N ₂ Span
O ₂							
CO ₂							
CO							
CO ₂ (DT)							

Stack Diameter (inches): 6 inches ^{400 ft/min JF} ^{50 ft/min JF}

Air Velocity (ft/min): Initial: ~~100 ft/min~~ ^{100 ft/min} Final: ~~104 ft/min~~ ^{104 ft/min}

Scale Audit (lbs): Pretest: 10 Post Test: 10

Induced Draft: 0 %Smoke Capture: 100%

Pitot Tube Leak Test: Pre: ✓ JF Post: ✓ JF

Flue Pipe Cleaned Prior to First Test in Series: Date: 6/6 Initials: JF

	Initial	Middle	Ending
Pb (in/Hg)	30.12 29.57	30.09 29.54	30.00 29.51
Room Temp (°F)	68 69	69.5	72

Technician signature: Joseph Jeyaraj Date: 6/12/2010

*Model: Encore
Monessen Hearth Systems
P.O. Box 501
Bethel, VT 05032*

Run 3

Wood Heater Test Data - EPA Method 5G

Manufacturer: Monessen
 Model: Encore Non-Cat
 Project No.: #REF!
 Tracking No.: 227-S-42-3
 Run: Run 3
 Test Date: 06/14/10

Burn Rate	2.86 kg/hr dry
Average Tunnel Temperature	137 degrees Fahrenheit
Average Gas Velocity in Dilution Tunnel - vs	14.6 feet/second
Average Gas Flow Rate in Dilution Tunnel - Qsd	8577.7 dscf/hour
Average Delta p	0.042 inches H2O
Average Delta H	0.00 inches H2O
Total Time of Test	120 minutes

	AVERAGE	SAMPLE TRAIN 1	SAMPLE TRAIN 2
Total Sample Volume - Vm	16.59 cubic feet	17.59 cubic feet	15.59 cubic feet
Average Gas Meter Temperature	71 degrees Fahrenheit	70 degrees Fahrenheit	73 degrees Fahrenheit
Total Sample Volume (Standard Conditions) - Vmstd	16.3 dscf	17.2 dscf	15.5 dscf
Total Particulates - mn		1.9 mg	1.7 mg
Particulate Concentration (dry-standard)	0.00011 grams/dscf	0.00011 grams/dscf	0.00011 grams/dscf
Particulate Emission Rate	0.95 grams/hour	0.95 grams/hour	0.94 grams/hour
Adjusted Emissions	1.74 grams/hour	1.74 grams/hour	1.73 grams/hour
Difference from Average		0.01 grams/hour	0.01 grams/hour
7.5% of the average emission rate	0.13		
Weighted Average Emission Rate Limit	4.10 grams/hour		
7.5% of the weighted average emission rate limit	0.31		

Results Are Acceptable

Wood Heater Test Data - EPA Method 5G

Run: **Run 3**
 Manufacturer: Montessen
 Model: Encore Non-Cat
 Tracking No.: _____
 Project No.: 227-S-42-3
 Test Date: 14-Jun-10
 Beginning Clock Time: 09:36
 Recording Interval: 10 min.
 Total Sampling Time: 120 min.

Velocity Traverse Data								
	Pt.1	Pt.2	Pt.3	Pt.4	Pt.5	Pt.6	Pt.7	Pt.8
Initial dP	0.034	0.044	0.043	0.039	0.029	0.040	0.046	0.042
Initial Temp.	138	138	138	138	138	138	138	138

OMNI Equipment Numbers: _____ Refer to calibrations and off site test equipment sheets

PM Control Module: _____
 Dilution Tunnel MW(dry): 29.00 lb/lb-mole
 Dilution Tunnel MW(wet): 28.36 lb/lb-mole
 Dilution Tunnel H2O: 4.00 percent
 Dilution Tunnel Static: -0.146 "H2O
 Pitot Tube Cp: 0.99
 Meter Box Y Factor: 1 (1) 1.025 (2)
 Barometric Pressure: 29.30 29.29 29.28 29.29 "Hg

Signature/Date: Joseph J. Jags 7/27
 Tunnel Velocity: 14.66 ft/sec.
 Initial Tunnel Flow: 138.9 scfm
 Average Tunnel Flow: 143.0 scfm
 Tunnel Area: 0.1963 ft²
 Post-Test Leak Check (1): .002 @ -4.5 cfm/"Hg
 Post-Test Leak Check (2): .005 @ -7 cfm/"Hg
 Fuel Moisture (dry basis %): 21.14
 Total Particulate (1): 1.9
 Total Particulate (2): 1.7

Elapsed Time	Particulate Sampling Data														Fuel Weight, lb		Wood Heater Temperature Data, °F														Stack	
	Gas Meter Cubic Feet (1)	Gas Meter Cubic Feet (2)	Sample Rate, cfm (1)	Sample Rate, cfm (2)	Orifice dH (1)	Orifice dH (2)	Meter °F (1)	Meter °F (2)	Meter Vac. In. Hg. (1)	Meter Vac. In. Hg. (2)	Dilution Tunnel Temp.	Dilution Tunnel dP	Pro. Rate (10%) (1)	Pro. Rate (10%) (2)	Scale Reading	Weight Change	Firebox Top	Firebox Bottom	Firebox Back	Firebox Left	Firebox Right	Catalyst Exit	Average Surface	Stack	Filter (1)	Filter (2)	Impinger exit (1)	Impinger exit (2)	Ambient	Draft In. H2O		
0	286.400	555.227			0.00	0.00	70	72	-0.7	-2.9	138	0.040			15.3		658	502	290	346	342		427.6	491	77	79			72	0.072		
10	287.935	556.601	0.15	0.14	0.00	0.00	69.8	72.3	-0.7	-2.9	132	0.041	106	107	13.4	-1.9	575	422	326	298	296		383.4	607	79	79			70	0.075		
20	289.420	557.940	0.15	0.13	0.00	0.00	70.2	72.5	-0.7	-2.9	143	0.041	103	105	11.1	-2.3	592	374	359	283	281		377.8	644	79	79			71	0.082		
30	290.901	559.240	0.15	0.13	0.00	0.00	70.2	72.5	-0.7	-2.9	150	0.042	103	102	8.9	-2.2	650	333	381	286	286		387.2	705	79	81			71	0.086		
40	292.367	560.517	0.15	0.13	0.00	0.00	70.2	72.5	-0.7	-2.9	145	0.043	100	98	7.2	-1.7	693	305	377	312	292		395.8	661	80	80			71	0.085		
50	293.860	561.800	0.15	0.13	0.00	0.00	70.2	72.5	-0.7	-2.9	144	0.042	103	100	5.6	-1.6	710	282	364	325	304		397.0	634	78	80			71	0.084		
60	295.340	563.084	0.15	0.13	0.00	0.00	70.2	72.6	-0.7	-2.9	139	0.043	100	98	4.4	-1.2	710	267	343	328	315		392.6	604	78	80			72	0.081		
70	296.790	564.364	0.15	0.13	0.00	0.00	70.2	72.6	-0.7	-2.9	137	0.043	98	98	3.4	-1	700	259	319	335	322		387.0	579	80	80			72	0.079		
80	298.183	565.647	0.14	0.13	0.00	0.00	70.3	72.6	-0.7	-2.9	133	0.044	93	97	2.5	-0.9	698	252	299	341	321		382.2	574	78	80			72	0.078		
90	299.633	566.937	0.14	0.13	0.00	0.00	70.3	72.6	-0.7	-2.9	136	0.040	102	102	1.5	-1	721	245	302	356	334		391.6	574	78	80			72	0.077		
100	301.085	568.225	0.15	0.13	0.00	0.00	70.3	72.6	-0.7	-2.9	132	0.042	99	99	0.8	-0.7	723	245	284	380	343		395.0	544	78	80			72	0.076		
110	302.535	569.518	0.15	0.13	0.00	0.00	70.3	72.6	-0.7	-2.9	125	0.042	98	99	0.3	-0.5	673	248	259	383	343		381.2	517	78	78			72	0.073		
120	303.992	570.814	0.15	0.13	0.00	0.00	70.3	72.6	-0.7	-2.9	123	0.040	102	102	0.0	-0.3	649	252	248	374	343		373.2	493	76	78			72	0.070		
Avg/Total	17.592	15.587	0.15	0.13	0.00	0.00	70.19	72.50			136.69	0.042	100.59	100.58									54		78.31	79.54	#DIV/0!	#DIV/0!		0.078		

PRINT

Final Laboratory Report - Method 5G Dual Train Dilution Tunnel Particulate Calculations

Client Name: <u>Monessen</u>	Equipment Numbers: _____	Run #: <u>Run 3 non-cat</u>
Model: <u>Encore</u>	Refer to calibrations and off site test	Train #: <u>A</u>
Project No.: <u>227-S-42-3</u>	equipment sheets	Date: <u>06/14/10</u>
Tracking No.: _____	_____	

