

TEST REPORT

Intertek

REPORT NUMBER: 100719074PRT-004

REPORT DATE: July 3, 2012

EVALUATION CENTER

Intertek Testing Services NA Inc.

22887 NE Townsend Way

Fairview Oregon 97024

RENDERED TO

Hearth & Home Technologies

1445 North Hwy

Colville Washington 99114

PRODUCT EVALUATED:

MODEL OEM LARGE PELLETT FIRED ROOM HEATER

PH50PS

Report of Testing Model OEM Large Pellet fired Room Heater for compliance as an "Affected Facility" with the applicable requirements of the following criteria: EPA Method 28 "Certification and Auditing of Wood Heaters" and EPA Method 5G "Determination of Particulate Matter Emissions from Wood Heaters".

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I. INTRODUCTION

Intertek Testing Services NA (Intertek) has conducted testing for Hearth & Home Technologies, on model OEM Large Pellet Fired Solid Fuel Room Heater, to evaluate all applicable performance requirements included in EPA Method 28 "Certification and auditing of wood heaters" and Method 5G "Determination of particulate matter emissions from wood heaters." Method 5G2 was used to evaluate emission rates from the OEM Large Pellet stove. 5G2 utilizes a Method 5H sample train that extracts samples from a Dilution Tunnel. This method does not require results be corrected to obtain an EPA adjusted emission result.

I.A PURPOSE OF TEST

The test was conducted to determine if the unit is in accordance with U.S EPA requirements under 40 CFR 60 SUBPART AAA, NSPS for Residential Wood Heaters. This evaluation was conducted on April 25, 2012

I.B LABORATORY

The test on the OEM Large Pellet fired Solid Fuel Room Heater was conducted at the client facility located at 1445 North Highway, Colville Washington. The facility elevation is 1635 feet above sea level. Intertek Portland is accredited by the U.S. EPA, Certificate Number 8. The test was conducted by Bruce Davis.

I.C DESCRIPTION OF UNIT

The model OEM Large Solid Fuel Room Heater is constructed of carbon steel. The outer dimensions are 24-inches deep, 34-inches high, and 24-inches wide. The unit has a door located on the front with a viewing glass for loading the fuel. Heat output is controlled via a control knob located on the right side of the appliance. Between minimum and maximum heat output settings is labeled as "Dynamic Mode". Within this mode are three individual heat output settings that the appliance will automatically modulate between in an attempt to maintain a predetermined temperature differential within the unit. Due to this modulation it was determined by the manufacturer that the appliance would not operate on its own within a medium low and medium high burn rate category as specified by the test method. An approval was granted by EPA representative John Dupree to allow the appliance to be held in one of the three Dynamic mode settings via a computer interface in order to conduct a medium low and medium high burn rate test.

(See product drawings.)

Proprietary drawings and manufacturing methods are on file at Intertek in Intertek's Portland, OR office.

I.D REPORT ORGANIZATION

This report includes summaries of all data necessary to determine compliance with the regulations. Raw data, calibration records, intermediate calculations, drawings, specifications and other supporting information are contained in appendices to this report.

II. SUMMARIZATION

II.A PRETEST INFORMATION

A sample was submitted to Intertek directly from the client at the Hearth & Home test facility, the sample was not independently selected for testing. The test unit was received at the client facility on April 24, 2012. The unit was inspected upon receipt and found to be in good condition. The unit was set up following the manufacturer's instructions without difficulty.

Following assembly, the unit was placed on the test stand and instrumented with thermocouples in the specified locations. Prior to beginning the emissions tests the unit had been operated in excess of 10 hours during research and development tests conducted by Hearth & Home personnel.

Prior to testing the unit's chimney system and laboratory dilution tunnels was cleaned using standard wire brush chimney cleaning equipment.

II.B INFORMATION LOG

TEST STANDARD

From April 25 through April 26, 2012 the unit was tested for EPA emissions using test method 5G2. A sample train described in EPA method 5H was used to extract a proportionate sample from the dilution tunnel. A heated front filter, four Impingers and a rear filter made up the sample train.

Deviation from Standard Method

No deviations from the standards were performed, however, only the applicable sections from each standard were used during all testing.

II.C SUMMARY OF TEST RESULTS

RUN #1 April 25, 2012: Control knob was set to minimum output, feed rate, combustion blower, and convection fan automatically set to a predetermined setting via a printed circuit board. A burn rate of 0.62 kg/hr was achieved producing 9,256 BTU's per hour using EPA calculation.

RUN #2 April 25, 2012: Control knob was set to maximum output, feed rate, combustion blower, and convection fan automatically set to a predetermined setting via a printed circuit board. A burn rate of 2.17 kg/hr was achieved producing 32,396 BTU's per hour using EPA calculations.

RUN #3 April 26, 2012: Control knob on the appliance was set to maximum and the heat output was controlled via a computer interface (see stove description section I.C) Auger feed time set to 1.6 seconds on out of a 7 second duty cycle. Combustion blower was set to a program value of 2080. A burn rate of 0.98 kg/hr was achieved producing 14,640 BTU's per hour using EPA calculations.

RUN #4 April 26, 2012: Control knob on the appliance was set to maximum and the heat output was controlled via a computer interface (see stove description section I.C) Auger feed time set to 2.2 seconds on out of a 7 second duty cycle. Combustion blower was set to a program value of 2200. A burn rate of 1.36 kg/hr was achieved producing 20,303 BTU's per hour using EPA calculations.

II.D SUMMARY OF OTHER DATA

EMISSIONS

Run Number	Test Date	Burn Rate (kg/hr)	Emission Rate (g/hr)	Heating Efficiency* (% HHV)
1	4/25/12	2.17	1.12	84.4
2	4/25/12	0.62	0.59	85.2
3	4/26/12	0.98	0.76	84.9
4	4/26/12	1.36	0.60	84.4

*Efficiency determined per CSA B415.1-2010.

WEIGHTED AVERAGE CALCULATION

Test No.	Burn Rate	(E) Average Emission Rate g/hr	Heat Output (Btu/hr)	Probability	(K) Weighting Factor	(KxE)
2	0.62	0.59	9,256	0.1084	0.3592	0.2119
3	0.98	0.76	14,631	0.3592	0.5538	0.4209
4	1.36	0.60	20,304	0.6622	0.5744	0.3446
1	2.17	1.12	32,396	0.9336	0.3378	0.3783
Totals:					1.8252	1.3558
Weighted average emission rate:						0.7428

TEST FACILITY CONDITIONS

Run	Room Temp. °F before	Room Temp °F after	Baro. Pres. In. Hg before	Baro. Pres. In. Hg after	Air Vel. Ft/min before	Air Vel. Ft/min after
1	79	84	28.30	28.26	<50	<50
2	76	72	28.26	28.26	<50	<50
3	71	73	27.93	27.91	<50	<50
4	76	73	27.91	28.16	<50	<50

DILUTION TUNNEL FLOW RATE MEASUREMENTS AND SAMPLING DATA (5G-2)

Run No.	Burn Time (min)	Velocity (ft/sec)	Volumetric Flow Rate (dscf/min)	Total Temp. (°R)	Volume of Sample	Particulate Catch (mg)
1	120	13.46	135.32	561	62.763	8.66
2	120	12.42	129.20	542	62.415	4.76
3	120	14.17	146.38	539	62.905	5.46
4	120	12.35	126.34	547	61.562	4.85

GENERAL SUMMARY OF RESULTS

Run No.	Burn Rate (kg/hr)	Change In Surface Temp (°F)	Initial Draft (in/H ₂ O)	Run Time (min)	Average Draft (in/H ₂ O)
1	0.62	1.0	-0.042	120	-0.042
2	2.17	8.2	-0.021	120	-0.02
3	0.98	0.0	-0.028	120	-0.028
4	1.36	21.2	-0.032	120	-0.032

III. PROCESS DESCRIPTION

III.A TEST SET-UP DESCRIPTON

A standard 6" diameter single wall pipe and insulated chimney system was installed to 15' above floor level as specified by EPA regulations. A 3 inch elbow was installed at the flue collar; a 3" to 6" adaptor was installed directly to the top of the 3" elbow which connected to the 6" single wall pipe. A 3" pellet vent transition to 6" single wall pipe stove pipe is shown as an option in manufactures installation instruction in addition to standard 3" and 4" pellet vent pipe.

III.B AIR SUPPLY SYSTEM

Combustion air enters through a tube located at the rear of the appliance. This

tube is connected directly to the firebox and firepot. Air control is achieved by a programmed speed control of the combustion blower creating a vacuum to the air inlet tube.

IV. SAMPLING SYSTEMS

IV.A. SAMPLING LOCATIONS

Particulate samples are collected from the vertical sample section of the dilution tunnel. The tunnel has two elbows and two mixing baffles in the system ahead of the sampling section. The sampling section is a continuous section of 6 inch diameter pipe straight over its entire length. Tunnel velocity pressure is determined by a standard Pitot tube located a minimum of 4 feet upstream of the sample location. The dry bulb thermocouple is located six inches downstream from the Pitot tube. Actual tunnel used was verified to meet EPA specifications and is similar to that shown in figure 1.

Stack gas samples are collected from the steel chimney section 8 feet \pm 6 inches above the scale platform. Actual gas sample collection train was similar to that shown in figure 2.

An emissions sample train similar to that shown in figure 3 was used; a glass probe was used in place of a heated probe and button hook nozzle.

