

# **Non-Confidential Business Information (Non-CBI)**

## **Certification Test Report**

**Harman Home Heating  
Freestanding Pellet Stove  
Model: Allure 50**

**Prepared for:** Harman Home Heating  
352 Mountain House Road  
Halifax, PA 17032

**Prepared by:** OMNI-Test Laboratories, Inc.  
13327 NE Airport Way  
Portland, OR 97230  
(503) 643-3788

**Test Period:** 9/2/15 – 9/10/15

**Report Date:** March 2016

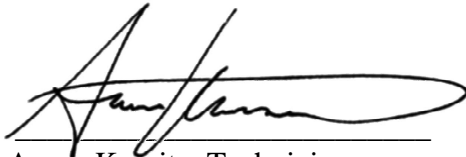
**Report Number:** 0135PS037E

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## AUTHORIZED SIGNATORIES

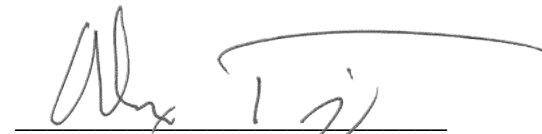
This report has been reviewed and approved by the following authorized signatories:

### Technician:



Aaron Kravitz, Technician  
OMNI-Test Laboratories, Inc.

### QA Review:



Alex Tiegs, QA Administrator  
OMNI-Test Laboratories, Inc.

### Evaluation Decision:



Sebastian Button, Testing Supervisor  
OMNI-Test Laboratories, Inc.

March 21, 2016  
Issue Date

## TABLE OF CONTENTS

	PREFACE .....	(3 pages)
1.	SAMPLING PROCEDURES AND TEST RESULTS .....	p. 4
	Introduction.....	p. 5
	Sampling Procedure .....	p. 5
	Summary of Results .....	p. 6
	<u>Summary Tables</u>	
	Table 1.1 – Particulate Emissions .....	p. 7
	Table 1.2 – Efficiency and CO .....	p. 7
	Table 1.3 – Test Facility Conditions .....	p. 7
	Table 1.4 – Fuel Measurement Summary .....	p. 8
	Table 1.5 – Dilution Tunnel and Flue Gas Measurements .....	p. 8
	Table 1.6 – Heater Configuration .....	p. 8
2.	PHOTOGRAPHS/APPLIANCE DESCRIPTION .....	p. 9
	Photographs.....	p. 10
	Appliance Description .....	p. 12
	Design Changes Following Testing .....	p. 12
3.	QUALITY ASSURANCE/QUALITY CONTROL .....	p. 13
	Sample Analysis.....	p. 15
	Calibrations .....	p. 29
	Example Calculations .....	p. 53
4.	OWNER’S MANUALS.....	p. 68
5.	LABEL.....	p. 117
6.	TEST DATA BY RUN.....	p. 119
	Run 1 .....	p. 121
	Run 2.....	p. 140

*Model: Allure 50  
Harman Home Heating  
352 Mountain House Road  
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# **Section 1**

## **Sampling Procedures and Test Results**

## INTRODUCTION

Harman Home Heating retained OMNI-Test Laboratories, Inc. (*OMNI*) to perform U.S. Environmental Protection Agency (EPA) certification testing on the Allure 50. The Allure 50 is a freestanding, pellet-fired room heater.

The testing was performed at *OMNI*'s testing facility in Portland, Oregon. The altitude of the laboratory is 30 feet above sea level. The unit was received in good condition and logged in at the *OMNI*'s testing facility on August 27, 2015. It was assigned and labeled with *OMNI* ID #2123. *OMNI* representative Aaron Kravitz conducted the certification testing and completed all testing by September 10, 2015.

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

## SAMPLING PROCEDURE & RESULTS

The Allure 50 was tested in accordance with the U.S. EPA 40 CFR Part 60, Subpart AAA—Standards of Performance for New Residential Wood Heaters using ASTM E2515 and ASTM E2779. The fuel used for certification testing was Lignetics hardwood pellet fuel; this fuel was graded as Premium by the Pellet Fuels Institute and was produced at registered mill # 03304. Particulate emissions were measured using dual sampling trains consisting of two sets of filters (front and back). The results of the integrated test run indicate an average particulate emission rate of 1.48 g/hr. The Allure 50 results are within the emission limit of 4.5 g/hr for affected facilities manufactured on or after May 15, 2015, or sold at retail after December 31, 2015.