Sample Component	Reagent	Filter # or Probe #	Weights		
			Final, mg	Tare, mg	Particulate, mg
A. Front filter catch	Filter	F676	118.0	116.4	1.6
B. Rear filter catch	Filter	F675	109.8	110.0	-0.2
C. Probe catch	Probe	M	78208.7	78208.2	0.5

Total Particulate, mg :	1.9
-------------------------	-----

Component	Equations:
A. Front filter catch	Final (mg) - Tare (mg) = Particulate, mg
B. Rear filter catch	Final (mg) - Tare (mg) = Particulate, mg
C. Probe catch	Final (mg) - Tare (mg) = Particulate, mg

Analyst: Joseph Feigs Date: 7/27/10

PRINT

Final Laboratory Report - Method 5G Dual Train Dilution Tunnel Particulate Calculations

Client Name: <u>Monessen</u>	Equipment Numbers: _____	Run #: <u>Run 3 non-cat</u>
Model: <u>Encore</u>	Refer to calibrations and off site test equipment sheets	Train #: <u>B</u>
Project No.: <u>227-S-42-3</u>		Date: <u>06/14/10</u>
Tracking No.: _____		

Sample Component	Reagent	Filter # or Probe #	Weights		
			Final, mg	Tare, mg	Particulate, mg
A. Front filter catch	Filter	F674	127.4	125.8	1.6
B. Rear filter catch	Filter	F673	117.0	116.9	0.1
C. Probe catch	Probe	C	85528.6	85528.6	0.0

Total Particulate, mg:	1.7
------------------------	-----

Component	Equations:
A. Front filter catch	$Final (mg) - Tare (mg) = Particulate, mg$
B. Rear filter catch	$Final (mg) - Tare (mg) = Particulate, mg$
C. Probe catch	$Final (mg) - Tare (mg) = Particulate, mg$

Analyst: Joseph J. [Signature] Date: 7/27/10

STOVE TEMPERATURE TEST DATA - METHOD 5G

Page ___ of ___

Client/Model: Minesen/Encore Project #: 227-8-42-3 Tracking #: _____
 Date: 6/14/2010 Test Crew: JT Run #: 3 non sat
 OMNI Equipment ID #: _____ Refer to calibrations and off site test equipment sheets

Time	Fuel Weight	Delta Weight	Stack Draft	TEMPERATURES (oF)					Right	Flue	Catalyst
				Ambient	Top	Bottom	Back	Left			
0	2.1		?	68	?	?	?	?	?	?	
10											
20	15.8		0.085	71	401	386	202	219	208	858	
30	13.4	2.4	0.087	72	413	405	270	210	279	957	
40	9.9	3.5	0.088	72	665	438	307	225	294	682	
50	7.1	2.8	0.089	73	695	596	331	240	307	719	
60	4.7	2.6	0.087	72	700	462	337	304	324	694	
70	3.6	1.1	0.085	73	698	489	311	339	339	557	
80	3.4	.2		71							
90											
00											
10											
20											
30											
40											
50											
60											
70											
80											
90											
AVG											

Coal Bed: target 3.5
 Data: 0 =
 Range: 3.1 - 3.8
 Actual: 3.4
 Coal Bed: 3.4

Technician signature: Joseph Feige Date: 6/14/2010

FUEL DATA

Client: Manassas
 Model: EMCOE 42-3
 Project #: 222 Tracking #: _____
 Date: 6/14/2010 Test Crew: JT Run #: 3 non cat category 4
 OMNI Equipment ID #: Refer to calibrations and off site test equipment sheets
 FUEL LOAD PREPARED BY: Dan (Dimensions and moisture checked by JT)
 FUEL: DOUGLAS-FIR SPECIES, UNTREATED, AIR-DRIED, STANDARD GRADE OR BETTER, DIMENSIONAL LUMBER.

PRE-BURN FUEL
MOISTURE CONTENT (METER -- DRY BASIS)

CALIBRATION: Cal Value (1) = 12% Actual Reading 12
 Cal Value (2) = 22% Actual Reading 22.3

Piece	Length	Readings			Type
1	<u>6in #</u>	<u>21.4</u>	<u>21.1</u>	<u>20.2</u>	<u>2x4</u>
2	<u>6in #</u>	<u>19.2</u>	<u>21.7</u>	<u>20.5</u>	<u>2x4</u>
3	<u>6in #</u>	<u>19.5</u>	<u>21.0</u>	<u>19.4</u>	<u>2x4</u>

Length of cut pieces: 6in inches Pre-Burn Fuel Average Moisture: 20.44
 Time (clock): 7:38 Room Temperature (F): 67 Initials: JT

TEST FUEL

FUEL TYPE AND AMOUNT: 2x4 2 4x4 2
 CALCULATED LOAD WEIGHT: 12.6 - 16.4 ACTUAL LOAD WEIGHT: 4.5 (2x4)
10.8 (4x4)
15.3 Total
 FUEL PIECE LENGTH: 19 1/2"

MOISTURE CONTENT (METER -- DRY BASIS)

PIECE	READINGS			TYPE
1	<u>20.3</u>	<u>20.6</u>	<u>21.2</u>	<u>2x4</u>
2	<u>20.6</u>	<u>21.1</u>	<u>24.1</u>	<u>2x4</u>
3	<u>19.2</u>	<u>20.8</u>	<u>19.4</u>	<u>4x4</u>
4	<u>20.6</u>	<u>23.2</u>	<u>22.6</u>	<u>4x4</u>
5	_____	_____	_____	_____
6	_____	_____	_____	_____
7	_____	_____	_____	_____
8	_____	_____	_____	_____
9	_____	_____	_____	_____
10	_____	_____	_____	_____

OVERALL TEST FUEL LOAD MOISTURE AVERAGE: 21.14
 Time (clock): 7:49 Room Temperature (F): 68 Initials: JT

Technician signature: Joseph J. [Signature] Date: 6/14/2010

Run Notes

Client: Manessen

Model: Encore

Project #: 227-0-42-3

Tracking #: _____

Category 4

Run #: 3 non cat

Date: 6/14/2010

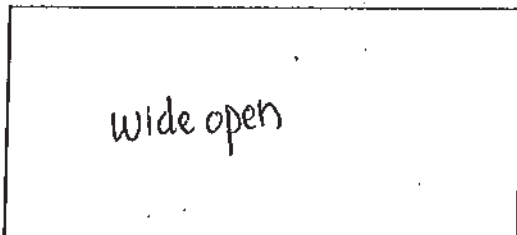
Test Crew: JT

OMNI Equipment ID #(s): Refer to calibration and offsite test equipment sheets

PREBURN

DESCRIBE OR SKETCH AIR OR THERMOMSTAT SETTINGS BELOW:
(SETTINGS MUST BE ACCURATE AND REPRODUCIBLE)

PRIMARY:



SECONDARY: fixed

TERTIARY: N/A

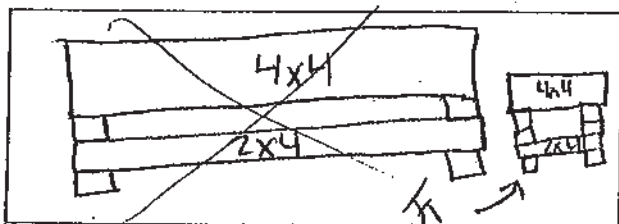
FAN: yes, high

PREBURN SETTINGS AND ACTIVITIES

TIME	AIR (THERMO) CHANGES PRIMARY/SECONDARY/TERTIARY	FAN SETTING CHANGE	ADD FUEL + WT.	ADD FUEL - WT.	RAKE COAL	COMMENT
30 min	bypass open when doors opened	-	-	.2	✓	
40 min	" "	-	-	.2	✓	

TEST

TEST FUEL CONFIGURATION SKETCH
(INDICATE VIEW ANGLE)



START UP PROCEDURES

BYPASS: closed @ 0 sec

FUEL LOADING: done @ 45 sec

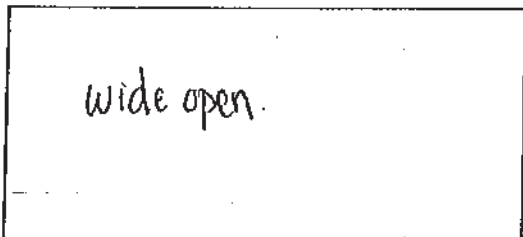
DOOR: closed @ 60 sec

PRIMARY AIR: set @ 0 sec

OTHER: _____

DESCRIBE OR SKETCH TEST SETTINGS BELOW:
(SETTINGS MUST BE ACCURATE AND REPRODUCIBLE)

PRIMARY:



SECONDARY: fixed

TERTIARY: N/A

FAN: yes, high

Technician signature: Joseph J. Jags

Date: 6/14/2010

Supplemental Data EPA 5G/5H

Client: Manssen

Model: Encore

Project #: 227-5-42-3 Tracking #: _____

Date: 6/14/2010 Run #: 3 Booth: _____

Test Crew: JF Start Time: 9:30 Stop Time: 11:37

OMNI Equipment #(s): Refer to calibrations and off site test equipment sheets

Gas Analyzer Train Leak Check:

Stack:

Dilution Tunnel (Method 5G Only):

Initial: _____

Initial: _____

Final: _____

Final: _____

Calibrations: Span Gas CO₂: _____ O₂: _____ CO: _____ CO₂(DT): _____

	N ₂ Span	N ₂ Span	N ₂ Span	N ₂ Span	N ₂ Span	N ₂ Span	N ₂ Span
Time							
O ₂							
CO ₂							
CO							
CO ₂ (DT)							

Stack Diameter (inches): 6inch

Air Velocity (ft/min): Initial: ~~11.1~~ 450 Final: 450

Scale Audit (lbs): Pretest: 10 Post Test: 10

Induced Draft: %Smoke Capture: 100%

Pitot Tube Leak Test: Pre: JF ✓ Post: JF ✓

Flue Pipe Cleaned Prior to First Test in Series: Date: 6/6 Initials: JF

	Initial	Middle	Ending
Pb (in/Hg)	<u>29.30</u> 29.85 <u>JF</u>	<u>29.29</u> 29.84 <u>JF</u>	<u>29.28</u> 29.83 <u>JF</u>
Room Temp (°F)	<u>68</u> <u>72</u> <u>JF</u>	<u>68</u> <u>70.5</u> <u>71</u> <u>JF</u>	<u>73</u> <u>72</u> <u>JF</u>

Technician signature: Joseph Frigo Date: 6/14/2010

*Model: Encore
Monessen Hearth Systems
P.O. Box 501
Bethel, VT 05032*

Run 4

Wood Heater Test Data - EPA Method 5G

Manufacturer: Monessen
 Model: Encore Non-Cat
 Project No.: #REF1
 Tracking No.: 227-S-42-3
 Run: 4 non cat
 Test Date: 06/14/10

Burn Rate	1.71 kg/hr dry
Average Tunnel Temperature	108 degrees Fahrenheit
Average Gas Velocity in Dilution Tunnel - vs	13.9 feet/second
Average Gas Flow Rate in Dilution Tunnel - Qsd	8581.5 dscf/hour
Average Delta p	0.040 inches H2O
Average Delta H	0.00 inches H2O
Total Time of Test	190 minutes

	AVERAGE	SAMPLE TRAIN 1	SAMPLE TRAIN 2
Total Sample Volume - Vm	26.44 cubic feet	28.18 cubic feet	24.70 cubic feet
Average Gas Meter Temperature	73 degrees Fahrenheit	73 degrees Fahrenheit	74 degrees Fahrenheit
Total Sample Volume (Standard Conditions) - Vmstd	25.9 dscf	27.3 dscf	24.5 dscf
Total Particulates - mn		1.7 mg	1.6 mg
Particulate Concentration (dry-standard)	0.00006 grams/dscf	0.00008 grams/dscf	0.00007 grams/dscf
Particulate Emission Rate	0.55 grams/hour	0.53 grams/hour	0.56 grams/hour
Adjusted Emissions	1.10 grams/hour	1.08 grams/hour	1.13 grams/hour
Difference from Average		0.02 grams/hour	0.02 grams/hour
7.5% of the average emission rate	0.08		
Weighted Average Emission Rate Limit	4.10 grams/hour		
7.5% of the weighted average emission rate limit	0.31		
Results Are Acceptable			

Wood Heater Test Data - EPA Method 5G

Run: 4 non cat
 Manufacturer: Monessen
 Model: Encore Non-Cat
 Tracking No.:
 Project No.: 227-S-42-3
 Test Date: 14-Jun-10
 Beginning Clock Time: 14:43
 Recording Interval: 10 min.
 Total Sampling Time: 190 min.

Velocity Traverse Data								
	Pt.1	Pt.2	Pt.3	Pt.4	Pt.5	Pt.6	Pt.7	Pt.8
Initial dP	0.025	0.037	0.041	0.039	0.025	0.038	0.039	0.036
Initial Temp.	98	98	98	98	98	98	98	98

OMNI Equipment Numbers: Refer to calibrations and off site test equipment sheets

PM Control Module:
 Dilution Tunnel MW(dry): 29.00 lb/lb-mole
 Dilution Tunnel MW(wet): 28.56 lb/lb-mole
 Dilution Tunnel H2O: 4.00 percent
 Dilution Tunnel Static: -0.132 "H2O
 Pitot Tube Cp: 0.99
 Meter Box Y Factor: 1 (1) 1.025 (2)
 Barometric Pressure: Begin Middle End Average
 29.28 29.28 29.28 29.28 "Hg

Signature/Date: *Jayma [Signature]* 7/17
 Tunnel Velocity: 13.91 f/sec.
 Initial Tunnel Flow: 134.9 scfm
 Average Tunnel Flow: 143.0 scfm
 Tunnel Area: 0.1963 ft²
 Post-Test Leak Check (1): 0.003 @ -4 cfm/"Hg
 Post-Test Leak Check (2): 0 @ -7.5 cfm/"Hg
 Fuel Moisture (dry basis %): 21.99
 Total Particulate (1): 1.7
 Total Particulate (2): 1.6

Elapsed Time	Particulate Sampling Data														Fuel Weight, lb		Wood Heater Temperature Data, oF														Stack	
	Gas Meter Cubic Feet (1)	Gas Meter Cubic Feet (2)	Sample Rate, cfm (1)	Sample Rate, cfm (2)	Orifice dH (1)	Orifice dH (2)	Meter oF (1)	Meter oF (2)	Meter Vac. In. Hg. (1)	Meter Vac. In. Hg. (2)	Dilution Tunnel Temp.	Dilution Tunnel dP	Pro. Rate (10%) (1)	Pro. Rate (10%) (2)	Scale Reading	Weight Change	Firebox Top	Firebox Bottom	Firebox Back	Firebox Left	Firebox Right	Catalyst Exit	Average Surface	Stack	Filter (1)	Filter (2)	Impinger exit (1)	Impinger exit (2)	Ambient	Draft In. H2O		
0	303.993	570.842			0.00	0.00	72.7	72.7	-0.5	-2.5	98	0.035			14.6		494	305	203	260	258		304.0	320	73	75			73	0.056		
10	305.518	572.170	0.15	0.13	0.00	0.00	72.7	73.5	-0.5	-2.5	100	0.040	103	102	13.8	-0.8	366	294	212	223	219		262.8	383	75	75			73	0.056		
20	307.025	573.473	0.15	0.13	0.00	0.00	72.6	73.9	-0.5	-2.5	106	0.040	102	100	12.8	-1	372	276	244	198	196		257.2	458	74	74			72	0.061		
30	308.515	574.775	0.15	0.13	0.00	0.00	72.7	74	-0.5	-2.5	119	0.041	101	100	11.1	-1.7	448	259	292	196	196		278.2	554	75	77			72	0.071		
40	309.990	576.065	0.15	0.13	0.00	0.00	72.8	74	-0.5	-2.5	119	0.040	101	101	9.8	-1.3	525	241	319	206	206		299.4	555	76	78			72	0.073		
50	311.466	577.351	0.15	0.13	0.00	0.00	72.8	74	-0.5	-2.5	141	0.042	100	100	8.3	-1.5	568	226	328	224	219		313.0	564	76	78			72	0.075		
60	312.941	578.644	0.15	0.13	0.00	0.00	72.8	74	-0.5	-2.5	121	0.042	99	99	6.8	-1.5	621	217	330	239	235		328.4	542	76	78			72	0.074		
70	314.412	579.939	0.15	0.13	0.00	0.00	72.8	74	-0.5	-2.5	119	0.042	98	98	5.7	-1.1	617	211	313	252	248		328.2	516	76	78			74	0.071		
80	315.896	581.236	0.15	0.13	0.00	0.00	72.8	74	-0.5	-2.5	114	0.040	101	101	4.7	-1	613	209	293	261	254		326.0	493	74	78			74	0.070		
90	317.368	582.527	0.15	0.13	0.00	0.00	72.8	74	-0.5	-2.5	110	0.039	101	101	3.9	-0.8	605	205	274	267	256		321.4	476	74	76			72	0.069		
100	318.846	583.827	0.15	0.13	0.00	0.00	72.8	74	-0.5	-2.5	110	0.040	100	101	3.2	-0.7	624	200	265	282	263		326.8	469	74	76			72	0.067		
110	320.318	585.129	0.15	0.13	0.00	0.00	72.8	74	-0.5	-2.5	108	0.042	97	98	2.6	-0.6	628	200	252	298	270		329.6	450	74	76			72	0.065		
120	321.798	586.433	0.15	0.13	0.00	0.00	72.8	74	-0.5	-2.5	106	0.040	100	101	2.1	-0.5	632	198	237	297	274		327.6	436	74	76			74	0.061		
130	323.281	587.724	0.15	0.13	0.00	0.00	72.8	74	-0.5	-2.5	104	0.037	104	103	1.6	-0.5	600	198	224	295	271		317.6	417	74	76			72	0.061		
140	324.756	589.018	0.15	0.13	0.00	0.00	72.8	74	-0.5	-2.5	101	0.039	101	101	1.3	-0.3	574	198	215	295	269		310.2	404	74	76			71	0.060		
150	326.240	590.322	0.15	0.13	0.00	0.00	72.8	74	-0.5	-2.5	99	0.039	101	101	1.0	-0.3	557	196	204	293	267		303.4	386	72	74			72	0.059		
160	327.725	591.612	0.15	0.13	0.00	0.00	72.8	74	-0.5	-2.5	99	0.039	101	100	0.7	-0.3	544	207	196	291	265		300.6	373	74	76			74	0.056		
170	329.204	592.920	0.15	0.13	0.00	0.00	72.8	74	-0.5	-2.5	100	0.040	99	100	0.4	-0.3	536	209	187	287	263		296.4	356	74	76			74	0.054		
180	330.685	594.232	0.15	0.13	0.00	0.00	72.8	74	-0.5	-2.5	95	0.038	102	103	0.2	-0.2	519	209	177	276	259		288.0	343	72	74			72	0.050		
190	332.170	595.545	0.15	0.13	0.00	0.00	72.8	74	-0.5	-2.5	93	0.040	99	100	0.0	-0.2	493	209	172	265	250		277.8	326	72	74			72	0.060		
Avg/Total	28.177	24.703	0.15	0.13	0.00	0.00	72.78	73.91			108.10	0.040	100.52	100.51									26		74.15	76.05	#DIV/0!	#DIV/0!		0.063		