IV.A.(1) DILUTION TUNNEL

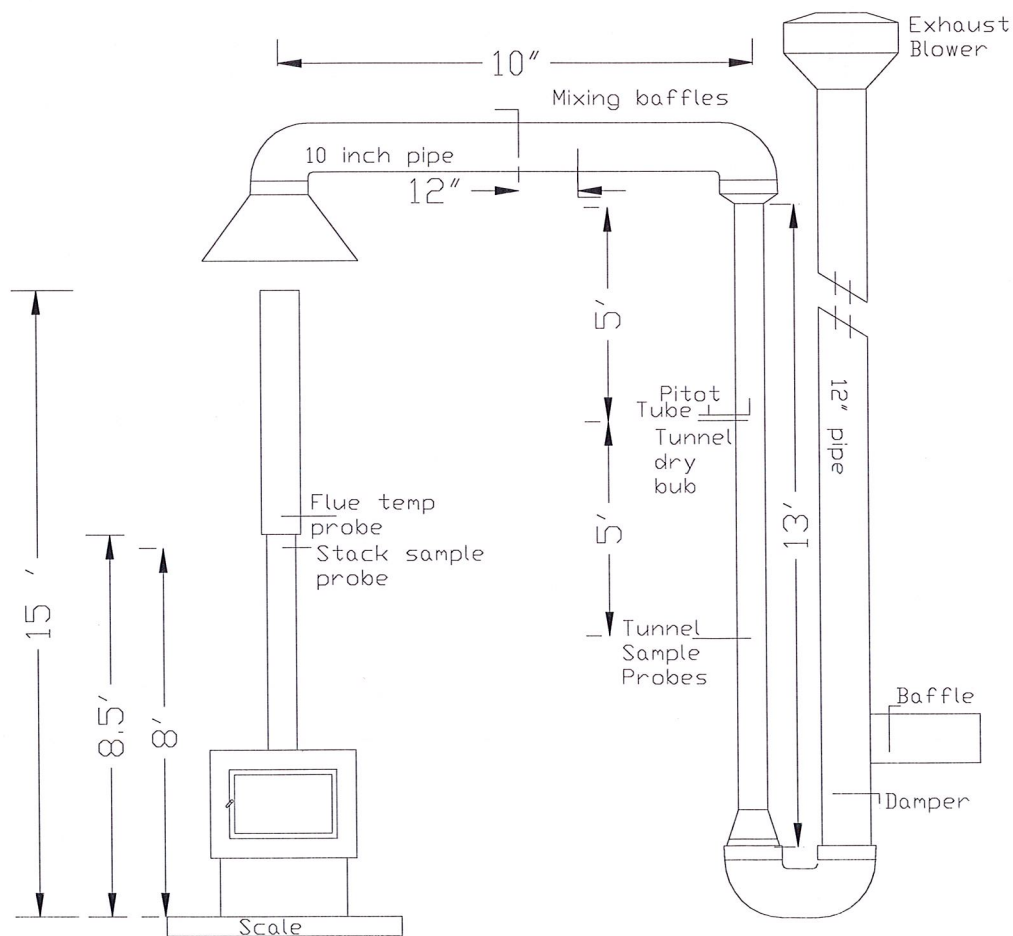
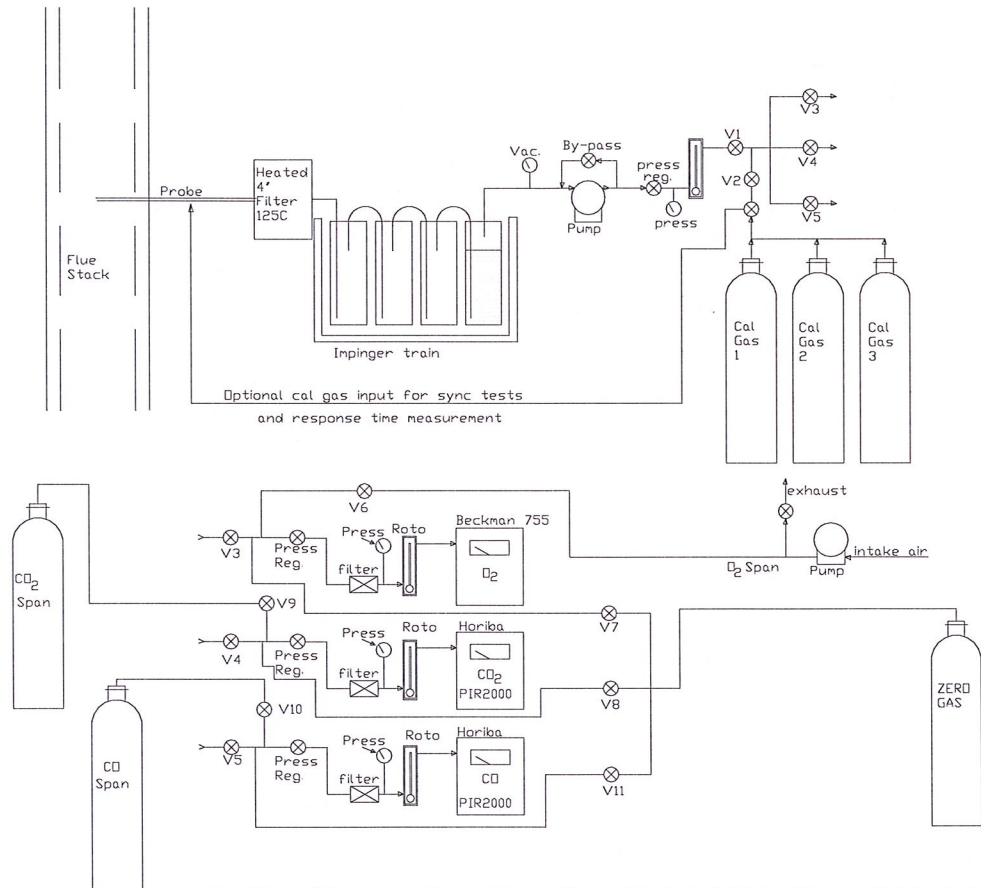


FIGURE 1

IV.B. OPERATIONAL DRAWINGS

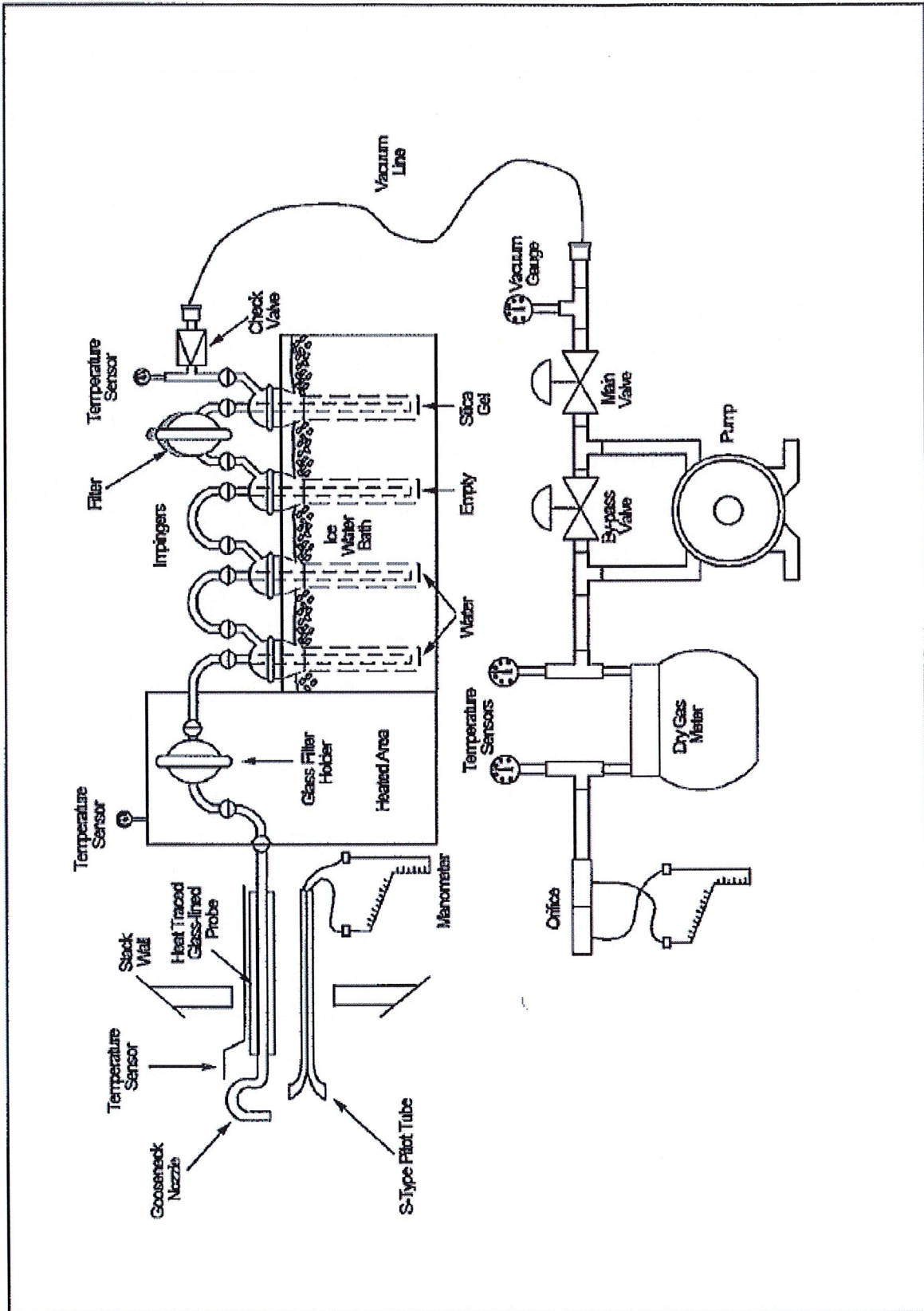
IV.B.(1) STACK GAS SAMPLE TRAIN



ITS FLUE GAS SAMPLE TRAIN

FIGURE 2

IV.B.(2). DILUTION TUNNEL SAMPLE SYSTEMS



V. SAMPLING METHODS

V.A. PARTICULATE SAMPLING

Particulates were sampled in strict accordance with EPA Method 5G-2 and 5H. A 5H sample train was used to extract particulate samples proportionally from a dilution tunnel. A glass probe was inserted into the tunnel and sample was drawn across a heated 110mm filter. After the heated front filter gasses entered a set of four Impingers, a rear 55mm filter was placed between number three and four Impingers. Sample analysis consisted of a front and back half acetone rinse. Impinger water was subjected to a Dichloromethane extraction to separate organics prior to oven drying.

VI. QUALITY ASSURANCE

VI.A. INSTRUMENT CALIBRATION

VI.A. (1) DRY GAS METERS

At the conclusion of each test program the dry gas meters are checked against our standard dry gas meter. Three runs are made on each dry gas meter used during the test program. The average calibration factors obtained are then compared with the six-month calibration factor and, if within 5%, the six-month factor is used to calculate standard volumes. Results of this calibration are contained in Appendix D.

An integral part of the post test calibration procedure is a leak check of the pressure side by plugging the system exhaust and pressurizing the system to 10" W.C. The system is judged to be leak free if it retains the pressure for at least 10 minutes.

The standard dry gas meter is calibrated every 12 months using an accredited calibration agency. All calibration values are verified to be within EPA specifications.

VI.A.(3). GAS ANALYZERS

The continuous analyzers are zeroed and spanned before each test with appropriate 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.

At the conclusion of each unit test program, a five-point calibration check is made. This calibration check must meet accuracy requirements of the applicable standards. Consistent deviations between analyzer readings and calibration gas concentrations are used to correct data before computer processing. Data is also corrected for interferences as prescribed by the instrument manufacturer's instructions.

VI.B. TEST METHOD PROCEDURES

VI.B.(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, not just the dry gas meters. Pre-test and post-test leak checks are conducted with a vacuum of 10 inches of mercury. Vacuum is monitored during each test and the highest vacuum reached is then used for the post test vacuum value. If leakage limits are not met, the test run is rejected. During, these tests the vacuum was typically less than 2 inches of mercury. Thus, leakage rates reported are expected to be much higher than actual leakage during the tests.

VI.B.(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.

VI.B.(3). PM SAMPLING PROPORTIONALITY (5G)

Proportionality was calculated in accordance with EPA Method 5G. The data and results are included in Appendix G.


VII. CONCLUSION

Results of this test show the OEM Large when operated following guidelines specified in EPA method 28 does meet emissions limits regulating an affected facility in the EPA New Source Performance Standards.

VII.A RESULTS AND OBSERVATIONS

The Model OEM Large Pellet fired Solid Fuel Room Heater has been found to be in compliance with the applicable performance and construction requirements of the following criteria: EPA Method 28 "Certification and auditing of wood heaters" and Method 5G Determination of particulate matter emissions from wood heaters."