The model Allure 50 was tested for thermal efficiency and carbon monoxide (CO) emissions in accordance with CSA B415.1-10. The heater has a demonstrated average thermal efficiency of 74.6%. The calculated CO emission rate was 30.3 g/hr.

The results reported for the purpose of certification are from test run 2, performed on September 10, 2015. An earlier test, run 1, was conducted on September 2, 2015, the results of which were significantly different from the manufacturer's expectations, based on R&D testing. At the direction of the manufacturer, an investigation into the condition of the appliance was performed, where it was discovered that previously unnoticed shipping damage to the unit was affecting combustion. The lower combustion air cover was dislodged from one of its two mounting tabs, disturbing airflow through the firebox and burn pot. With guidance from the manufacturer, the cover was mounted properly and the unit was re-tested. Photos of the cover in its as-received and repaired positions are in Section 2. Due the nature of the discrepancy of the run 1 results and the subsequent fix that was made to the appliance, run 1 was not considered to be valid test data that is representative of actual use when properly installed. All data and results from run 1 are presented in Section 6 of this report.

## **SUMMARY OF RESULTS**

The average particulate emission rate over the complete, integrated test run was measured to be 1.48g/hr.

The average particulate emission factor for the complete, integrated test run was measured to be 1.17 g/dry kg of fuel.

The average thermal efficiency for the complete, integrated test run was measured to be 74.0%.

The particulate emission rate calculated from the one-hour filter was 3.70 g/hr.

The proportionality results and sample train agreement for the test run was acceptable. Quality check results for each test run are presented in Section 3 of this report.

**SUMMARY TABLES**

**Table 1.1 – Particulate Emissions**

	<b>One-Hour Filter</b>	<b>Integrated Total</b>
<b>Emission Rate (g/hr)</b>	3.70	1.48
<b>Emission Factor (g/dry kg)</b>	1.30	1.17

**Table 1.2 – Efficiency and CO**

	<b>Burn Rate Segment</b>			<b>Integrated Total</b>
	<b>Maximum</b>	<b>Medium</b>	<b>Minimum</b>	
<b>Time (minutes)</b>	62	121	180	363
<b>Burn Rate (dry kg/hr)</b>	2.84	1.26	0.72	1.26
<b>Heat Input Rate (BTU/hr, HHV)</b>	52,554	23,364	13,310	23,364
<b>Heat Output Rate (BTU/hr, HHV)</b>	39,105	17,711	9,001	17,432
<b>Efficiency (% , HHV)</b>	74.4	75.8	67.6	74.6
<b>Efficiency (% , LHV)</b>	79.7	81.1	72.4	79.9
<b>CO Emission Rate (g/hr)</b>	205.43	1.3	N/A	30.3

**Table 1.3 – Test Facility Conditions**

	<b>Initial</b>	<b>Middle</b>	<b>Final</b>
<b>Room Temperature (°F)</b>	77	80	82
<b>Barometric Pressure (in Hg)</b>	30.10	30.08	30.07
<b>Air Velocity (ft/min)</b>	< 50	< 50	< 50
<b>Induced Draft (in H2O)</b>	0	0	0

**Table 1.4 – Fuel Measurement Summary**

<b>Segment</b>	<b>Time (min)</b>	<b>Burn Rate (dry kg/hr)</b>	<b>Consumed Fuel Weight (lbs)</b>	<b>Fuel Moisture Content (dry basis - %)</b>
Pretest	60	2.86	6.6	5.05
Maximum	62	2.84	6.8	5.05
Medium	121	1.26	5.9	5.05
Minimum	180	0.72	5.0	5.05
Integrated Total	363	1.26	17.7	5.05