PRINT

Final Laboratory Report - Method 5G Dual Train Dilution Tunnel Particulate Calculations

Client Name: <u>Monessen</u>	Equipment Numbers: _____	Run #: <u>Run 4 non-cat</u>
Model: <u>Encore</u>	Refer to calibrations and off site test	Train #: <u>A</u>
Project No.: <u>227-S-42-3</u>	equipment sheets	Date: <u>06/14/10</u>
Tracking No.: _____	_____	

Sample Component	Reagent	Filter # or Probe #	Weights		
			Final, mg	Tare, mg	Particulate, mg
A. Front filter catch	Filter	F672	111.7	110.1	1.6
B. Rear filter catch	Filter	F671	125.2	125.1	0.1
C. Probe catch	Probe	L	77120.5	77120.5	0.0

Total Particulate, mg :	1.7
-------------------------	-----

Component	Equations:
A. Front filter catch	Final (mg) - Tare (mg) = Particulate, mg
B. Rear filter catch	Final (mg) - Tare (mg) = Particulate, mg
C. Probe catch	Final (mg) - Tare (mg) = Particulate, mg

Analyst: Joseph Fahey Date: 7/27/10

PRINT

Final Laboratory Report - Method 5G Dual Train Dilution Tunnel Particulate Calculations

Client Name: <u>Monessen</u>	Equipment Numbers: _____	Run #: <u>Run 4 non-cat</u>
Model: <u>Encore</u>	Refer to calibrations and off site test	Train #: <u>B</u>
Project No.: <u>227-S-42-3</u>	equipment sheets	Date: <u>06/14/10</u>
Tracking No.: _____	_____	_____

Sample Component	Reagent	Filter # or Probe #	Weights		
			Final, mg	Tare, mg	Particulate, mg
A. Front filter catch	Filter	F670	117.8	116.6	1.2
B. Rear filter catch	Filter	F669	110.5	110.1	0.4
C. Probe catch	Probe	N	77899.1	77899.1	0.0

Total Particulate, mg :	1.6
-------------------------	-----

Component	Equations:
A. Front filter catch	$Final (mg) - Tare (mg) = Particulate, mg$
B. Rear filter catch	$Final (mg) - Tare (mg) = Particulate, mg$
C. Probe catch	$Final (mg) - Tare (mg) = Particulate, mg$

Analyst: Joseph Siegel Date: 7/27/10

STOVE TEMPERATURE TEST DATA - METHOD 5G

Page of

Client/Model: Messner/Encore Project #: 227-S-923 Tracking #:
 Date: 6/14/2010 Test Crew: JF Run #: 4

OMNI Equipment ID #: Refer to calibrations and off site test equipment sheets

Time	Fuel Weight	Delta Weight	Stack Draft	Ambient	Top	TEMPERATURES (oF)				Right	Flue	Catalyst
						Bottom	Back	Left	Right			
0	14.9		0.072	74	411	267	183	250	248	458		
10	12.8	2.1	0.066	73	343	295	187	243	242	421		
20	11.0	1.8	0.063	73	391	300	187	239	239	400		
30	9.6	1.4	0.077	73	402	295	179	243	241	301		
40	7.8	1.1	0.076	74	637	287	266	274	250	504		
50	6.1	1.4	0.077	73	689	282	302	295	256	567		
60	5.1	1.0	0.067	74	681	287	296	311	265	465		
70	4.3	0.8	0.064	74	611	296	250	311	270	460		
80	4.0	0.3	0.050	73	543	294	235	283	268	398		
90	3.4	0.6	0.055	73	522	298	216	269	261	363		
00	3.2											
10												
20												
30												
40												
50												
60												
70												
80												
90												
AVG												

Coal Bed: target 3.6
 Data: 0 =
 Range: 3.1 - 3.8
 Actual: Coal Bed: 3.2

Technician signature: Joseph Sigurd Date: 6/14/2010

FUEL DATA

Client: Monessen
 Model: ENCORE 3A23
 Project #: 22A-3A23 Tracking #: _____
 Date: 6/14/2010 Test Crew: Joseph Tiegs Run #: 4
 OMNI Equipment ID #: Refer to calibrations and off site test equipment sheets
 FUEL LOAD PREPARED BY: DAM (Dimension and moisture checked by JT)
 FUEL: DOUGLAS-FIR SPECIES, UNTREATED, AIR-DRIED, STANDARD GRADE OR BETTER, DIMENSIONAL LUMBER.

PRE-BURN FUEL
MOISTURE CONTENT (METER -- DRY BASIS)

CALIBRATION: Cal Value (1) = 12% Actual Reading 12
 Cal Value (2) = 22% Actual Reading 22.3

Piece	Length	Readings			Type
1	<u>6in</u> ft	<u>20.9</u>	<u>20.9</u>	<u>20.4</u>	<u>2x4</u>
2	<u>6in</u> ft	<u>22.3</u>	<u>22.7</u>	<u>17.7</u>	<u>2x4</u>
3	<u>6in</u> ft	<u>22.0</u>	<u>22.3</u>	<u>19.9</u>	<u>2x4</u>

Length of cut pieces: 6in inches Pre-Burn Fuel Average Moisture: 21.01

Time (clock): 12:27 Room Temperature (F): 72 Initials: JT

TEST FUEL

FUEL TYPE AND AMOUNT: 2x4 2 4x4 2
 CALCULATED LOAD WEIGHT: 12.6 - 15.4 ACTUAL LOAD WEIGHT: 4.75 (2x4)
10.0 (4x4)
10.0 (4x4)
4.75 Total

FUEL PIECE LENGTH: 19 1/2"

MOISTURE CONTENT (METER -- DRY BASIS)

PIECE	READINGS			TYPE
1	<u>21.0</u>	<u>21.7</u>	<u>22.6</u>	<u>2x4</u>
2	<u>21.0</u>	<u>21.9</u>	<u>22.8</u>	<u>2x4</u>
3	<u>22.3</u>	<u>22.8</u>	<u>20.6</u>	<u>4x4</u>
4	<u>22.6</u>	<u>22.6</u>	<u>21.4</u>	<u>4x4</u>
5	_____	_____	_____	_____
6	_____	_____	_____	_____
7	_____	_____	_____	_____
8	_____	_____	_____	_____
9	_____	_____	_____	_____
10	_____	_____	_____	_____