INTERTEK TESTING SERVICES NA

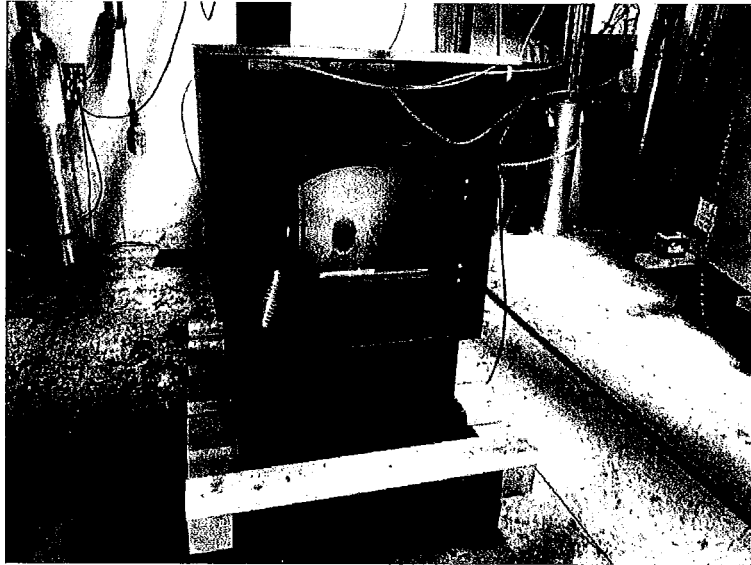
Reported by: 
Bruce S Davis
Test Engineer

Reviewed by: 
John Voorhees
Operations Manager

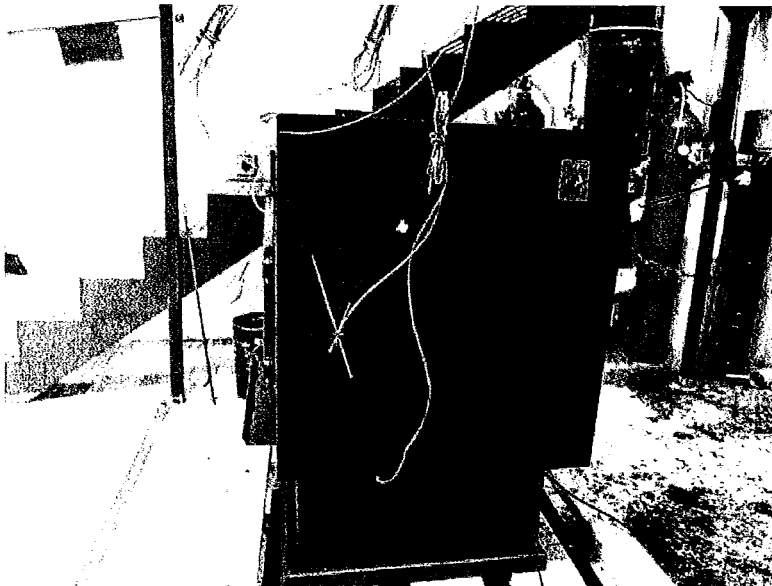
Appendix F

Test Data

Hearth & Home Technologies
OEM Large Pellet
G100719074



OEM Large Front View



OEM Large Side View

EPA NSPS WEIGHTED AVERAGE CALCULATION

V 1.1

8/27/2010

Client: Hearth & Home
 Model: OEM Large
 Date: 4/25/2012
 Sample: PRT1204201552-002
 Project: G100719074

Type of Stove: 3
 Weighted Average: 1=cat, 2=noncat, 3=pellet

*LHV Calculated
 1.0305 x 92.0
 91.7
 91.1*

Test No.	Burn Rate	Emission Rate g/hr	HHV (OHE)	Heat		(K)		KxOHE
				Output (BTU/HR)	Prob.	Weighting Factor	(KxE)	
2	0.62	0.59	85.20	9256.10	0.1084	0.3592	0.2119	30.60
3	0.98	0.76	84.90	14630.62	0.3592	0.5538	0.4209	47.02
4	1.36	0.60	84.40	20303.71	0.6622	0.5744	0.3446	48.48
1	2.17	1.12	84.40	32396.36	0.9336	0.3378	0.3783	28.51
				0.00	1.0000	0.0000	0.0000	0.00
				0.00	1.0000	0.0000	0.0000	0.00
				0.00	1.0000	0.0000	0.0000	0.00
				0.00	1.0000	0.0000	0.0000	0.00
				0.00	1.0000	0.0000	0.0000	0.00
				0.0000		0.0000	0.0000	0.00

Totals: 1.8252 1.3558 154.61

Weighted average emissions rate:	0.7428
Weighted Average OHE:	84.71



**TEST RESULTS
EPA METHOD 5G-3**

Project Number: G100719074
 Manufacturer: Hearth N Home
 Model: OEM Large
 Sample ID Number: PRT1204201552-001
 Test Date: 25-Apr-12
 Test Run Number: 1

Dry Burn-Rate, kg/hr:		2.17
Emission-Rate, g/hr:		1.12
Duration of Test, Minutes		120
Dry Gas Meter Standardization		
Train A		
Dry Gas Meter Beginning Reading, ft ³	295.372	
Dry Gas Meter Ending Reading, ft ³	363.07	
Barometric Pressure Correction Factor	0.945	
Dry Gas Meter Calibration Factors (γ factors)	0.994	
Dry Gas Meter Temperature Factors	0.984	
Dry Gas Meter Delta-H Correction Factors	1.002	
Dry Gas Meter STD Volume Sampled, ft ³	62.763	
Dilution Tunnel Flow / Volume		
Standardized Tunnel Flow, dscfm	135.316	
Total Tunnel Volume, scf	16237.967	
Emission Calculations		
Train A		
Sample Ratios (Total Tunnel Volume / Total Sample Volume)	258.719	
Sample Particulate Mass, mg	8.7	
Total Emissions, grams	2.240	
Emission-Rate, g/hr	1.12	
Adjusted Emission Rates, g/hr	2.00	
Operating Parameters		
Train A		
Max Filter Temperature, °F	232	
Post-Test Leak Check, cfm @ in. Hg vac.	0.0@5"	
Average Firebox Surface Temperature delta-T, °F	1	
Maximum Ambient Temperature, °F	84	
Minimum Ambient Temperature, °F	77	
Fuel Properties		
Wet Fuel Load Weight, lb.	10.20	
Dry-Basis Fuel Load Moisture Content, %	6.48	
Wet-Basis Fuel Load Moisture Content, %	6.09	

Test Engineer: BA

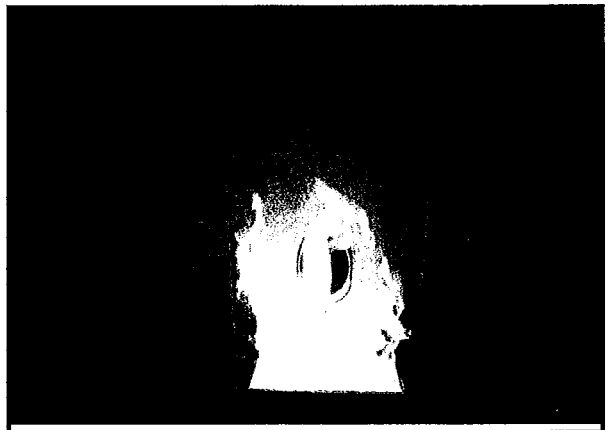
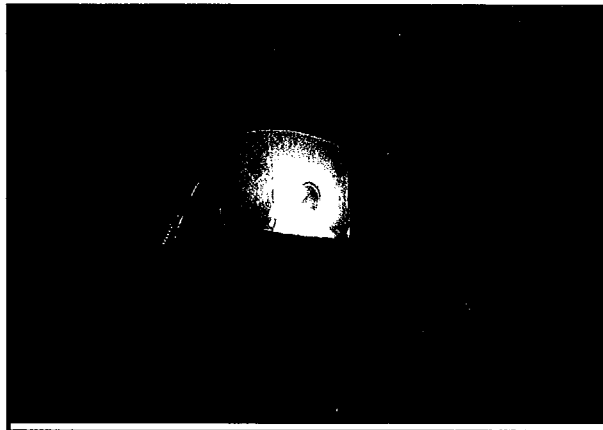
Date: 7-1-12



**Run Notes
EPA Methods 28 and 5G-3**

PROJECT / TEST INFORMATION	
Project Number:	G100719074
Manufacturer:	Hearth N Home
Model:	OEM Large
Sample ID Number:	PRT1204201552-001
Test Date:	25-Apr-12
Test Run Number:	1
Date tunnel cleaned:	4/25/2012
Purpose of Test	Cert High Burn

Appliance Information		
Appliance Type:	3	1 - Catalytic 2 - Non - Catalytic 3 - Pellet 4 - Hydronic
Firebox Volume, ft ³ :	0	N/A for pellet type
Convection Blower	3	1 - No Fan 2 - Fan Optional 3 - Fan Standard



Test Settings	
Primary Air:	NA
Secondary Air:	NA
Control Board:	Control set at maximum
Blower/Fan:	Automatic
Pre- Burn Activities	
Time	Activity
	Burned at high for one hour
Start-Up Procedure	
Loading of fuel, sec. :	NA
Fuel-loading door :	NA
Primary air:	NA
Secondary air:	NA
Control board:	Control set at maximum
Blower / fan:	Automatic
Other Notes	
NA	

Test Engineer: B.P.D.

Date: 7-1-12



**TEST FUEL DATA
EPA METHOD 5G-3**

Project Number:	G100719074
Manufacturer:	Hearth N Home
Model:	OEM Large
Sample ID Number:	PRT1204201552-001
Test Date:	25-Apr-12
Test Run Number:	1

Firebox Volume, ft ³ :	0
-----------------------------------	---

Calibration Reference ID		
Set meter to Species 1		
Set Temperature to 70F	12%	12.0
Set pin setting to 444	22%	22.0

PRE-BURN FUEL PROPERTIES				
Eq. ID No.:		Time:		Temp., °F:
Piece No.	Length, In.	Weight, Lb.	Moisture, %, Dry Basis	
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
Total Weight		0.0	Average, %db	#DIV/0!

Allowable Fuel Load Range:	0.0	to	0.0
----------------------------	-----	----	-----

TEST FUEL LOAD PROPERTIES					
Eq. ID No.:		Time:		Temp., °F:	
Piece No.	Length, In.	Weight, Lb.		Moisture, %, Dry Basis	
		2x4	4x4		
1		10.20		6.5	6.5
2					
3					
4					
5					
6					
7					
8					
Totals		10.2	0.0		
% of Weight		100	0		
Total weight, wet, lb.		10.20		Average Moisture, dry	6.48
Total weight, dry, kg		4.35		Average Moisture, wet	6.09

Test Engineer: BD

Date: 7-1-12



Project Number: **G100719074**
 Manufacturer: **Hearth N Home**
 Model: **OEM Large**
 Sample ID Number: **PRT1204201552-001**
 Test Date: **25-Apr-12**
 Test Run Number: **1**

EPA Method 28
Pre Burn Data

Coal Bed Range 2.1 to 2.5

Average Firebox Temp, °F 583.2

Final Coal Bed Wt, lb 82.1

Duration, Minutes	Temperature Data									Flue Draft	Fuel Weight	Weight Loss
	Room	Dilution Tunnel	Flue Gas	Firebox Top	Firebox Bottom	Firebox Back	Firebox Left	Firebox Right	Catalyst Outlet			
0	68	81	205	489	351	319	432	401		-0.032	87.50	5.40
10	72	88	271	638	571	488	602	561		-0.04	86.50	1.00
20	73	90	279	651	587	500	615	574		-0.04	85.50	1.00
30	76	93	283	683	594	517	634	593		-0.04	84.50	1.00
40	77	95	283	665	592	516	628	587		-0.041	83.70	0.80
50	78	96	284	558	586	486	586	561		-0.042	83.00	0.70
60	78	96	280	655	572	503	610	576		-0.043	82.10	0.90