**Table 1.5 – Dilution Tunnel and Flue Gas Measurements**

<b>Segment</b>	<b>Average Flue Draft (in H<sub>2</sub>O)</b>	<b>Average Dilution Tunnel Gas Measurements</b>		
		<b>Velocity (ft/sec)</b>	<b>Flow Rate (dscf/min)</b>	<b>Temperature (°F)</b>
Integrated Total	-0.026	13.69	149.2	101.8

**Table 1.6 – Heater Configuration**

<b>Segment</b>	<b>Temperature Control</b>	<b>Feed Rate</b>	<b>Distribution Blower Setting</b>	<b>Combustion Blower Setting (max RPM)</b>	<b>Combustion Blower Setting (min RPM)</b>
Pretest	7.0	100%	100%	3000	2600
Maximum	7.0	100%	100%	3000	2600
Medium	2.5	41%	15%	2625	2300
Minimum	1.0	25%	Off	2625	2100



*Model: Allure 50  
Harman Home Heating  
352 Mountain House Road  
Halifax, PA 17032*

# **Section 2**

## **Photographs**

### **Appliance Description**

Model: Allure 50  
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Halifax, PA 17032

## Harman Home Heating Allure 50

### PHOTOGRAPHS



**Allure 50 Front**



**Allure 50 Back**



**Allure 50 Left**



**Allure 50 Right**



**Combustion Air Cover As Received**  
Position for Run 1



**Combustion Air Cover Repaired**  
Position for Run 2

## APPLIANCE DESCRIPTION

**Appliance Manufacturer:** Harman Home Heating

**Pellet Stove Model:** Allure 50

**Type:** Freestanding, air-circulating type, pellet-fired room heater.

The Allure 50's principle elements include a fuel hopper, steel firebox chamber, steel burn pot, and electrical fuel feed, combustion air, and convection air supply systems.

Air is forced by the combustion air blower through holes in the burn pot and combustion products are routed out of the firebox chamber through a 3-inch diameter flue outlet located on the rear of the unit.

Fuel is supplied from the hopper to the burn pot via an auger which moves pellets horizontally towards the front of the appliance. Fuel supply rate is varied by cycling the auger motor as needed.

Ashes fall through the burn pot into a removable ash drawer located at the bottom of the unit. The drawer is accessed through the front firebox door, which also features a 5mm glass viewing window sealed by fiberglass rope gasket

The electrical systems are regulated by a user-operated control board. On this board settings such as feed rate, combustion and distribution fan speeds, and desired temperature and can be adjusted to achieve desired heat output. The unit can also be controlled by an external thermostat system.

## DESIGN CHANGES FOLLOWING TESTING

Several small design changes were made to the Allure 50 subsequent to testing. OMNI affirms that these changes do not affect combustion or emissions performance. Production units conforming to drawings found in this section are similar in all material respects that would affect emissions or cause emissions performance to exceed the limit.

These changes include the removal of a cosmetic "flame enhancer" from the front of the burn pot and changing the material of the burn pot attachment gasket from fiberglass to closed cell silicone foam. Engineering drawings in the following pages contain the details of these changes.

*Model: Allure 50  
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# **Section 3**

## **Quality Assurance/Quality Control**

## **QUALITY ASSURANCE/QUALITY CONTROL**

OMNI follows the guidelines of ISO/IEC 17025, “General Requirements for the Competence of Testing and Calibration Laboratories,” and the quality assurance/quality control (QA/QC) procedures found in OMNI’s Quality Assurance Manual.

OMNI’s scope of accreditation includes, but is not limited to, the following:

- ANSI (American National Standards Institute) for certification of product to safety standards.
- To perform product safety testing by the International Accreditation Service, Inc. (formerly ICBO ES) under accreditation as a testing laboratory designated TL-130.
- To perform product safety testing as a “Certification Organization” by the Standards Council of Canada (SCC).
- Serving as a testing laboratory for the certification of wood heaters by the U.S. Environmental Protection Agency.

This report is issued within the scope of OMNI’s accreditation. Accreditation certificates are available upon request.