OVERALL TEST FUEL LOAD MOISTURE AVERAGE: 21.99

Time (clock): 12:32 Room Temperature (F): 72 Initials: JT

Technician signature: Joseph Tiegs Date: 6/14/2010

Run Notes

Client: Munesser

Model: Encore

Project #: 22-6-42-3

Tracking #: _____ Category #3

Run #: 4 non cat Date: 6/14/2010

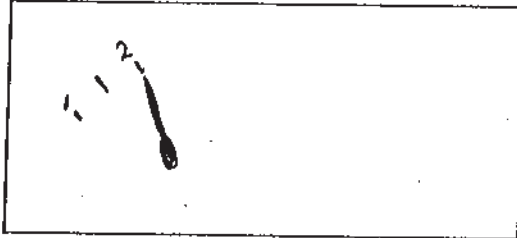
Test Crew: JT

OMNI Equipment ID #(s): Refer to calibrations and offsite test equipment sheets

PREBURN

DESCRIBE OR SKETCH AIR OR THERMOMSTAT SETTINGS BELOW:
(SETTINGS MUST BE ACCURATE AND REPRODUCIBLE)

PRIMARY:



SECONDARY: fixed

TERTIARY: N/A

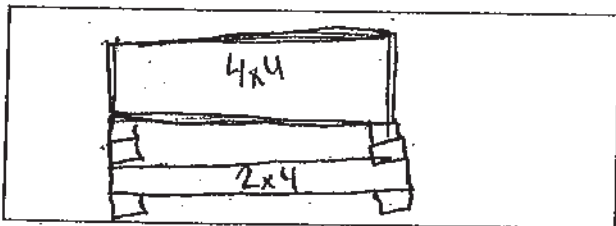
FAN: yes

PREBURN SETTINGS AND ACTIVITIES

TIME	AIR (THERMO) CHANGES PRIMARY/SECONDARY/TERTIARY	FAN SETTING CHANGE	ADD FUEL + WT.	ADD FUEL - WT.	RAKE COAL	COMMENT
28min	bypass opened when doors opened	✓	-	.2	✓	
65min	" " "	-	-	.2	✓	
68min	" " "	-	-	.3		look out + reach weight and right temp

TEST

TEST FUEL CONFIGURATION SKETCH
(INDICATE VIEW ANGLE)



START UP PROCEDURES

BYPASS: closed @ 60sec

FUEL LOADING: Done @ 45sec

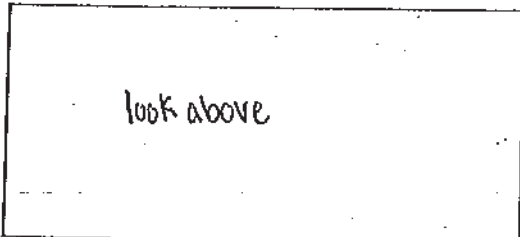
DOOR: closed @ 60sec

PRIMARY AIR: set @ 0sec

OTHER: _____

DESCRIBE OR SKETCH TEST SETTINGS BELOW:
(SETTINGS MUST BE ACCURATE AND REPRODUCIBLE)

PRIMARY:



SECONDARY: fixed

TERTIARY: N/A

FAN: yes

Technician signature: Joseph J. [Signature] Date: 6/14/2010

Supplemental Data EPA 5G/5H

Client: Monsen

Model: Encore

Project #: 2278-423 Tracking #: _____

Date: 6/14/2010 Run #: 4 Booth: _____

Test Crew: JF Start Time: 2:42PM Stop Time: 5:53PM

OMNI Equipment #(s): Refer to calibration and off site test equipment sheets

Gas Analyzer Train Leak Check:

Stack:

Dilution Tunnel (Method 5G Only):

Initial: _____

Initial: _____

Final: _____

Final: _____

Calibrations: Span Gas CO₂: _____ O₂: _____ CO: _____ CO₂(DT): _____

	N ₂ Span	N ₂ Span	N ₂ Span	N ₂ Span	N ₂ Span	N ₂ Span	N ₂ Span
Time							
O ₂							
CO ₂							
CO							
CO ₂ (DT)							

Stack Diameter (inches): 6 inch

Air Velocity (ft/min): Initial: ~~12.7 ft/sec~~ 150 ft/min JF Final: ~~12.7 ft/sec~~ 150 ft/min JF

Scale Audit (lbs): Pretest: 10 Post Test: 10

Induced Draft: 0 %Smoke Capture: 100%

Pitot Tube Leak Test: Pre: JF ✓ Post: JF ✓

Flue Pipe Cleaned Prior to First Test in Series: Date: 6/6 Initials: JF

	Initial	Middle	Ending
Pb (in/Hg)	JF 29.83 29.28	29.28 29.83 JF	JF 29.83 29.28
Room Temp (°F)	JF 72 73	72	72

Technician signature: Joseph Jiggs Date: 6/14/2010

*Model: Encore
Monessen Hearth Systems
P.O. Box 501
Bethel, VT 05032*

Run 5

Wood Heater Test Data - EPA Method 5G

Manufacturer: Monessen
 Model: Encore Non-Cat
 Project No.: #REF!
 Tracking No.: 227-S-42-3
 Run: 5
 Test Date: 06/13/10

Burn Rate	1.12 kg/hr dry
Average Tunnel Temperature	96 degrees Fahrenheit
Average Gas Velocity in Dilution Tunnel - vs	13.3 feet/second
Average Gas Flow Rate in Dilution Tunnel - Qsd	8438.9 dscf/hour
Average Delta p	0.037 inches H2O
Average Delta H	0.00 inches H2O
Total Time of Test	290 minutes

	AVERAGE	SAMPLE TRAIN 1	SAMPLE TRAIN 2
Total Sample Volume - Vm	40.18 cubic feet	42.74 cubic feet	37.62 cubic feet
Average Gas Meter Temperature	72 degrees Fahrenheit	71 degrees Fahrenheit	72 degrees Fahrenheit
Total Sample Volume (Standard Conditions) - Vmstd	39.7 dscf	41.8 dscf	37.6 dscf
Total Particulates - mn		3.1 mg	2.8 mg
Particulate Concentration (dry-standard)	0.00007 grams/dscf	0.00007 grams/dscf	0.00007 grams/dscf
Particulate Emission Rate	0.63 grams/hour	0.63 grams/hour	0.63 grams/hour
Adjusted Emissions	1.24 grams/hour	1.23 grams/hour	1.24 grams/hour
Difference from Average		0.00 grams/hour	0.00 grams/hour
7.5% of the average emission rate	0.09		
Weighted Average Emission Rate Limit	4.10 grams/hour		
7.5% of the weighted average emission rate limit	0.31		
Results Are Acceptable			

Wood Heater Test Data - EPA Method 5G

Run: 5
 Manufacturer: Mouessen
 Model: Encore Non-Cat
 Tracking No.: _____
 Project No.: 227-S-42-3
 Test Date: 13-Jun-10
 Beginning Clock Time: 10:12
 Recording Interval: 10 min.
 Total Sampling Time: 290 min.

	Pt.1	Pt.2	Pt.3	Pt.4	Pt.5	Pt.6	Pt.7	Pt.8	
Initial dP	0.026	0.037	0.040	0.036	0.026	0.039	0.039	0.036	"H2O
Initial Temp.	95	95	95	95	95	95	95	95	oF

OMNI Equipment Numbers: _____ Refer to calibrations and off site test equipment sheets

PM Control Module: _____
 Dilution Tunnel MW(dry): 29.00 lb/lb-mole
 Dilution Tunnel MW(wet): 28.55 lb/lb-mole
 Dilution Tunnel H2O: 4.00 percent
 Dilution Tunnel Static: -0.130 "H2O
 Pitot Tube Cp: 0.99
 Meter Box Y Factor: 1 (1) 1.025 (2)
 Barometric Pressure: 29.42 29.4 29.39 Average 29.40 "Hg

Signature/Date: Joseph [Signature]
 Tunnel Velocity: 13.32 ft/sec.
 Initial Tunnel Flow: 135.4 scfm
 Average Tunnel Flow: 140.6 scfm
 Tunnel Area: 0.1963 ft²
 Post-Test Leak Check (1): 0.004 @ -4 cfm/"Hg
 Post-Test Leak Check (2): 0.006 @ -8 cfm/"Hg
 Fuel Moisture (dry basis %): 22
 Total Particulate (1): 3.1
 Total Particulate (2): 2.8