Test Engineer:  _____

Date: 7-1-12 _____



TEST DATA
EPA METHOD 5G-3

Project Number:	G100719074
Manufacturer:	Hearth N Home
Model:	OEM Large
Sample ID No:	PRT1204201552-001
Test Date:	25-Apr-12
Test Run No:	1

Temperature Data

Firebox Temp Start	602.8
Firebox Temp End	601.8
Firebox Delta-T	1.0

Max Filter Temps	
Train A	
232	

Interval	10	Duration of Test, Min	120	Temperature Data										
Time				Temperature Data										
Interval	Duration	Room	Dilution Tunnel	Flue Gas	Firebox Top	Firebox Bottom	Firebox Back	Firebox Left	Firebox Right	Catalyst Outlet	Train A Filter	Impinger Exit	Train A DGM	
0	0	79	97	284	692	576	517	635	594		232	77	73	
1	10	77	98	285	689	584	516	632	589		231	45	73	
2	20	79	99	286	680	580	517	634	586		231	48	74	
3	30	81	100	288	684	582	521	630	587		230	55	75	
4	40	82	102	289	669	582	520	629	585		230	57	75	
5	50	79	101	284	674	557	496	612	571		230	61	76	
6	60	82	102	286	677	574	519	630	588		230	62	77	
7	70	80	102	288	686	581	527	637	595		231	64	78	
8	80	84	104	291	698	578	530	642	600		231	65	79	
9	90	80	102	289	695	579	527	638	598		230	65	78	
10	100	81	102	288	706	572	520	642	596		230	66	79	
11	110	81	102	282	683	543	498	618	579		232	66	78	
12	120	84	103	285	689	571	526	629	594		230	67	78	

Test Engineer: BD

Date: 7-1-12



TEST DATA
EPA METHOD 5G-3

Gas Particulate Sampling Data

Project Number:	G100719074
Manufacturer:	Hearth N Home
Model:	OEM Large
Sample ID Number:	PRT1204201552-001
Test Date:	25-Apr-12
Test Run Number:	1

Barometer, In. Hg	RH, %	Sample Box Correction (y) Factors	
Start 28.30		Meter Box (A)	0.994
End 28.26			

Leak Check, cfm @ in Hg	
Train A	
0.0@5"	

Maximum Vacuum	
Train A	
0.00	

Duration of Test, Min	120
-----------------------	-----

Time	Particulate Sampling Data										
	Tunnel Delta-P	Train A Delta-H		Flue Draft	Fuel Weight	Weight Loss	Train A Volume		Train A Proportional Rate		Train A Vacuum, In. Hg
0	0.040	1.00		-0.042	81.70	10.20	295.372		100.03		0.00
10	0.040	1.00		-0.042	80.80	0.90	301.120		102.30		0.00
20	0.040	1.00		-0.042	79.90	0.90	307.000		104.55		0.00
30	0.040	1.00		-0.042	79.10	0.80	312.410		96.10		0.00
40	0.040	1.00		-0.042	78.30	0.80	317.750		95.03		0.00
50	0.040	1.00		-0.042	77.40	0.90	323.730		106.12		0.00
60	0.040	1.00		-0.042	76.60	0.80	329.110		95.38		0.00
70	0.040	1.00		-0.041	75.70	0.90	335.010		104.41		0.00
80	0.040	1.00		-0.041	74.90	0.80	340.280		93.25		0.00
90	0.040	1.00		-0.041	74.00	0.90	346.140		103.70		0.00
100	0.040	1.00		-0.041	73.20	0.80	351.750		99.09		0.00
110	0.040	1.00		-0.041	72.30	0.90	357.770		106.53		0.00
120	0.040	1.00		-0.041	71.50	0.80	363.070		93.87		0.00

Test Engineer: *[Signature]*

Date: *7-1-12*



DILLUTION TUNNEL PARTICULATE CALCULATIONS
EPA Method 5G-3

Project Number: G100719074
 Manufacturer: Hearth N Home
 Model: OEM Large
 Sample ID Number: PRT1204201552-001
 Test Date: 25-Apr-12
 Test Run Number: 1

Intertek Equipment No.'s 19683, 19684

SAMPLE COMPONENT	REAGENT	FILTER # OR	WEIGHTS			
			FINAL, mg	TARE, mg	BLANK, mg/ml	PARTICULATE, mg
FRONT FILTER CATCH	FILTER	392	713.9	710.9		3.00
REAR FILTER CATCH	FILTER	402	165.6	165.8		-0.20
RINSE OF PROBE &	ACETONE	45	99195.8	99193.2	0.0005	2.58
RINSE OF IMPINGER SET	WATER	200	96379.9	96378.3	0	1.60
RINSE OF IMPINGER SET	METHANE	100	109121.1	109120.5	0.002	0.40
RINSE OF FILTER ASSEMBLY & GAS TRAIN -	ACETONE	40	95091	95089.7	0.0005	1.28
TOTAL:						8.66

CONDENSED WATER

IMPINGERS	WEIGHTS		
	FINAL, g	INITIAL, g	NET, g
1	708.3	705.4	2.90
2	701.8	691	10.80
3	606.9	606.4	0.50
4	999.3	990.4	8.90
TOTAL:			23.10

EQUATIONS

FRONT FILTER CATCH	Final, mg - Tare, mg = Particulate, mg
REAR FILTER CATCH	Final, mg - Tare, mg = Particulate, mg
RINSE OF PROBE & FILTER ASSEMBLY - FRONT	(Final, mg - Tare, mg) - (Blank, mg/ml x Volume, ml) = Particulate, mg
RINSE OF IMPINGER SET	(Final, mg - Tare, mg) - (Blank, mg/ml x Volume, ml) = Particulate, mg
RINSE OF FILTER ASSEMBLY & GAS TRAIN - BACK	(Final, mg - Tare, mg) - (Blank, mg/ml x Volume, ml) = Particulate, mg

Test Engineer: _____

Date: _____



**TEST RESULTS
EPA METHOD 5G-3**

Project Number: G100719074
 Manufacturer: Hearth N Home
 Model: OEM Large
 Sample ID Number: PRT1204201552-001
 Test Date: 25-Apr-12
 Test Run Number: 2

Dry Burn-Rate, kg/hr:		0.62
Emission-Rate, g/hr:		0.59
Duration of Test, Minutes		120
Dry Gas Meter Standardization		Train A
Dry Gas Meter Beginning Reading, ft ³	363.3	
Dry Gas Meter Ending Reading, ft ³	430.583	
Barometric Pressure Correction Factor	0.945	
Dry Gas Meter Calibration Factors (γ factors)	0.994	
Dry Gas Meter Temperature Factors	0.986	
Dry Gas Meter Delta-H Correction Factors	1.002	
Dry Gas Meter STD Volume Sampled, ft ³	62.415	
Dilution Tunnel Flow / Volume		
Standardized Tunnel Flow, dscfm	129.200	
Total Tunnel Volume, scf	15504.016	
Emission Calculations		Train A
Sample Ratios (Total Tunnel Volume / Total Sample Volume)	248.403	
Sample Particulate Mass, mg	4.8	
Total Emissions, grams	1.181	
Emission-Rate, g/hr	0.59	
Adjusted Emission Rates, g/hr	1.18	
Operating Parameters		Train A
Max Filter Temperature, °F	234	
Post-Test Leak Check, cfm @ in. Hg vac.	.005@5	
Average Firebox Surface Temperature delta-T, °F	8.2	
Maximum Ambient Temperature, °F	76	
Minimum Ambient Temperature, °F	72	
Fuel Properties		
Wet Fuel Load Weight, lb.	2.90	
Dry-Basis Fuel Load Moisture Content, %	6.48	
Wet-Basis Fuel Load Moisture Content, %	6.09	

Test Engineer: 

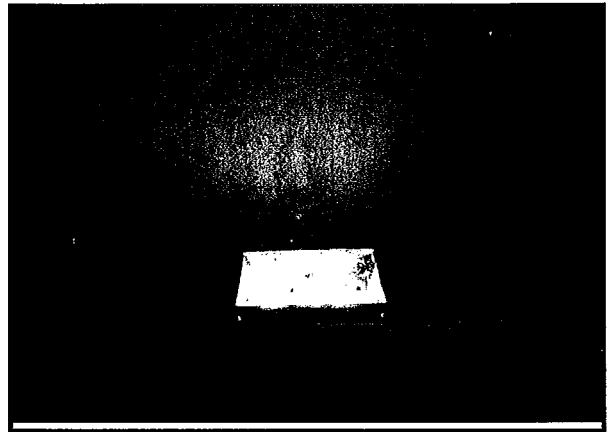
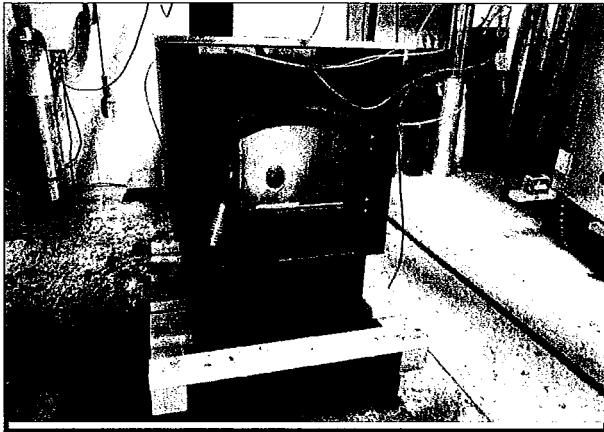
Date: 7-1-12



Run Notes
EPA Methods 28 and 5G-3

PROJECT / TEST INFORMATION	
Project Number:	G100719074
Manufacturer:	Hearth N Home
Model:	OEM Large
Sample ID Number:	PRT1204201552-001
Test Date:	25-Apr-12
Test Run Number:	2
Date tunnel cleaned:	4/25/2012
Purpose of Test	Certification

Appliance Information		
Appliance Type:	3	1 - Catalytic 2 - Non - Catalytic 3 - Pellet 4 - Hydronic
Firebox Volume, ft ³ :	0	N/A for pellet type
Convection Blower	3	1 - No Fan 2 - Fan Optional 3 - Fan Standard



Test Settings	
Primary Air:	NA
Secondary Air:	NA
Control Board:	Control set at minimum setting
Blower/Fan:	Automatic
Pre- Burn Activities	
Time	Activity
	No activity during pre burn
Start-Up Procedure	
Loading of fuel, sec. :	NA
Fuel-loading door :	NA
Primary air:	NA
Secondary air:	NA
Control board:	Set at minimum setting
Blower / fan:	Automatic
Other Notes	
NA	

Test Engineer: BD

Date: 7-1-12



TEST FUEL DATA
EPA METHOD 5G-3

Project Number:	G100719074
Manufacturer:	Hearth N Home
Model:	OEM Large
Sample ID Number:	PRT1204201552-001
Test Date:	25-Apr-12
Test Run Number:	2

Firebox Volume, ft ³ :	0
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Calibration Reference ID		
Set meter to Species 1		
Set Temperature to 70F	12%	12.0
Set pin setting to 444	22%	22.0

PRE-BURN FUEL PROPERTIES					
Eq. ID No.:		Time:		Temp., °F:	
Piece No.	Length, In.	Weight, Lb.	Moisture, %, Dry Basis		
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
Total Weight		0.0	Average, %db	#DIV/0!	