The manufacturing facilities and quality control system for the production of the Allure 50 at Harman Home Heating were evaluated to determine if sufficient to maintain conformance with OMNI’s requirements for product certification. OMNI has concluded that the manufacturing facilities, processes, and quality control system are adequate to produce the appliance congruous with the standards and model codes to which it was evaluated.

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*Model: Allure 50  
Harman Home Heating  
352 Mountain House Road  
Halifax, PA 17032*

## **Sample Analysis**

Analysis Worksheets  
Moisture Content Worksheet  
Fuel Certification Label  
Tared Filter, Probe, and O-Ring Data

**NOTE: The original data sheets show the model name as “Allure 43” rather than “Allure 50.” The name was changed following completion of testing and analysis.**

## Pellet Heater Lab Data - ASTM E2779 / ASTM E2515

Manufacturer: <u>Harman</u>	Equipment Numbers: <u>23, 131, 291</u>
Model: <u>Allure 43</u>	_____
Tracking No.: <u>2123</u>	_____
Project No.: <u>0135PS037E</u>	_____
Run #: <u>1</u>	_____
Date: <u>9/2/15</u>	_____

### TRAIN 1 (First Hour emissions)

Sample Component	Reagent	Filter, Probe or Dish #	Weights		
			Final, mg	Tare, mg	Particulate, mg
A. Front filter catch	Filter	C23	123.4	118.2	5.2
B. Rear filter catch	Filter	C24	114.6	114.8	-0.2
C. Probe catch*	Probe	50	121765.6	121765.3	0.3
D. Filter seals catch*	Seals	R354	3394.1	3392.3	1.8

<b>Sub-Total</b>	Total Particulate, mg:	7.1
------------------	------------------------	-----

### TRAIN 1 (Remainder of Test)

Sample Component	Reagent	Filter, Probe or Dish #	Weights		
			Final, mg	Tare, mg	Particulate, mg
A. Front filter catch	Filter	C25	125.4	117.2	8.2
B. Rear filter catch	Filter	C26	113.2	113.5	-0.3
C. Probe catch*	Probe	61	122553.3	122553.2	0.1
D. Filter seals catch*	Seals	R355	3305.5	3304.5	1.0

<b>Sub-Total</b>	Total Particulate, mg:	9.0
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<b>Train 1 Aggregate</b>	Total Particulate, mg:	16.1
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### TRAIN 2

Sample Component	Reagent	Filter, Probe or Dish #	Weights		
			Final, mg	Tare, mg	Particulate, mg
A. Front filter catch	Filter	C27	129.3	113.8	15.5
B. Rear filter catch	Filter	C28	117.4	118.1	-0.7
C. Probe catch*	Probe	63	121595.3	121595.1	0.2
D. Filter seals catch*	Seals	R356	4111.6	4109.1	2.5

<b>Total Particulate, mg:</b>	17.5
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### AMBIENT

Sample Component	Reagent	Filter # or Probe #	Weights		
			Final, mg	Tare, mg	Particulate, mg
A. Front filter catch*	Filter	C29	115.5	115.3	0.2

<b>Total Particulate, mg:</b>	0.2
-------------------------------	-----

\*Particulate catch that results in a negative number, is assumed to be zero for probes and seals, negative numbers for filters are assumed to be part of the seal

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



NI-Test Laboratories, Inc.

**ASTM E2779 Pellet Heater Run Sheets**

Client: Harman Project Number: 0135PS037E Run Number: 1  
 Model: Allure 43 Tracking Number: 2123 Date: 9/2/15  
 Test Crew: A. Kowitz  
 OMNI Equipment ID numbers: 23, 131, 291

**ASTM E2515 Lab Sheet**

Assembled By:

A. Kowitz

Date/Time in Dessicator:

9/2/15 1630

Weighing #1	Weighing #2	Weighing #3	Weighing #4	Weighing #5
Date: 9/4/15	Date: 9/8/15	Date: 9/9/15	Date:	Date:
Time: 1030	Time: 1000	Time: 1100	Time:	Time:
R/H %: 13.1	R/H %: 19.9	R/H %: 15.7	R/H %:	R/H %:
Temp: 73.8	Temp: 71.0	Temp: 73.7	Temp:	Temp:
Audit: 500.1	Audit: 500.2	Audit: 500.1	Audit:	Audit:
Initials: A	Initials: A	Initials: N	Initials:	Initials:

Train	Element	ID #	Tare (mg)	Weight (mg)	Weight (mg)	Weight (mg)	Weight (mg)	Weight (mg)
A	Front Filter (60 min)	23	114.2	123.4	123.4	-		
A	Rear Filter (60 min)	24	114.8	114.9	114.6	114.6		
A	Probe (60 min)	50	121765.3	121765.6	121765.6	-		
A	O-Ring Set (60 min)	R354	3392.3	3394.3	3394.0	3394.1		
A	Front Filter (Remainder)	25	117.2	125.5	125.4	-		
A	Rear Filter (Remainder)	26	113.5	113.5	113.2	113.2		
A	Probe (Remainder)	61	122553.2	122553.3	122553.3	-		
A	O-Ring Set (Remainder)	R355	3364.5	3305.8	3305.5	3305.5		
B	Front Filter	27	113.8	129.4	129.3	-		
B	Rear Filter	28	118.1	117.7	117.4	117.4		
B	Probe	63	121595.1	121595.3	121595.3	-		
B	O-Ring Set	R356	4104.1	4112.1	4111.5	4111.6		
BG	Filter	29	115.3	115.6	115.5	-		

Technician Signature:

[Signature]

Date:

9/2/15

## Pellet Heater Lab Data - ASTM E2779 / ASTM E2515

Manufacturer: <u>Harman</u>	Equipment Numbers: <u>23, 131, 291</u>
Model: <u>Allure 43</u>	_____
Tracking No.: <u>2123</u>	_____
Project No.: <u>0135PS037E</u>	_____
Run #: <u>2</u>	_____
Date: <u>9/10/15</u>	_____

### TRAIN 1 (First Hour emissions)

Sample Component	Reagent	Filter, Probe or Dish #	Weights		
			Final, mg	Tare, mg	Particulate, mg
A. Front filter catch	Filter	C45	123.1	120.5	2.6
B. Rear filter catch	Filter	C46	121.8	122.2	-0.4
C. Probe catch*	Probe	OES 6	113702.3	113701.7	0.6
D. Filter seals catch*	Seals	R346	3347.5	3346.7	0.8

<b>Sub-Total</b>	Total Particulate, mg:	3.6
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### TRAIN 1 (Remainder of Test)

Sample Component	Reagent	Filter, Probe or Dish #	Weights		
			Final, mg	Tare, mg	Particulate, mg
A. Front filter catch	Filter	C40	125.3	121.6	3.7
B. Rear filter catch	Filter	C41	120.6	120.9	-0.3
C. Probe catch*	Probe	9	115695.1	115694.1	1.0
D. Filter seals catch*	Seals	R347	3313.3	3312.6	0.7

<b>Sub-Total</b>	Total Particulate, mg:	5.1
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<b>Train 1 Aggregate</b>	Total Particulate, mg:	8.7
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### TRAIN 2

Sample Component	Reagent	Filter, Probe or Dish #	Weights		
			Final, mg	Tare, mg	Particulate, mg
A. Front filter catch	Filter	C42	129.8	122.3	7.5
B. Rear filter catch	Filter	C43	121.4	121.4	0.0
C. Probe catch*	Probe	29	114282.6	114281.4	1.2
D. Filter seals catch*	Seals	R348	3373.1	3372.8	0.3

	Total Particulate, mg:	9.0
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### AMBIENT

Sample Component	Reagent	Filter # or Probe #	Weights		
			Final, mg	Tare, mg	Particulate, mg
A. Front filter catch*	Filter	C44	119.8	119.6	0.2

	Total Particulate, mg:	0.2
--	------------------------	-----

\*Particulate catch that results in a negative number, is assumed to be zero for probes and seals, negative numbers for filters are assumed to be part of the seal

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

**ASTM E2779 Pellet Heater Run Sheets**

Client: Harman Project Number: 0135PS037E Run Number: 2  
 Model: Allure 43 Tracking Number: 2123 Date: 9/10/15  
 Test Crew: A. Kravitz