Elapsed Time	Particulate Sampling Data														Fuel Weight, lb		Wood Heater Temperature Data, oF														Stack	
	Gas Meter Cubic Feet (1)	Gas Meter Cubic Feet (2)	Sample Rate, cfm (1)	Sample Rate, cfm (2)	Orifice dH (1)	Orifice dH (2)	Meter oF (1)	Meter oF (2)	Meter Vac. In. Hg. (1)	Meter Vac. In. Hg. (2)	Dilution Tunnel Temp.	Dilution Tunnel dP	Pro. Rate (10%) (1)	Pro. Rate (10%) (2)	Scale Reading	Weight Change	Firebox Top	Firebox Bottom	Firebox Back	Firebox Left	Firebox Right	Catalyst Exit	Average Surface	Stack	Filter (1)	Filter (2)	Impinger exit (1)	Impinger exit (2)	Ambient	Draft In. H2O		
0	243.521	517.539			0.00	0.00	70	72	-0.6	-2.5	95	0.035			14.6		478	361	417	354	335		389.0	306	72	70			72	0.049		
10	245.042	518.832	0.15	0.13	0.00	0.00	70.8	72	-0.6	-2.5	93	0.038	103	99	14.0	-0.6	361	330	402	315	302		342.0	341	72	70			72	0.051		
20	246.540	520.118	0.15	0.13	0.00	0.00	70.9	71.9	-0.6	-2.5	95	0.037	103	100	13.2	-0.8	322	300	430	285	272		321.8	404	72	72			72	0.057		
30	248.028	521.390	0.15	0.13	0.00	0.00	71	71.9	-0.6	-2.5	102	0.040	99	96	12.0	-1.2	343	283	482	265	256		325.8	452	72	72			70	0.064		
40	249.502	522.663	0.15	0.13	0.00	0.00	71	72.1	-0.6	-2.5	103	0.039	99	98	10.9	-1.1	389	267	540	258	254		341.6	478	74	72			70	0.067		
50	250.967	523.948	0.15	0.13	0.00	0.00	71	72.1	-0.6	-2.5	104	0.037	102	101	9.7	-1.2	447	256	577	263	261		360.8	471	74	72			70	0.069		
60	252.435	525.242	0.15	0.13	0.00	0.00	71	72.1	-0.6	-2.5	104	0.038	100	101	8.6	-1.1	491	246	587	272	272		373.6	463	74	72			72	0.068		
70	253.905	526.530	0.15	0.13	0.00	0.00	71	72.1	-0.6	-2.5	104	0.039	99	99	7.6	-1	521	239	583	285	285		382.6	461	74	72			72	0.068		
80	255.378	527.783	0.15	0.13	0.00	0.00	71	72.1	-0.6	-2.5	104	0.040	98	95	6.6	-1	549	237	579	300	302		393.4	461	74	74			70	0.067		
90	256.843	529.131	0.15	0.13	0.00	0.00	71	72.1	-0.6	-2.5	102	0.038	100	105	5.7	-0.9	562	235	568	313	313		398.2	437	74	72			70	0.066		
100	258.308	530.428	0.15	0.13	0.00	0.00	71	72.1	-0.6	-2.5	102	0.037	101	102	4.9	-0.8	570	233	551	322	322		399.6	430	74	72			72	0.065		
110	259.775	531.705	0.15	0.13	0.00	0.00	71	72.1	-0.6	-2.5	100	0.037	101	100	4.2	-0.7	573	231	545	333	330		402.4	419	72	72			70	0.063		
120	261.255	532.995	0.15	0.13	0.00	0.00	71	72.1	-0.6	-2.5	97	0.037	102	101	3.6	-0.6	547	233	521	341	337		395.8	396	74	72			70	0.062		
130	262.723	534.286	0.15	0.13	0.00	0.00	71	72.1	-0.6	-2.5	96	0.038	100	100	3.1	-0.5	532	231	500	351	342		391.2	387	73	73			71	0.060		
140	264.190	535.570	0.15	0.13	0.00	0.00	71	72.1	-0.6	-2.5	96	0.038	100	99	2.6	-0.5	537	227	476	366	342		389.6	368	72	72			72	0.058		
150	265.662	536.862	0.15	0.13	0.00	0.00	71	72.1	-0.6	-2.5	96	0.039	99	98	2.2	-0.4	539	227	449	377	342		386.8	344	73	73			73	0.055		
160	267.137	538.165	0.15	0.13	0.00	0.00	71	72.1	-0.6	-2.5	95	0.038	100	100	1.9	-0.3	512	225	423	379	338		375.4	327	73	73			73	0.052		
170	268.606	539.453	0.15	0.13	0.00	0.00	71	72.1	-0.6	-2.5	93	0.036	102	102	1.7	-0.2	493	224	400	380	337		366.8	313	74	74			72	0.050		
180	270.083	540.752	0.15	0.13	0.00	0.00	71	72.1	-0.6	-2.5	94	0.036	103	103	1.5	-0.2	476	224	378	389	335		360.4	298	74	72			74	0.049		
190	271.546	542.047	0.15	0.13	0.00	0.00	71	72.1	-0.6	-2.5	92	0.040	96	97	1.3	-0.2	468	225	359	392	333		355.4	288	75	73			73	0.045		
200	273.020	543.354	0.15	0.13	0.00	0.00	71	72.1	-0.6	-2.5	92	0.039	98	99	1.2	-0.1	462	223	344	390	329		349.6	277	73	73			75	0.044		
210	274.498	544.655	0.15	0.13	0.00	0.00	71	72.1	-0.6	-2.5	91	0.036	103	103	1.0	-0.2	453	223	329	386	321		342.4	267	73	73			73	0.041		
220	275.961	545.940	0.15	0.13	0.00	0.00	71	72.1	-0.6	-2.5	91	0.037	100	100	0.9	-0.1	447	221	317	375	315		335.0	258	74	74			76	0.040		
230	277.440	547.265	0.15	0.13	0.00	0.00	71	72.1	-0.6	-2.5	89	0.036	103	104	0.7	-0.2	439	219	304	367	308		327.4	250	74	74			76	0.039		
240	278.905	548.605	0.15	0.13	0.00	0.00	71	72.1	-0.6	-2.5	90	0.035	103	107	0.6	-0.1	432	217	293	358	304		320.8	245	74	74			76	0.038		
250	280.389	549.900	0.15	0.13	0.00	0.00	71	72.1	-0.6	-2.5	90	0.036	103	102	0.5	-0.1	420	214	285	348	296		312.6	242	74	74			74	0.037		
260	281.849	551.215	0.15	0.13	0.00	0.00	71	72.1	-0.6	-2.5	90	0.036	101	104	0.4	-0.1	407	209	276	335	292		303.8	237	75	72			75	0.037		
270	283.317	552.510	0.15	0.13	0.00	0.00	71	72.1	-0.6	-2.5	90	0.038	99	99	0.3	-0.1	394	205	268	322	285		294.8	231	75	73			77	0.036		
280	284.784	553.825	0.15	0.13	0.00	0.00	71	72.1	-0.6	-2.5	90	0.037	100	102	0.1	-0.2	381	204	262	312	281		288.0	227	75	73			75	0.036		
290	286.256	555.154	0.15	0.13	0.00	0.00	71	72.1	-0.6	-2.5	88	0.037	101	103	0.0	-0.1	370	199	255	299	277		280.0	223	75	73			75	0.035		
Avg/Total	42.735	37.615	0.15	0.13	0.00	0.00	70.96	72.08			95.60	0.037	100.69	100.70									109		73.60	72.50	#DIV/0!	#DIV/0!		0.052		

PRINT

Final Laboratory Report - Method 5G Dual Train Dilution Tunnel Particulate Calculations

Client Name: <u>Monessen</u>	Equipment Numbers: _____	Run #: <u>Run 5 non-cat</u>
Model: <u>Encore</u>	Refer to calibrations and off site test	Train #: <u>A</u>
Project No.: <u>227-S-42-3</u>	equipment sheets	Date: <u>06/13/10</u>
Tracking No.: _____	_____	

Sample Component	Reagent	Filter # or Probe #	Weights		
			Final, mg	Tare, mg	Particulate, mg
A. Front filter catch	Filter	F680	127.2	125.0	2.2
B. Rear filter catch	Filter	F679	116.8	116.5	0.3
C. Probe catch	Probe	A	76439.4	76438.8	0.6

Total Particulate, mg :	3.1
-------------------------	-----

Component	Equations:
A. Front filter catch	Final (mg) - Tare (mg) = Particulate, mg
B. Rear filter catch	Final (mg) - Tare (mg) = Particulate, mg
C. Probe catch	Final (mg) - Tare (mg) = Particulate, mg

Analyst: *Joseph Siega* Date: 7/12/10

PRINT

Final Laboratory Report - Method 5G Dual Train Dilution Tunnel Particulate Calculations

Client Name: <u>Monessen</u>	Equipment Numbers: _____	Run #: <u>Run 5 non-cat</u>
Model: <u>Eucore</u>	Refer to calibrations and off site test	Train #: <u>B</u>
Project No.: <u>227-S-42-3</u>	equipment sheets	Date: <u>06/13/10</u>
Tracking No.: _____	_____	