Allowable Fuel Load Range:	0.0	to	0.0
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TEST FUEL LOAD PROPERTIES					
Eq. ID No.:		Time:		Temp., °F:	
Piece No.	Length, In.	Weight, Lb.		Moisture, %, Dry Basis	
		2x4	4x4		
1		2.90		6.5	6.5
2					
3					
4					
5					
6					
7					
8					
Totals		2.9	0.0		
% of Weight		100	0		
Total weight, wet, lb.		2.90		Average Moisture, dry	6.48
Total weight, dry, kg		1.24		Average Moisture, wet	6.09



Project Number:	G100719074
Manufacturer:	Hearth N Home
Model:	OEM Large
Sample ID Number:	PRT1204201552-001
Test Date:	25-Apr-12
Test Run Number:	2

EPA Method 28
Pre Burn Data

Coal Bed Range	0.6	to	0.7
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Average Firebox Temp, °F	304.4
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Final Coal Bed Wt, lb	68.9
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Duration, Minutes	Temperature Data									Flue Draft	Fuel Weight	Weight Loss
	Room	Dilution Tunnel	Flue Gas	Firebox Top	Firebox Bottom	Firebox Back	Firebox Left	Firebox Right	Catalyst Outlet			
0	78	90	191	339	346	261	325	309		-0.027	70.30	1.40
10	78	87	163	321	331	238	307	295		-0.022	70.10	0.20
20	75	84	157	316	335	233	301	290		-0.02	69.90	0.20
30	75	84	153	330	333	233	306	295		-0.02	69.70	0.20
40	75	83	154	331	339	239	312	298		-0.02	69.40	0.30
50	74	82	154	317	337	235	304	291		-0.021	69.20	0.20
60	76	85	176	333	334	248	311	296		-0.021	68.90	0.30

Test Engineer: B.A.

Date: 7-1-12



TEST DATA
EPA METHOD 5G-3

Project Number:	G100719074
Manufacturer:	Hearth N Home
Model:	OEM Large
Sample ID No:	PRT1204201552-001
Test Date:	25-Apr-12
Test Run No:	2

Temperature Data

Firebox Temp Start	303
Firebox Temp End	294.8
Firebox Delta-T	8.2

Max Filter Temps	
Train A	
234	

Interval	10	Duration of Test, Min	120
----------	----	-----------------------	-----

Time		Temperature Data												
Interval	Duration	Room	Dilution Tunnel	Flue Gas	Firebox Top	Firebox Bottom	Firebox Back	Firebox Left	Firebox Right	Catalyst Outlet	Train A Filter	Impinger Exit	Train A DGM	
0	0	76	85	175	328	331	248	312	296		233	75	76	
1	10	73	81	154	307	326	231	297	286		234	42	76	
2	20	72	81	152	324	335	236	308	296		233	42	76	
3	30	73	82	153	328	333	235	306	296		233	43	75	
4	40	74	82	152	326	330	233	306	295		233	44	75	
5	50	72	81	152	330	342	238	311	300		234	46	76	
6	60	75	83	167	318	317	326	241	307		234	47	76	
7	70	74	81	150	299	329	230	294	282		233	48	76	
8	80	74	82	151	308	331	231	299	287		233	48	76	
9	90	74	81	149	301	330	230	296	285		233	49	76	
10	100	76	82	149	297	330	227	293	282		234	50	76	
11	110	73	80	149	319	331	233	306	293		233	50	75	
12	120	72	82	167	320	321	240	305	288		234	51	75	

Test Engineer: *BD*

Date: 7-1-12



TEST DATA
EPA METHOD 5G-3

Gas Particulate Sampling Data

Project Number: G100719074
 Manufacturer: Hearth N Home
 Model: OEM Large
 Sample ID Number: PRT1204201552-001
 Test Date: 25-Apr-12
 Test Run Number: 2

Barometer, In. Hg	RH, %	Sample Box Correction (y) Factors	
Start	28.26	Meter Box (A)	0.994
End	28.26		

Leak Check, cfm @ in Hg	
Train A	
.005@5	

Maximum Vacuum	
Train A	
0.00	

Time	Particulate Sampling Data										
	Tunnel Delta-P	Train A Delta-H		Flue Draft	Fuel Weight	Weight Loss	Train A Volume		Train A Proportional Rate		Train A Vacuum, In. Hg
0	0.038	1.00		-0.021	68.90	2.90	363.300		99.97		0.00
10	0.038	1.00		-0.021	68.60	0.30	368.950		100.63		0.00
20	0.038	1.00		-0.021	68.40	0.20	374.570		100.10		0.00
30	0.038	1.00		-0.020	68.20	0.20	380.000		96.99		0.00
40	0.038	1.00		-0.020	67.90	0.30	385.580		99.67		0.00
50	0.038	1.00		-0.020	67.70	0.20	391.170		99.57		0.00
60	0.038	1.00		-0.020	67.40	0.30	396.850		101.36		0.00
70	0.038	1.00		-0.020	67.20	0.20	402.750		105.09		0.00
80	0.038	1.00		-0.020	66.90	0.30	407.970		93.06		0.00
90	0.038	1.00		-0.021	66.70	0.20	413.630		100.81		0.00
100	0.038	1.00		-0.021	66.50	0.20	419.330		101.62		0.00
110	0.038	1.00		-0.020	66.30	0.20	424.940		100.02		0.00
120	0.038	1.00		-0.020	66.00	0.30	430.583		100.79		0.00

Test Engineer: BO

Date: 7-1-12



**Dilution Tunnel Velocity Traverse
EPA Method 5G-3**

Project Number: G100719074
 Manufacturer: Hearth N Home
 Model: OEM Large
 Sample ID Number: PRT1204201552-001
 Test Date: 25-Apr-12
 Test Run Number: 2

	Dilution Tunnel		Square Root
	Delta P In. H2O	Temp, °F	
A1	0.0280	83	0.1673
A2	0.0400	83	0.2000
A3	0.0400	83	0.2000
A4	0.0360	83	0.1897
A Center	0.0420	83	0.2049
B1	0.0260	83	0.1612
B2	0.0340	83	0.1844
B3	0.0400	83	0.2000
B4	0.0340	83	0.1844
B Center	0.0400	83	0.2000
Averages	0.036	83	0.1859

Tunnel Diameter **6.000** inches
 Tunnel Static **-0.320** in. H2O
 Tunnel Area 0.19635 Ft²
 Pitot Correction 0.9181 factor
 Baro. Pressure 28.26
 Pitot Factor **0.99** (0.99 for standard, 0.84 or Cal. For S-Type)
 Initial Velocity 12.911 Ft/ Sec
 Initial Flow **134.05** Ft³/min

Test Engineer: *[Signature]*

Date: 7-1-12



Supplemental Data EPA 5G/5H

Client: Hearth N Home

Model: OFM L Project #: G100719074 Sample ID #: PRT1204201552-001

Date: 4/25/12 Run #: 2

Start Time: 16:15 Stop Time: 18:15

Intertek Equipment #s: ETC5-4, ETC-11, ETC7-1

Gas Analyzer Train Leak Check:

Stack:

Initial: good

Final: good

Dilution Tunnel (Method 5G Only):

Initial: NA

Final: _____

Calibrations: Span Gas CO₂: 9.96 O₂: NA CO: 9.77 CO₂(DT): _____

Time	N ₂ Span	N ₂ Span	N ₂ Span	N ₂ Span	N ₂ Span	N ₂ Span	N ₂ Span
	<u>Ø</u>	<u>EOT</u>					
O ₂							
CO ₂	<u>0.00</u>	<u>10.00</u>	<u>-0.04</u>	<u>9.94</u>			
CO	<u>0.06</u>	<u>0.98</u>	<u>0.00</u>	<u>0.97</u>			
CO ₂ (DT)	<u>NA</u>						

Stack Diameter (inches): 3 to 6"

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

Scale Audit (lbs): Pretest: 10.0 Post Test: 10.0

Induced Draft: 0.0 %Smoke Capture: 100%

Pitot Tube Leak Test: Pre: 0.0 Post: 0.0

Flue Pipe Cleaned Prior to First Test in Series: Date: 4/25/12 Initials: BC

	Initial	Middle	Ending
Pb (in/Hg)	<u>28.26</u>		<u>28.26</u>
Room Temp (°F)	<u>76</u>		<u>72</u>

Date: 7-1-12

Engineer signature: BO



Twin Ports Testing, Inc.
 1301 North 3rd Street
 Superior, WI 54880
 p: 715-392-7114
 p: 800-373-2562
 f: 715-392-7163
 www.twinportstesting.com

Report No: USR:W212-0482-01
Issue No: 1
This report replaces all previous issues

Analytical Test Report

Client: HEARTH & HOME TECHNOLOGIES
 1915 W Saunders St
 Mount Pleasant IA 52641
Attention: Colin McCormick
PO No:

Signed:

 Amanda Sayles
 Chemistry Lab Technician
Date of Issue: 4/26/2012
 THIS DOCUMENT SHALL NOT BE REPRODUCED EXCEPT IN FULL

Sample Details
Sample Log No: W212-0482-01
Sample Designation: Gallon sized pellet sample
Sample Recognized As: Pellets
Sample Date:
Sample Time:
Arrival Date: 4/16/2012

	METHOD	UNITS	MOISTURE	
			FREE	AS RECEIVED
Moisture Total	ASTM E871	wt. %		6.48
Ash	ASTM D1102	wt. %	0.26	0.24
Volatile Matter	ASTM D3175	wt. %		
Fixed Carbon by Difference	ASTM D3175	wt. %		
lflur	ASTM D4239	wt. %	0.030	0.028
SO ₂	Calculated	lb/mmbtu		0.065
Net Cal. Value at Const. Pressure	ISO 1928	GJ/tonne	19.24	17.84
Net Cal. Value at Const. Pressure	ISO 1928	J/g	19243	17839
Gross Cal. Value at Const. Vol.	ASTM E711	J/g	20581	19190
Gross Cal. Value at Const. Vol.	ASTM E711	Btu/lb	8849	8251
Carbon	ASTM D5373	wt. %	50.33	46.93
Hydrogen	ASTM D5373	wt. %	6.15	5.73
Nitrogen	ASTM D5373	wt. %	< 0.20	< 0.19
Oxygen	ASTM D3176	wt. %	> 43.04	> 40.41
Chlorine	ASTM D6721	mg/kg		
Fluorine	ASTM D3761	mg/kg		
Mercury	ASTM D6722	mg/kg		
Bulk Density	ASTM E873	lbs/ft ³		
Fines (Less than 1/8")	TPT CH-P-06	wt. %		
Durability Index	Kansas State	PDI		
Sample Above 1.50"	TPT CH-P-06	wt. %		
Maximum Length (Single Pellet)	TPT CH-P-06	inch		
Diameter, Range	TPT CH-P-05	inch		to
Diameter, Average	TPT CH-P-05	inch		
Stated Bag Weight	TPT CH-P-01	lbs		
Actual Bag Weight	TPT CH-P-01	lbs		

Comments



**TEST RESULTS
EPA METHOD 5G-3**

Project Number: G100719074
 Manufacturer: Hearth N Home
 Model: OEM Large
 Sample ID Number: PRT1204201552-001
 Test Date: 26-Apr-12
 Test Run Number: 3