OMNI Equipment ID numbers: 23, 131, 185, 132, 209, 291, 335, 336, 410, 420, 559

**ASTM E2515 Lab Sheet**

Assembled By:

A. Kravitz

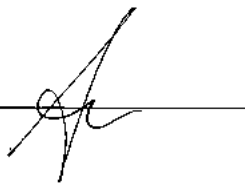
Date/Time in Dessicator:

9/10/15 16:00

Weighing #1	Weighing #2	Weighing #3	Weighing #4	Weighing #5
Date: 9/11/15	Date: 9/11/15	Date: 9/15/15		
Time: 16:15	Time: 13:15	Time: 10:36		
R/H %: 24.8	R/H %: 21.3	R/H %: 22.2		
Temp: 73.3	Temp: 75.4	Temp: 73.5		
Audit: 500.1	Audit: 500.2	Audit: 500.1		
Initials: A	Initials: A	Initials: A		

Train	Element	ID #	Tare (mg)	Weight (mg)	Weight (mg)	Weight (mg)	Weight (mg)	Weight (mg)
A (First Hour)	Front Filter	<del>C45</del> C39A	<del>120.5</del> 120.4	123.1	123.1	-		
	Rear Filter	<del>C46</del> C39A	<del>122.2</del> 122.1	121.8	121.8	-		
	Probe	OES 6	113701.7	113702.4	113702.3	-		
	O-Ring Set	R346	3346.7	3349.2	3347.6	3347.5		
A (Remainder)	Front Filter	C40	121.6	125.5	125.3	-		
	Rear Filter	C41	120.9	120.7	120.6	-		
	Probe	9	115694.1	115696.1	115695.1			
	O-Ring Set	R347	3312.6	3315.1	3313.3	3313.3		
B	Front Filter	C42	122.3	129.8	129.8	-		
	Rear Filter	C43	121.4	121.4	121.7	-		
	Probe	29	114281.4	114282.6	114282.6	-		
	O-Ring Set	R348	3372.4	3374.2	3373.1	3373.1		
BG	Filter	C44	119.6	119.8	119.8	-		

Technician Signature:



Date:

9/15/15




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:W215-0901-01  
**Issue No:** 1

## Analytical Test Report

**Client:** OMNI-TEST LABORATORIES INC.  
 13327 NE Airport Way  
 Portland, OR 97230  
**Attention:** Sebastian Button  
**PO No:** OTL-15-030

**Signed:**   
 Stephen Sundeen  
 Chemistry Laboratory Manager  
**Date of Issue:** 8/20/2015  
THIS DOCUMENT SHALL NOT BE REPRODUCED EXCEPT IN FULL

**Sample Details**  
**Sample Log No:** W215-0901-01      **Sample Date:**  
**Sample Designation:** Lignetics #1      **Sample Time:**  
**Sample Recognized As:** Pellets      **Arrival Date:** 8/13/2015

### Test Results

	METHOD	UNITS	MOISTURE FREE	AS RECEIVED
Moisture Total	ASTM E871	wt. %		5.05
Ash	ASTM D1102	wt. %	0.83	0.79
Volatile Matter	ASTM D3175	wt. %		
Fixed Carbon by Difference	ASTM D3172	wt. %		
Sulfur	ASTM D4239	wt. %	0.003	0.003
SO <sub>2</sub>	Calculated	lb/mmbtu		0.007
Net Cal. Value at Const. Pressure	ISO 1928	GJ/tonne	18.20	16.28
Net Cal. Value at Const. Pressure	ISO 1928	J/g	18196	16282
Gross Cal. Value at Const. Vol.	ASTM E711	J/g	19492	18508
Gross Cal. Value at Const. Vol.	ASTM E711	Btu/lb	8381	7957
Carbon	ASTM D5373	wt. %	49.23	46.74
Hydrogen*	ASTM D5373	wt. %	5.95	5.65
Nitrogen	ASTM D5373	wt. %	< 0.20	< 0.19
Oxygen*	ASTM D3176	wt. %	> 43.79	> 41.58

\*Note: As received values do not include hydrogen and oxygen in the total moisture.