Sample Component	Reagent	Filter # or Probe #	Weights		
			Final, mg	Tare, mg	Particulate, mg
A. Front filter catch	Filter	F678	112.6	110.1	2.5
B. Rear filter catch	Filter	F677	124.8	124.8	0.0
C. Probe catch	Probe	J	76840.9	76840.6	0.3

Total Particulate, mg :	2.8
-------------------------	-----

Component	Equations:
A. Front filter catch	Final (mg) - Tare (mg) = Particulate, mg
B. Rear filter catch	Final (mg) - Tare (mg) = Particulate, mg
C. Probe catch	Final (mg) - Tare (mg) = Particulate, mg

Analyst: *Joseph Siegs* Date: 7/27/10

STOVE TEMPERATURE TEST DATA - METHOD 5G

Page of

Client/Model: Manessen/Encore Project #: 227-8-42-S Tracking #:
Date: 6/13/2010 Test Crew: JF Run #: 3F

OMNI Equipment ID #: Refer to calibrations and off site test equipment sheets

Preburn Test	Time	Fuel Weight	Delta Weight	Stack Draft	TEMPERATURES (oF)						Actual:	
					Ambient	Top	Bottom	Back	Left	Right		Flue
	0	13.8		0.072	70	479	418	246	366	244	476	
	10	11.8	2.0	0.064	70	500	429	279	344	268	383	
	20	10.5	1.3	0.061	70	476	396	305	370	285	366	
	30	9.1	1.4	0.069	71	490	383	332	364	296	440	
	40	7.7	1.4	0.072	71	496	385	453	353	290	472	
	50	6.4	1.3	0.073	71	535	384	516	353	299	501	
	60	5.2	1.2	0.073	71	477	321	580	351	301	496	
	70	4.1	0.8	0.060	72	482	323	600	368	308	445	
	80	4.1	.3	0.06	72	499	336	566	367	319	384	
	90	3.9	.2	0.056	72	504	350	512	367	330	354	
	00	3.8	.1	0.057	72	503	354	465	363	324	330	
	10	3.6	.2	0.050	72	493	356	430	352	332	311	
	20	3.4										
	30											
	40											
	50											
	60											
	70											
	80											
	90											
	AVG											

Coal Bed: target 3.6 Data: 0 = Range: 2.92 - 3.65 Coal Bed: 3.4

Technician signature: Joseph Scarp Date: 6/13/2010

FUEL DATA

Client: Monesen
 Model: Encore
 Project #: 227-S-A2-S Tracking #: _____
 Date: 6/13/2010 Test Crew: JF Run #: 3 noncat
 OMNI Equipment ID #: Refer to calibrations and offsite test equipment sheets
 FUEL LOAD PREPARED BY: Dan (Dimensions and moisture checked by JF)
 FUEL: DOUGLAS-FIR SPECIES, UNTREATED, AIR-DRIED, STANDARD GRADE OR BETTER,
 DIMENSIONAL LUMBER.

PRE-BURN FUEL
MOISTURE CONTENT (METER -- DRY BASIS)

CALIBRATION: Cal Value (1) = 12% Actual Reading 12
 Cal Value (2) = 22% Actual Reading 22.3

Piece	Length	Readings			Type
1	<u>6 in</u> ft	<u>21.1</u>	<u>20.0</u>	<u>19.9</u>	<u>2x4</u>
2	<u>"</u> ft	<u>22.3</u>	<u>20.9</u>	<u>20.4</u>	<u>"</u>
3	<u>"</u> ft	<u>21.4</u>	<u>21.3</u>	<u>20.5</u>	<u>"</u>

Length of cut pieces: 6 inches Pre-Burn Fuel Average Moisture: 20.88
 Time (clock): 7:36 Room Temperature (F): 69 Initials: JF

TEST FUEL

FUEL TYPE AND AMOUNT: 2x4 2 4x4 2
 CALCULATED LOAD WEIGHT: 12.6 - 10.4 ACTUAL LOAD WEIGHT: 4.9 (2x4)
9.8 (4x4)
14.6 Total
14.6 JF

FUEL PIECE LENGTH: 19 1/2"

MOISTURE CONTENT (METER -- DRY BASIS)

PIECE	READINGS			TYPE
1	<u>23.0</u>	<u>23.3</u>	<u>22.7</u>	<u>2x4</u>
2	<u>21.0</u>	<u>21.3</u>	<u>21.6</u>	<u>2x4</u>
3	<u>19.9</u>	<u>23.6</u>	<u>22.8</u>	<u>4x4</u>
4	<u>22.8</u>	<u>21.1</u>	<u>20.9</u>	<u>4x4</u>
5	_____	<u>?</u>	_____	_____
6	_____	_____	_____	_____
7	_____	_____	_____	_____
8	_____	_____	_____	_____
9	_____	_____	_____	_____
10	_____	_____	_____	_____

OVERALL TEST FUEL LOAD MOISTURE AVERAGE: 22
 Time (clock): 7:39 Room Temperature (F): 70 Initials: JF

Technician signature: Joseph J. J... Date: 6/13/2010

Run Notes

Client: Monessen

Model: Encore

Project #: 2215-42-5 confirmation test (w/ no fan)

Tracking #: _____

Run #: 5 non cat Date: 6/13/2010

Test Crew: Joseph A Tiegs

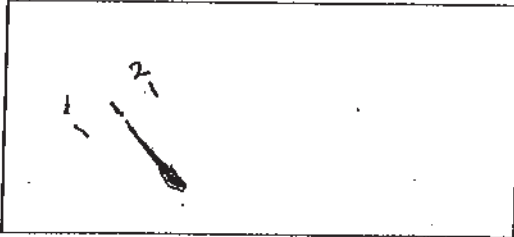
OMNI Equipment ID #(s): Refer to calibrations and offsite test equipment sheets

cut-2
copy

PREBURN

DESCRIBE OR SKETCH AIR OR THERMOMSTAT SETTINGS BELOW:
(SETTINGS MUST BE ACCURATE AND REPRODUCIBLE)

PRIMARY:



SECONDARY: fixed

TERTIARY: N/A

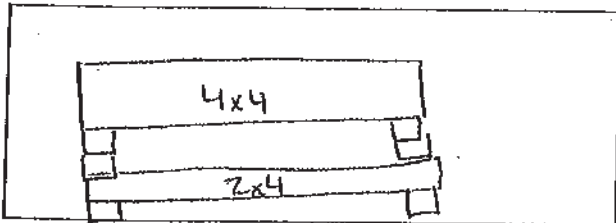
FAN: NO FAN

PREBURN SETTINGS AND ACTIVITIES

TIME	AIR (THERMO) CHANGES PRIMARY/SECONDARY/TERTIARY	FAN SETTING CHANGE	ADD FUEL + WT.	ADD FUEL - WT.	RAKE COAL	COMMENT
25 min	bypass opened when doors opened	-	-	.2	✓	stirring coals
40 min	bypass opened when doors opened	-	-	.1	✓	"

TEST

TEST FUEL CONFIGURATION SKETCH
(INDICATE VIEW ANGLE)



START UP PROCEDURES

BYPASS: closed @ 60 sec

FUEL LOADING: Done @ 45 sec

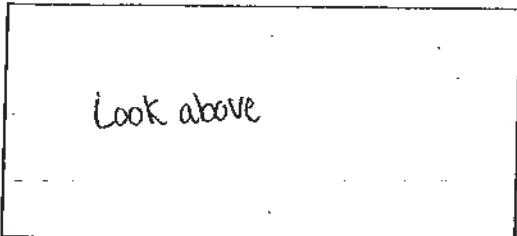
DOOR: closed @ 60 sec

PRIMARY AIR: set @ 0 sec

OTHER: _____

DESCRIBE OR SKETCH TEST SETTINGS BELOW:
(SETTINGS MUST BE ACCURATE AND REPRODUCIBLE)

PRIMARY:



SECONDARY: fixed

TERTIARY: N/A

FAN: NO FAN

Technician signature: Joseph Tiegs

Date: 6/13/2010
4-46 OF 4-47

Supplemental Data EPA 5G/5H

Client: Monessen

Model: Encore

Project #: 2275423 Tracking #: _____

Date: 6/13/2010 Run #: 37 Booth: _____

Test Crew: JT Handling: 7:30AM preburn: 9:00AM Start Time: 10:12 Stop Time: 3:09

OMNI Equipment #(s): Refer to calibrations and off site test equipment sheets

Gas Analyzer Train Leak Check:

Stack: Initial: _____ Final: _____

Dilution Tunnel (Method 5G Only): Initial: _____ Final: _____

Calibrations: Span Gas _____ CO₂: _____ O₂: _____ CO: _____ CO₂(DT): _____

Time	N ₂ Span	N ₂ Span	N ₂ Span	N ₂ Span	N ₂ Span	N ₂ Span	N ₂ Span
O ₂							
CO ₂							
CO							
CO ₂ (DT)							