Dry Burn-Rate, kg/hr:		0.98
Emission-Rate, g/hr:		0.76
Duration of Test, Minutes		120
Dry Gas Meter Standardization		
Train A		
Dry Gas Meter Beginning Reading, ft ³	430.7	
Dry Gas Meter Ending Reading, ft ³	498.687	
Barometric Pressure Correction Factor	0.933	
Dry Gas Meter Calibration Factors (γ factors)	0.994	
Dry Gas Meter Temperature Factors	0.995	
Dry Gas Meter Delta-H Correction Factors	1.002	
Dry Gas Meter STD Volume Sampled, ft ³	62.905	
Dilution Tunnel Flow / Volume		
Standardized Tunnel Flow, dscfm		146.378
Total Tunnel Volume, scf		17565.327
Emission Calculations		
Train A		
Sample Ratios (Total Tunnel Volume / Total Sample Volume)	279.235	
Sample Particulate Mass, mg	5.5	
Total Emissions, grams	1.524	
Emission-Rate, g/hr	0.76	
Adjusted Emission Rates, g/hr	1.45	
Operating Parameters		
Train A		
Max Filter Temperature, °F	235	
Post-Test Leak Check, cfm @ in. Hg vac.	0.0 @ 8	
Average Firebox Surface Temperature delta-T, °F	0	
Maximum Ambient Temperature, °F	77	
Minimum Ambient Temperature, °F	69	
Fuel Properties		
Wet Fuel Load Weight, lb.	4.60	
Dry-Basis Fuel Load Moisture Content, %	6.48	
Wet-Basis Fuel Load Moisture Content, %	6.09	

Test Engineer: BD

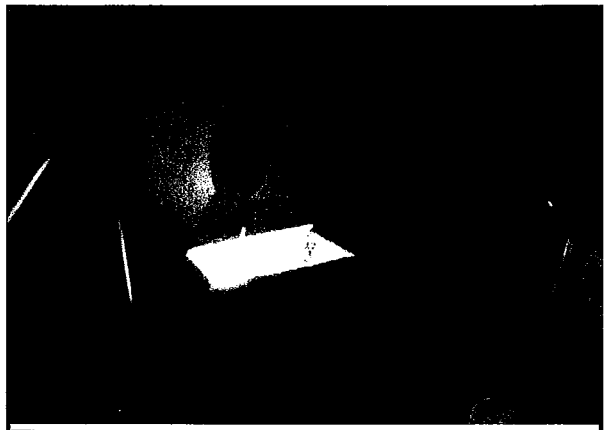
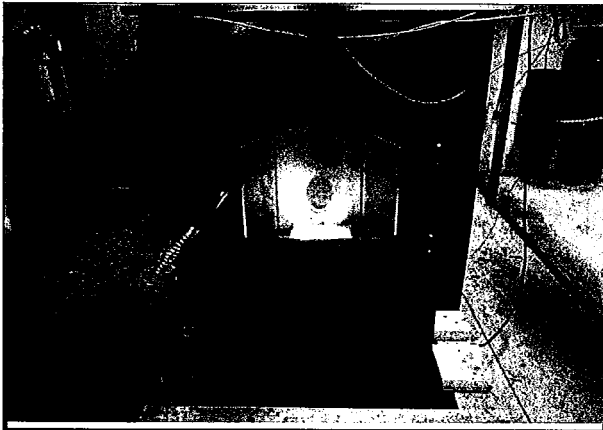
Date: 7-1-12



Run Notes
EPA Methods 28 and 5G-3

PROJECT / TEST INFORMATION	
Project Number:	G100719074
Manufacturer:	Hearth N Home
Model:	OEM Large
Sample ID Number:	PRT1204201552-001
Test Date:	26-Apr-12
Test Run Number:	3
Date tunnel cleaned:	4/25/2012
Purpose of Test	Certification

Appliance Information		
Appliance Type:	3	1 - Catalytic 2 - Non - Catalytic 3 - Pellet 4 - Hydronic
Firebox Volume, ft ³ :	0	N/A for pellet type
Convection Blower	3	1 - No Fan 2 - Fan Optional 3 - Fan Standard



Test Settings	
Primary Air:	NA
Secondary Air:	NA
Control Board:	Power level two
Blower/Fan:	Automatic
Pre- Burn Activities	
Time	Activity
	No activity was noted
Start-Up Procedure	
Loading of fuel, sec. :	NA
Fuel-loading door :	NA
Primary air:	NA
Secondary air:	NA
Control board:	Computer input to hold constant burn rate
Blower / fan:	Automatic
Other Notes	
Feed time is 1.6 seconds on out of 7 second duty cycle. Combustion blower at 2080	

Test Engineer: W.D.

Date: 7-1-12



TEST FUEL DATA
EPA METHOD 5G-3

Project Number:	G100719074
Manufacturer:	Hearth N Home
Model:	OEM Large
Sample ID Number:	PRT1204201552-001
Test Date:	26-Apr-12
Test Run Number:	3

Firebox Volume, ft ³ :	0
-----------------------------------	---

Calibration Reference ID		
Set meter to Species 1		
Set Temperature to 70F	12%	12.0
Set pin setting to 444	22%	22.0

PRE-BURN FUEL PROPERTIES				
Eq. ID No.:		Time:		Temp., °F:
Piece No.	Length, In.	Weight, Lb.	Moisture, %, Dry Basis	
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
Total Weight		0.0	Average, %db	#DIV/0!

Allowable Fuel Load Range:	0.0	to	0.0
----------------------------	-----	----	-----

TEST FUEL LOAD PROPERTIES					
Eq. ID No.:		Time:		Temp., °F:	
Piece No.	Length, In.	Weight, Lb.		Moisture, %, Dry Basis	
		2x4	4x4		
1		4.60		6.5	6.5
2					
3					
4					
5					
6					
7					
8					
Totals		4.6	0.0		
% of Weight		100	0		
Total weight, wet, lb.		4.60		Average Moisture, dry	6.48
Total weight, dry, kg		1.96		Average Moisture, wet	6.09

Test Engineer: BD

Date: 7-1-12



TEST DATA
EPA METHOD 5G-3

Project Number:	G100719074
Manufacturer:	Hearth N Home
Model:	OEM Large
Sample ID No:	PRT1204201552-001
Test Date:	26-Apr-12
Test Run No:	3

Temperature Data

Firebox Temp Start	388.2
Firebox Temp End	388.2
Firebox Delta-T	0.0

Max Filter Temps	
Train A	
	235

Interval	10	Duration of Test, Min	120
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Time		Temperature Data												
Interval	Duration	Room	Dilution Tunnel	Flue Gas	Firebox Top	Firebox Bottom	Firebox Back	Firebox Left	Firebox Right	Catalyst Outlet	Train A Filter	Impinger exit	Train A DGM	
0	0	71	78	184	433	417	304	402	385		234	74	69	
1	10	72	80	185	421	421	304	396	381		233	43	70	
2	20	70	79	187	400	394	296	386	365		233	44	70	
3	30	77	79	183	411	405	300	395	376		233	48	70	
4	40	70	78	183	417	407	303	395	380		234	50	71	
5	50	71	79	184	404	411	299	391	375		232	51	71	
6	60	69	79	182	410	408	298	387	372		233	53	71	
7	70	70	79	184	442	415	310	407	390		234	54	71	
8	80	73	81	192	392	406	303	381	364		235	55	71	
9	90	73	81	185	410	401	298	384	370		234	56	71	
10	100	69	78	182	421	405	299	392	378		233	54	71	
11	110	72	80	183	396	408	300	387	370		234	54	71	
12	120	73	80	186	427	411	310	407	386		234	55	71	

Test Engineer: BA

Date: 7-1-12



TEST DATA
EPA METHOD 5G-3

Gas Particulate Sampling Data

Project Number: G100719074
 Manufacturer: Hearth N Home
 Model: OEM Large
 Sample ID Number: PRT1204201552-001
 Test Date: 26-Apr-12
 Test Run Number: 3

Barometer, In. Hg	RH, %	Sample Box Correction (y) Factors
Start 27.93		Meter Box (A) 0.994
End 27.91		

Leak Check, cfm @ in Hg
Train A
0.0 @ 8

Maximum Vacuum
Train A
0.00

Particulate Sampling Data												
Time	Tunnel Delta-P	Train A Delta-H		Flue Draft	Fuel Weight	Weight Loss	Train A Volume		Train A Proportional Rate		Train A Vacuum, In. Hg	
0	0.048	1.00		-0.028	61.70	4.60	430.700		100.01		0.00	
10	0.048	1.00		-0.028	61.30	0.40	436.370		100.28		0.00	
20	0.048	1.00		-0.030	60.90	0.40	442.330		105.31		0.00	
30	0.048	1.00		-0.029	60.50	0.40	447.950		99.31		0.00	
40	0.048	1.00		-0.028	60.20	0.30	453.480		97.44		0.00	
50	0.048	1.00		-0.028	59.70	0.50	459.060		98.41		0.00	
60	0.048	1.00		-0.028	59.40	0.30	464.680		99.12		0.00	
70	0.048	1.00		-0.028	59.00	0.40	470.350		100.00		0.00	
80	0.048	1.00		-0.028	58.60	0.40	476.050		100.72		0.00	
90	0.048	1.00		-0.028	58.30	0.30	481.630		98.60		0.00	
100	0.048	1.00		-0.028	57.90	0.40	487.330		100.44		0.00	
110	0.048	1.00		-0.028	57.50	0.40	493.060		101.15		0.00	
120	0.048	1.00		-0.028	57.10	0.40	498.687		99.34		0.00	

Test Engineer: BR

Date: 7-1-12



**Dilution Tunnel Velocity Traverse
EPA Method 5G-3**

Project Number: G100719074
 Manufacturer: Hearth N Home
 Model: OEM Large
 Sample ID Number: PRT1204201552-001
 Test Date: 26-Apr-12
 Test Run Number: 3

	Dilution Tunnel		Square Root
	Delta P In. H2O	Temp, °F	
A1	0.0360	79	0.1897
A2	0.0440	79	0.2098
A3	0.0440	79	0.2098
A4	0.0420	79	0.2049
A Center	0.0480	79	0.2191
B1	0.0360	79	0.1897
B2	0.0420	79	0.2049
B3	0.0460	79	0.2145
B4	0.0420	79	0.2049
B Center	0.0480	79	0.2191
Averages	0.0428	79	0.2035

Tunnel Diameter **6.000** inches
 Tunnel Static **-0.300** in. H2O
 Tunnel Area 0.19635 Ft²
 Pitot Correction 0.9290 factor
 Baro. Pressure 27.93
 Pitot Factor **0.99** (0.99 for standard, 0.84 or Cal. For S-Type)
 Initial Velocity 14.166 Ft/ Sec
 Initial Flow **146.45** Ft³/min

Test Engineer: BOZ

Date: 7-1-12



DILLUTION TUNNEL PARTICULATE CALCULATIONS
EPA Method 5G-3

Project Number: G100719074
 Manufacturer: Hearth N Home
 Model: OEM Large
 Sample ID Number: PRT1204201552-001
 Test Date: 26-Apr-12
 Test Run Number: 3