Chlorine	ASTM D6721	mg/kg		
Fluorine	ASTM D3761	mg/kg		
Mercury	ASTM D6722	mg/kg		

Bulk Density	ASTM E873	lbs/ft <sup>3</sup>		
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**



**CONWAY &  
ROBISON**

## **CERTIFICATE OF MEMBERSHIP**

Be it known to all parties that:

**LIGNETICS OF WEST VIRGINIA  
LINN, WV**



Facility #: 03304

Is certified to produce Premium grade fuel and is in good standing with Conway & Robison, LLC's Quality Assurance Program for Densified Fuel Manufacturers which has been approved by the American Lumber Standard Committee (ALSC) Board of Review and is in compliance with the Pellet Fuel Institute's (PFI) Standard Specifications for Residential/Commercial Densified Fuel and the PFI Residential/Commercial Densified Fuel QA/QC Handbook.

Jason Robison

10/3/2013

DATE

**CONWAY & ROBISON, LLC**

P O Box 1508 SHARPSBURG, GA 30277  
(678) 642-4036 P (770) 234-5837 F [www.cr-inspect.com](http://www.cr-inspect.com)

### Moisture Content Worksheet

Client: Harman Home Heating / Hearth and Home Technologies

Model: Advance

Project #: 0135PS034E Tracking #: 2066

Sample description: Lignetics Premium Quality Wood Pellet Fuel

**Weight record:**

*Prior to Oven-Drying*

Balance ID #: OMNI - 00128

Audit ID #: OMNI-00283B

Date/Time in: 5/1/15 13:30

Audit weight: 199.9 g

Container: ID#: 247

Tare weight: 94.1 g

Total weight: 235.6 g

Material weight (total weight - container tare weight): 141.5 g

*Post Oven-Drying*

Balance ID #: OMNI - 00128

Audit ID #: OMNI-00283B

Date/Time out: 5/6/15 15:00

Total weight: 228.8 g

Audit weight (if necessary): 199.9 g

Material weight (total weight - container tare weight): 134.7 g

**Calculations:**

$$\text{Dry basis (\%)} = \frac{\text{Initial} - \text{Final}}{\text{Final}} \times 100 = \frac{141.5 \text{ g} - 134.7 \text{ g}}{134.7 \text{ g}} \times 100\% = 5.05 \%$$

$$\text{Wet basis (\%)} = \frac{\text{Initial} - \text{Final}}{\text{Initial}} \times 100 = \frac{141.5 \text{ g} - 134.7 \text{ g}}{141.5 \text{ g}} \times 100\% = 4.81 \%$$

Method: ASTM D4442-92 Method A—Oven-Drying Method

Technician signature: [Signature] Date: 5/7/15

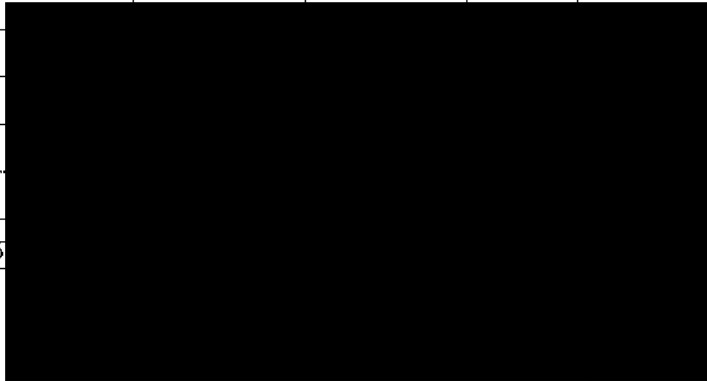
Reviewed by: [Signature] Date: 5/7/15

**FILTER TARES**

Date Placed in Desiccator: 8/20/15 1530 Technician: A. Krawitz Balance ID # 23  
 Thermo/Hygro meter ID #: 291 Audit Weight ID # 131 (Balance audit mfr. Std.: 500 ± 0.72)