Stack Diameter (inches): 6in

Air Velocity (ft/min): Initial: ~~12.77~~ 12.77/sec Final: ~~13.19~~ 13.19/sec

Scale Audit (lbs): Pretest: 10 Post Test: 10

Induced Draft: 0 %Smoke Capture: 100%

Pitot Tube Leak Test: Pre: JT V Post: JT V

Flue Pipe Cleaned Prior to First Test in Series: Date: 6/16 Initials: JT

	Initial	Middle	Ending
Pb (in/Hg)	<u>JT 29.97 29.42</u>	<u>29.4 29.955 JT</u>	<u>29.39 29.94 JT</u>
Room Temp (°F)	<u>72 72</u>	<u>72</u>	<u>JT 74 75</u>

Technician signature: Joseph Jiggs Date: 6/13/2010

*Model: Encore
Monessen Hearth Systems
P.O. Box 501
Bethel, VT 05032*

Section 5

Sampling Procedures and Test Results

INTRODUCTION

Monessen Hearth Systems retained *OMNI* to perform U.S. Environmental Protection Agency (EPA) certification testing on the Encore wood stove. The Encore wood stove is a non-catalytic, freestanding, radiant-type room heater. The firebox is constructed of cast iron. Usable firebox volume was measured to be 2.0 cubic feet and the stove is vented through a 6-inch diameter flue collar located at the top of the unit.

The testing was performed at Monessen's facility in Bethel, Vermont. The unit was observed to be in good condition. *OMNI* representative Joseph Tiegs conducted the certification testing and completed all testing by June 14, 2010. The EPA was notified of the testing dates in a letter dated June 7, 2010. A testing contract, including provisions for Random Compliance Audit (RCA) testing, has been signed by Doug Fongeallaz of Monessen Hearth Systems and is on file at *OMNI*'s testing facility.

The Encore wood stove was tested in accordance with the U.S. EPA 40 CFR Part 60, Subpart AAA – Standard of Performance for Residential Wood Heaters (Appendix A, Methods 28 and 5G). Particulate emissions were measured using a Method 5G sampling train consisting of two filters (front and back). The weighted average emissions of the four test runs included in the results indicate a particulate emission level of 1.5 grams per hour. Run #5, a category II confirmation test run, was performed and was not used in the weighted average emission results. Test runs were conducted in each of three burn rate categories (0.80-1.25 kg/hr, 1.25-1.90 kg/hr, and maximum). Emissions for each of their individual test runs did not exceed the cap. The Encore results are within the emission limit of 7.5 grams per hour for non-catalytic affected facilities manufactured on or after July 1, 1990, or sold at retail on or after July 1, 1992.

The wood heater was sealed after completion of testing in compliance with the EPA regulation as follows:

- “DO NOT TAMPER” labels were placed on the door and on all other openings.
- Plastic material sealed with “DO NOT TAMPER” labels and tape was wrapped around the unit.
- The unit was sealed in a wood box constructed for the unit and secured with steel banding.
- “DO NOT TAMPER” labels were placed on all outer surfaces of the box.

This report is organized in accordance with the EPA-recommended outline and is summarized in the Table of Contents immediately preceding this report. The results in this report are limited to the item submitted.

Table 1.1 – Particulate Emissions

Run	Burn Rate (kg/hr dry)	Method 5G Emissions (g/hr)
1	0.84	2.47
2	1.15	1.26
3	2.86	1.74
4	1.71	1.10
Weighted particulate emission average of four test runs: 1.6 grams per hour.		

Table 1.2 – Test Facility Conditions

Run	Room Temperature (°F)		Barometric Pressure (Hg)		Air Velocity (ft/min)	
	Before	After	Before	After	Before	After
1	76	79	29.57	29.57	<50	<50
2	69	72	29.57	29.51	<50	<50
3	72	72	29.30	29.28	<50	<50
4	73	72	29.28	29.28	<50	<50

Table 1.3.1 – Fuel Measurement and Crib Description Summary – PRETEST

Run	Pretest Fuel Weight (Starting weight in lbs)	Pretest Moisture (Dry basis - %)	Coal Bed Weight (lbs)
1	14.0	20.8	3.5
2	14.0	18.7	3.5
3	21.0	20.4	3.4
4	14.9	21.0	3.2

Table 1.3.2 – Fuel Measurement and Crib Description Summary – TEST

Run	Test Fuel Wet Basis (lbs)	Firebox Volume (ft ³)	Fuel Loading Density Wet Basis (lbs/ft ³)	Fuel Moisture Content Dry (%)	Piece Length (in)	2x4s Used	4x4s Used
1	15.0	2.0	7.50	21.1	19.5	2	2
2	14.8	2.0	7.40	20.9	19.5	2	2
3	15.3	2.0	7.65	21.1	19.5	2	2
4	14.6	2.0	7.30	22.0	19.5	2	2

Table 1.4 – Dilution Tunnel Gas Measurements and Sampling Data Summary

Run	Length of Test (min)	Average Dilution Tunnel Gas Measurements		
		Velocity (ft/sec)	Flow Rate (dscf/min)	Temperature (°F)
1	400	14.69	156.8	92.8
2	290	14.18	151.3	92.1
3	120	14.60	143.0	136.7
4	190	13.91	143.0	108.1

Table 1.5 - Heater Operation Data (Average Temperature Data)

Run	Beginning Surface Temperature Average ^a	Ending Surface Temperature Average ^a	Surface Delta T ^b
1	333.8	225.6	108
2	330.0	236.4	94
3	427.6	373.2	54
4	304.0	277.8	26

a. All temperatures are in degrees F.
 b. Represents the difference between beginning and ending average surface temperatures.

Table 1.6 – Pretest Configuration

Run	Combustion Air (in)	Fuel Added	Fuel Removed	Time (min)
1	Fully Closed	14.0 lbs at start; no addition; coal bed 3.5 lbs	0.85	120
2	Halfway Between Settings 1 and 2	14.0 lbs at start; no addition; coal bed 3.5 lbs	0.30	120
3	Fully Open	21.0 lbs at start; no addition; coal bed 3.4 lbs	0.40	70
4	Setting 2	14.9 lbs at start; no addition; coal bed 3.2 lbs	0.70	90

Table 1.7 – Run Data

Run	Average Dry Burn Rate (kg/hr)	Initial (Induced) Draft (H ₂ O)	Primary Air Setting (in)	Run Time (min)	Average Draft (H ₂ O)
1	0.84	0	Fully Closed	400	-0.041
2	1.15	0	Halfway Between Settings 1 and 2	290	-0.052
3	2.86	0	Fully Open	120	-0.078
4	1.71	0	Setting 2	190	-0.063

Table 1.8 – Test Configurations

Run	Five-Minute Startup	Combustion Air
1	<u>Bypass</u> : Closed at 60 seconds. <u>Fuel Loading</u> : Completed by 45 seconds. <u>Door</u> : Closed at 60 seconds. <u>Primary Air</u> : Set at 0 seconds. <u>Other</u> : None. <u>Secondary</u> : Fixed. <u>Tertiary</u> : N/A. <u>Fan</u> : On for duration of test.	Fully Closed
2	<u>Bypass</u> : Closed at 60 seconds. <u>Fuel Loading</u> : Completed by 45 seconds. <u>Door</u> : Closed at 60 seconds. <u>Primary Air</u> : Set at 0 seconds. <u>Other</u> : None. <u>Secondary</u> : Fixed. <u>Tertiary</u> : N/A. <u>Fan</u> : On for duration of test.	Halfway Between Settings 1 and 2
3	<u>Bypass</u> : Closed at 60 seconds. <u>Fuel Loading</u> : Completed by 45 seconds. <u>Door</u> : Closed at 60 seconds. <u>Primary Air</u> : Set at 0 seconds. <u>Other</u> : None. <u>Secondary</u> : Fixed. <u>Tertiary</u> : N/A. <u>Fan</u> : On high for duration of test.	Fully Open
4	<u>Bypass</u> : Closed at 60 seconds. <u>Fuel Loading</u> : Completed by 45 seconds. <u>Door</u> : Closed at 60 seconds. <u>Primary Air</u> : Set at 0 seconds. <u>Other</u> : None. <u>Secondary</u> : Fixed. <u>Tertiary</u> : N/A. <u>Fan</u> : On for duration of test.	Setting 2

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TEST RESULTS AND DISCUSSION

A total of five test runs were performed on the Encore wood stove. Four test runs were conducted in the following categories and included in the weighted average emission level results: two in the 0.80 to 1.25 kg/hr dry category; one in the 1.25 to 1.90 kg/hr dry category; and one at maximum.

The weighted particulate emission level was measured to be **1.6 g/hr**.

The proportionality results for all five test runs were acceptable. Quality check results for each test run are presented in Section 2 of this report.