Intertek Equipment No.'s 19683, 19684, 19726

SAMPLE COMPONENT	REAGENT	FILTER # OR	WEIGHTS			
			FINAL, mg	TARE, mg	BLANK, mg/ml	PARTICULATE, mg
FRONT FILTER CATCH	FILTER	394	716.2	715.8		0.40
REAR FILTER CATCH	FILTER	400	164	164.3		-0.30
RINSE OF PROBE &	ACETONE	35	107606.5	107606.1	0.0005	0.38
RINSE OF IMPINGER SET	WATER	205	98800.4	98797.8	0	2.60
RINSE OF IMPINGER SET	METHANE	100	94732.9	94733.8	0.002	0.00
RINSE OF FILTER ASSEMBLY & GAS TRAIN -	ACETONE	50	105069.3	105066.9	0.0005	2.38
TOTAL:						5.46

CONDENSED WATER

IMPINGERS	WEIGHTS		
	FINAL, g	INITIAL, g	NET, g
1	715.4	708.9	6.50
2	697	695.5	1.50
3	608.5	606.4	2.10
4	1000.1	991.4	8.70
TOTAL:			18.80

EQUATIONS

FRONT FILTER CATCH	Final, mg - Tare, mg = Particulate, mg
REAR FILTER CATCH	Final, mg - Tare, mg = Particulate, mg
RINSE OF PROBE & FILTER ASSEMBLY - FRONT	(Final, mg - Tare, mg) - (Blank, mg/ml x Volume, ml) = Particulate, mg
RINSE OF IMPINGER SET	(Final, mg - Tare, mg) - (Blank, mg/ml x Volume, ml) = Particulate, mg
RINSE OF FILTER ASSEMBLY & GAS TRAIN - BACK	(Final, mg - Tare, mg) - (Blank, mg/ml x Volume, ml) = Particulate, mg

Test Engineer: BD

Date: 7-1-12

Supplemental Data EPA 5G/5H

Client: Hearth N Home

Model: QEM L Project #: G100719074 Sample ID #: PRT1204201552-001

Date: 4/24/12 Run #: 3

Start Time: 09:01 Stop Time: 11:07

Intertek Equipment #'s: ETCS-4, ETC-11, ETC7-1

Gas Analyzer Train Leak Check:

Stack:

Dilution Tunnel (Method 5G Only):

Initial: good

Initial: NA

Final: good

Final:

Calibrations: Span Gas CO₂: 9.96 O₂: NA CO: 978 CO₂(DT): NA

Time	N ₂ Span	N ₂ Span	N ₂ Span	N ₂ Span	N ₂ Span	N ₂ Span	N ₂ Span
	<u>Ø</u>	<u>EOT</u>					
O ₂							
CO ₂	<u>-0.10</u>	<u>9.98</u>	<u>0.02</u>	<u>10.08</u>			
CO	<u>0.00</u>	<u>0.97</u>	<u>0.00</u>	<u>0.98</u>			
CO ₂ (DT)							/

Stack Diameter (inches): 3 to 6"

Air Velocity (ft/min): Initial: 250 Final: 250

Scale Audit (lbs): Pretest: 10.0 Post Test: 10.0

Induced Draft: 0.0 %Smoke Capture: 100%

Pitot Tube Leak Test: Pre: 0.0 Post: 0.0

Flue Pipe Cleaned Prior to First Test in Series: Date: 4/25/12 Initials: Bu

	Initial	Middle	Ending
Pb (in/Hg)	<u>27.93</u>		<u>27.91</u>
Room Temp (°F)	<u>71</u>		<u>73</u>

Date: 7-1-12

Engineer signature: B. D. [Signature]

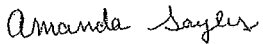


Twin Ports Testing, Inc.
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 Superior, WI 54880
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 www.twinportstesting.com

Analytical Test Report

Report No: USR:W212-0482-01
Issue No: 1
This report replaces all previous issues

Client: HEARTH & HOME TECHNOLOGIES
 1915 W Saunders St
 Mount Pleasant IA 52641
Attention: Colin McCormick
PO No:

Signed:

 Amanda Sayles
 Chemistry Lab Technician
Date of Issue: 4/26/2012
THIS DOCUMENT SHALL NOT BE REPRODUCED EXCEPT IN FULL

Sample Details
Sample Log No: W212-0482-01 **Sample Date:**
Sample Designation: Gallon sized pellet sample **Sample Time:**
Sample Recognized As: Pellets **Arrival Date:** 4/16/2012

Test Results			MOISTURE	AS
	METHOD	UNITS	FREE	RECEIVED
Moisture Total	ASTM E871	wt. %		6.48
Ash	ASTM D1102	wt. %	0.26	0.24
Volatile Matter	ASTM D3175	wt. %		
Fixed Carbon by Difference	ASTM D3175	wt. %		
ulfur	ASTM D4239	wt. %	0.030	0.028
SO ₂	Calculated	lb/mmbtu		0.065
Net Cal. Value at Const. Pressure	ISO 1928	GJ/tonne	19.24	17.84
Net Cal. Value at Const. Pressure	ISO 1928	J/g	19243	17839
Gross Cal. Value at Const. Vol.	ASTM E711	J/g	20581	19190
Gross Cal. Value at Const. Vol.	ASTM E711	Btu/lb	8849	8251
Carbon	ASTM D5373	wt. %	50.33	46.93
Hydrogen	ASTM D5373	wt. %	6.15	5.73
Nitrogen	ASTM D5373	wt. %	< 0.20	< 0.19
Oxygen	ASTM D3176	wt. %	> 43.04	> 40.41
Chlorine	ASTM D6721	mg/kg		
Fluorine	ASTM D3761	mg/kg		
Mercury	ASTM D6722	mg/kg		
Bulk Density	ASTM E873	lbs/ft ³		
Fines (Less than 1/8")	TPT CH-P-06	wt. %		
Durability Index	Kansas State	PDI		
Sample Above 1.50"	TPT CH-P-06	wt. %		
Maximum Length (Single Pellet)	TPT CH-P-06	inch		
Diameter, Range	TPT CH-P-05	inch		to
Diameter, Average	TPT CH-P-05	inch		
Stated Bag Weight	TPT CH-P-01	lbs		
Actual Bag Weight	TPT CH-P-01	lbs		

Comments



**TEST RESULTS
EPA METHOD 5G-3**

Project Number: G100719074
 Manufacturer: Hearth N Home
 Model: OEM Large
 Sample ID Number: PRT1204201552-001
 Test Date: 26-Apr-12
 Test Run Number: 4

Dry Burn-Rate, kg/hr:		1.36
Emission-Rate, g/hr:		0.60
Duration of Test, Minutes		120
Dry Gas Meter Standardization		
Train A		
Dry Gas Meter Beginning Reading, ft ³	498.9	
Dry Gas Meter Ending Reading, ft ³	565.508	
Barometric Pressure Correction Factor	0.937	
Dry Gas Meter Calibration Factors (γ factors)	0.994	
Dry Gas Meter Temperature Factors	0.990	
Dry Gas Meter Delta-H Correction Factors	1.002	
Dry Gas Meter STD Volume Sampled, ft ³	61.562	
Dilution Tunnel Flow / Volume		
Standardized Tunnel Flow, dscfm	126.335	
Total Tunnel Volume, scf	15160.211	
Emission Calculations		
Train A		
Sample Ratios (Total Tunnel Volume / Total Sample Volume)	246.260	
Sample Particulate Mass, mg	4.9	
Total Emissions, grams	1.195	
Emission-Rate, g/hr	0.60	
Adjusted Emission Rates, g/hr	1.19	
Operating Parameters		
Train A		
Max Filter Temperature, °F	235	
Post-Test Leak Check, cfm @ in. Hg vac.	0.0 @ 5	
Average Firebox Surface Temperature delta-T, °F	21.2	
Maximum Ambient Temperature, °F	76	
Minimum Ambient Temperature, °F	71	
Fuel Properties		
Wet Fuel Load Weight, lb.	6.40	
Dry-Basis Fuel Load Moisture Content, %	6.48	
Wet-Basis Fuel Load Moisture Content, %	6.09	

Test Engineer: 

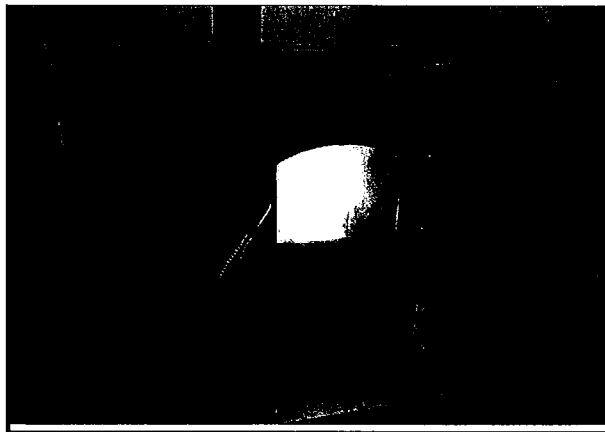
Date: 7-1-12



Run Notes
EPA Methods 28 and 5G-3

PROJECT / TEST INFORMATION	
Project Number:	G100719074
Manufacturer:	Hearth N Home
Model:	OEM Large
Sample ID Number:	PRT1204201552-001
Test Date:	26-Apr-12
Test Run Number:	4
Date tunnel cleaned:	4/25/2012
Purpose of Test	Certification

Appliance Information		
Appliance Type:	3	1 - Catalytic 2 - Non - Catalytic 3 - Pellet 4 - Hydronic
Firebox Volume, ft ³ :	0	N/A for pellet type
Convection Blower	3	1 - No Fan 2 - Fan Optional 3 - Fan Standard



Test Settings	
Primary Air:	NA
Secondary Air:	NA
Control Board:	Set at medium high via a computer interface
Blower/Fan:	Automatic
Pre- Burn Activities	
Time	Activity
	No activity was noted
Start-Up Procedure	
Loading of fuel, sec. :	NA
Fuel-loading door :	NA
Primary air:	NA
Secondary air:	NA
Control board:	Computer input to hold constant burn rate
Blower / fan:	Automatic
Other Notes	
2200 rpm on combustion blower, 2.2 seconds on time out of a 7 second duty cycle.	

Test Engineer: BA

Date: 7-1-12



**TEST FUEL DATA
EPA METHOD 5G-3**

Project Number:	G100719074
Manufacturer:	Hearth N Home
Model:	OEM Large
Sample ID Number:	PRT1204201552-001
Test Date:	26-Apr-12
Test Run Number:	4

Firebox Volume, ft ³ :	0
-----------------------------------	---

Calibration Reference ID	
Set meter to Species 1	
Set Temperature to 70F	12% 12.0
Set pin setting to 444	22% 22.0

PRE-BURN FUEL PROPERTIES					
Eq. ID No.:		Time:	Temp., °F:		
Piece No.	Length, In.	Weight, Lb.	Moisture, %, Dry Basis		
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
Total Weight		0.0	Average, %db	#DIV/0!	

Allowable Fuel Load Range:	0.0	to	0.0
----------------------------	------------	----	------------

TEST FUEL LOAD PROPERTIES						
Eq. ID No.:		Time:	Temp., °F:			
Piece No.	Length, In.	Weight, Lb.		Moisture, %, Dry Basis		
		2x4	4x4			
1		6.40		6.5	6.5	6.5
2						
3						
4						
5						
6						
7						
8						
Totals		6.4	0.0			
% of Weight		100	0			
Total weight, wet, lb.		6.40		Average Moisture, dry	6.48	
Total weight, dry, kg		2.73		Average Moisture, wet	6.09	

Test Engineer: BD

Date: 7-1-12



TEST DATA
EPA METHOD 5G-3

Project Number:	G100719074
Manufacturer:	Hearth N Home
Model:	OEM Large
Sample ID No:	PRT1204201552-001
Test Date:	26-Apr-12
Test Run No:	4

Temperature Data

Firebox Temp Start	466.2
Firebox Temp End	445
Firebox Delta-T	21.2

Max Filter Temps	
Train A	
235	

Interval	10	Duration of Test, Min		120		Temperature Data									
Time															
Interval	Duration	Room	Dilution Tunnel	Flue Gas	Firebox Top	Firebox Bottom	Firebox Back	Firebox Left	Firebox Right	Catalyst Outlet	Train A Filter	Impinger Exit	Train A DGM		
0	0	76	88	225	522	466	387	491	465		235	76	74		
1	10	76	88	226	537	468	391	501	473		234	54	74		
2	20	73	87	225	519	466	382	487	461		233	53	74		
3	30	73	86	221	484	436	358	459	433		234	54	74		
4	40	73	86	222	499	453	373	479	448		234	54	74		
5	50	72	86	221	499	450	371	474	445		234	54	73		
6	60	71	86	224	528	457	384	493	462		235	54	73		
7	70	72	86	226	524	464	387	496	466		233	54	73		
8	80	74	87	225	500	457	380	485	455		234	55	73		
9	90	74	87	222	503	433	361	472	440		234	56	73		
10	100	75	86	223	524	449	378	491	459		233	56	73		
11	110	73	86	223	500	458	374	478	449		235	57	73		
12	120	73	86	223	494	447	366	473	445		233	59	73		

Test Engineer: BD

Date: 7-1-12



TEST DATA
EPA METHOD 5G-3

Gas Particulate Sampling Data

Project Number: G100719074
 Manufacturer: Hearth N Home
 Model: OEM Large
 Sample ID Number: PRT1204201552-001
 Test Date: 26-Apr-12
 Test Run Number: 4

Barometer, In. Hg	RH, %	Sample Box Correction (y) Factors
Start	27.91	Meter Box (A) 0.994
End	28.16	

Leak Check, cfm @ in Hg
Train A
0.0 @ 5

Maximum Vacuum
Train A
0.00

Duration of Test, Min		120		Particulate Sampling Data									
Time	Tunnel Delta-P	Train A Delta-H		Flue Draft	Fuel Weight	Weight Loss	Train A Volume		Train A Proportional Rate		Train A Vacuum, In. Hg		
0	0.034	1.00		-0.032	51.30	6.40	498.900		99.99		0.00		
10	0.034	1.00		-0.032	50.70	0.60	504.690		104.32		0.00		
20	0.034	1.00		-0.032	50.20	0.50	510.020		95.95		0.00		
30	0.034	1.00		-0.032	49.70	0.50	515.580		99.99		0.00		
40	0.034	1.00		-0.032	49.10	0.60	521.350		103.77		0.00		
50	0.034	1.00		-0.032	48.60	0.50	527.010		101.98		0.00		
60	0.034	1.00		-0.032	48.10	0.50	532.630		101.26		0.00		
70	0.034	1.00		-0.032	47.50	0.60	537.950		95.86		0.00		
80	0.034	1.00		-0.032	47.00	0.50	543.380		97.93		0.00		
90	0.034	1.00		-0.032	46.50	0.50	548.840		98.47		0.00		
100	0.034	1.00		-0.032	46.00	0.50	554.300		98.38		0.00		
110	0.034	1.00		-0.032	45.40	0.60	559.930		101.44		0.00		
120	0.034	1.00		-0.032	44.90	0.50	565.508		100.51		0.00		

Test Engineer: BD

Date: 7-1-12



Dilution Tunnel Velocity Traverse
EPA Method 5G-3

Project Number: G100719074
Manufacturer: Hearth N Home
Model: OEM Large
Sample ID Number: PRT1204201552-001
Test Date: 26-Apr-12
Test Run Number: 4

	Dilution Tunnel		Square Root
	Delta P In. H2O	Temp, °F	
A1	0.0260	87	0.1612
A2	0.0320	87	0.1789
A3	0.0360	87	0.1897
A4	0.0300	87	0.1732
A Center	0.0340	87	0.1844
B1	0.0260	87	0.1612
B2	0.0320	87	0.1789
B3	0.0360	87	0.1897
B4	0.0320	87	0.1789
B Center	0.0340	87	0.1844
Averages	0.0318	87	0.1765

Tunnel Diameter **6.000** inches
Tunnel Static **-0.300** in. H2O
Tunnel Area 0.19635 Ft²
Pitot Correction 0.9571 factor
Baro. Pressure 27.91
Pitot Factor **0.99** (0.99 for standard, 0.84 or Cal. For S-Type)
Initial Velocity 12.378 Ft/ Sec
Initial Flow **126.00** Ft³/min

Test Engineer: 

Date: 7-1-12



DILLUTION TUNNEL PARTICULATE CALCULATIONS
EPA Method 5G-3

Project Number: G100719074
 Manufacturer: Hearth N Home
 Model: OEM Large
 Sample ID Number: PRT1204201552-001
 Test Date: 26-Apr-12
 Test Run Number: 4

Intertek Equipment No.'s 19683, 19684, 19726

SAMPLE COMPONENT	REAGENT	FILTER # OR	WEIGHTS			
			FINAL, mg	TARE, mg	BLANK, mg/ml	PARTICULATE, mg
FRONT FILTER CATCH	FILTER	395	715.9	713.9		2.00
REAR FILTER CATCH	FILTER	405	165.2	165.7		-0.50
RINSE OF PROBE &	ACETONE	40	108637.3	108637.4	0.0005	-0.12
RINSE OF IMPINGER SET	WATER	200	107982.6	107980.9	0	1.70
RINSE OF IMPINGER SET	METHANE	100	108416.4	108416.4	0.002	0.00
RINSE OF FILTER ASSEMBLY & GAS TRAIN -	ACETONE	55	110222.6	110220.8	0.0005	1.77
TOTAL:						4.85

CONDENSED WATER

IMPINGERS	WEIGHTS		
	FINAL, g	INITIAL, g	NET, g
1	717.1	710.9	6.20
2	695.7	690.8	4.90
3	607.7	607.4	0.30
4	985.6	970	15.60
TOTAL:			27.00

EQUATIONS

FRONT FILTER CATCH	Final, mg - Tare, mg = Particulate, mg
REAR FILTER CATCH	Final, mg - Tare, mg = Particulate, mg
RINSE OF PROBE & FILTER ASSEMBLY - FRONT	(Final, mg - Tare, mg) - (Blank, mg/ml x Volume, ml) = Particulate, mg
RINSE OF IMPINGER SET	(Final, mg - Tare, mg) - (Blank, mg/ml x Volume, ml) = Particulate, mg
RINSE OF FILTER ASSEMBLY & GAS TRAIN - BACK	(Final, mg - Tare, mg) - (Blank, mg/ml x Volume, ml) = Particulate, mg

Test Engineer: BO

Date: 7-1-12



Supplemental Data EPA 5G/5H

Client: Hearth N Home

Model: DEM L Project #: G100719074 Sample ID #: PRT1204201552-001

Date: 4/26/12 Run #: 4

Start Time: 12:54 Stop Time: 14:54

Intertek Equipment #'s: ETCS-4, ETC-11, EFC7-1

Gas Analyzer Train Leak Check:

Stack:

Dilution Tunnel (Method 5G Only):

Initial: good

Initial: NA

Final: good

Final: _____

Calibrations: Span Gas 9.96 CO₂: 2.54 O₂: NA CO: 9.74 CO₂(DT): NA

	N ₂ Span		N ₂ Span		N ₂ Span		N ₂ Span	
Time	<u>Ø</u>		<u>EOT</u>					
O ₂								
CO ₂	<u>0.02</u>	<u>10.08</u>	<u>-0.06</u>	<u>10.00</u>				
CO	<u>0.00</u>	<u>0.98</u>	<u>0.00</u>	<u>0.97</u>				
CO ₂ (DT)	<u>NA</u>							

Stack Diameter (inches): 3 to 6"

Air Velocity (ft/min): Initial: 250 Final: 250

Scale Audit (lbs): Pretest: 100 Post Test: 10.1

Induced Draft: 0.0 %Smoke Capture: 100%

Pitot Tube Leak Test: Pre: 0.0 Post: 0.0

Flue Pipe Cleaned Prior to First Test in Series: Date: 4/15/12 Initials: BSL

	Initial	Middle	Ending
Pb (in/Hg)	<u>27.91</u>		<u>28.16</u>
Room Temp (°F)	<u>76</u>		<u>73</u>

Date: 7-1-12

Engineer signature: [Signature]



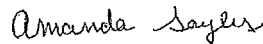
Twin Ports Testing, Inc.
 1301 North 3rd Street
 Superior, WI 54880
 p: 715-392-7114
 p: 800-373-2562
 f: 715-392-7163
 www.twinportstesting.com

Report No: USR:W212-0482-01
Issue No: 1

This report replaces all previous issues

Analytical Test Report

Client: HEARTH & HOME TECHNOLOGIES
 1915 W Saunders St
 Mount Pleasant IA 52641
Attention: Colin McCormick
PO No:

Signed:

 Amanda Sayles
 Chemistry Lab Technician
Date of Issue: 4/26/2012
 THIS DOCUMENT SHALL NOT BE REPRODUCED EXCEPT IN FULL

Sample Details
Sample Log No: W212-0482-01
Sample Designation: Gallon sized pellet sample
Sample Recognized As: Pellets
Sample Date:
Sample Time:
Arrival Date: 4/16/2012

Test Results		METHOD	UNITS	MOISTURE FREE	AS RECEIVED
Moisture Total		ASTM E871	wt. %		6.48
Ash		ASTM D1102	wt. %	0.26	0.24
Volatile Matter		ASTM D3175	wt. %		
Fixed Carbon by Difference		ASTM D3175	wt. %		
Ifur		ASTM D4239	wt. %	0.030	0.028
CO ₂		Calculated	lb/mmbtu		0.065
Net Cal. Value at Const. Pressure		ISO 1928	GJ/tonne	19.24	17.84
Net Cal. Value at Const. Pressure		ISO 1928	J/g	19243	17839
Gross Cal. Value at Const. Vol.		ASTM E711	J/g	20581	19190
Gross Cal. Value at Const. Vol.		ASTM E711	Btu/lb	8849	8251
Carbon		ASTM D5373	wt. %	50.33	46.93
Hydrogen		ASTM D5373	wt. %	6.15	5.73
Nitrogen		ASTM D5373	wt. %	< 0.20	< 0.19
Oxygen		ASTM D3176	wt. %	> 43.04	> 40.41
Chlorine		ASTM D6721	mg/kg		
Fluorine		ASTM D3761	mg/kg		
Mercury		ASTM D6722	mg/kg		
Bulk Density		ASTM E873	lbs/ft ³		
Fines (Less than 1/8")		TPT CH-P-06	wt. %		
Durability Index		Kansas State	PDI		
Sample Above 1.50"		TPT CH-P-06	wt. %		
Maximum Length (Single Pellet)		TPT CH-P-06	inch		
Diameter, Range		TPT CH-P-05	inch		to
Diameter, Average		TPT CH-P-05	inch		
Stated Bag Weight		TPT CH-P-01	lbs		
Actual Bag Weight		TPT CH-P-01	lbs		

Comments