Filter Size/ID#	Date: 8-21-15 Time: 11:17 RH%: 14.7 T (F): 77.5 Initials: DK	Date: 8/25/17 Time: 09:30 RH%: 16.3 T (F): 76.1 Initials: DK	Date: Time: RH%: T (F): Initials:	Date: Time: RH%: T (F): Initials:	Manufacturer	Appliance	Project No.	Run No.
(23) 102 (47) 110 55					Horne	Allura 43	0135PS037E	1
(24)	118.2	118.2						
(25)	114.9	114.8						
(26)	117.2	117.2						
(27)	113.3	113.5						
(28)	114.0	113.8						
(29)	118.0	118.1						
(30)	115.1	115.3						
(31)	121.5	121.5			Morse	6600	019245024E	2
(32)	121.5	121.5						
(33)	122.7	122.9						
(34)	121.0	121.2						
(35)	121.3	121.2						
(36)	122.4	122.5						
(36)	120.3	120.5			PS			

Final Technician signature: *A. Krawitz* Date: 8/20/15



**FILTER TARES**

Date Placed in Desiccator: 8/20/15 1530 Technician: A. Kravitz Balance ID # 23

Thermo/Hygro meter ID #: 291 Audit Weight ID # 131 (Balance audit mfr. Std.: 500 ± 0.72)

Filter Size/ID#	Date: <u>8-24-15</u> Time: 10:15 RH%: 14.8 T (F): 78.9 Initials: <u>AK</u>	Date: <u>8/25/15</u> Time: 08:50 RH%: 16.3 T (F): 76.1 Initials: <u>AK</u>	Date: Time: RH%: T (F): Initials:	Date: Time: RH%: T (F): Initials:	Manufacturer	Appliance	Project No.	Run No.
(37)	122.0	122.1						
C38	120.1	120.1						
C39	122.0	122.1						
C40	121.5	121.6			Harman	AirLife 43	0138PS0378	2
C41	120.8	120.9						
C42	122.4	122.3						
C43	121.4	121.4						
C44	119.6	119.6						
C45	120.4	120.5						
C46	122.1	122.2						
C47	121.0	121.1			PSCAR	PONCANT	2323V001W	22
C48	121.2	121.1						
C49	121.1	121.1						
C50	121.7	121.7						

Final Technician signature: *A. Kravitz*

Date: 8/26/15



TARE SHEET - PROBES

Date Placed in Dessicator: 8/14/15 0915


Thermohyrometer ID #: OMNI-00291

Cleaned By: A. Kravitz

Balance ID #: OMNI-00023

Audit Weight ID #: OMNI-00131

Probe ID #	Date: 8/14/15 Time: 0827 RH %: 9.5 T (°F): 78 Audit: .5001	Date: 8/20/15 Time: 0915 RH %: 15.3 T (°F): 78 Audit: .5001	Date: 8/24/15 Time: 1115 RH %: 14.8 T (°F): 78.7 Audit: .5001	Date: 8/25/15 Time: 0850 RH %: 16.3 T (°F): 76.1 Audit: .5001	Date Used	Project Number	Run No.
2	115020.9	115020.4	115020.1	115020.0	8/14/15		
OES 3	114772.0	114771.4	114771.4				
7	114984.7	114984.6			9/1/15		
12	114286.4	114286.3					
13	114325.7	114325.0	114324.8				
18	114409.1	114403.9	114403.4	114403.4			
20	114255.4	114254.9	114254.8				
22	114349.1	114348.5	114348.3				
50	121766.1	121765.3	121765.3		9/2/15		
61	122553.8	122553.3	122553.2				
63	121595.2	121595.1					
65	122189.6	122189.5			9/4/15		2
66	123169.2	123168.6	123168.6				
68	122442.4	122442.0	122441.6	122441.5			
	Initials: <u>NR</u>	Initials: <u>NR</u>	Initials: <u>NR</u>	Initials: <u>NR</u>			

Final Technician Signature: 

Date: 8/26/15

TARE SHEET - PROBES

Date Placed in Dessicator: 9/1/15 10:30

Thermohyrometer ID #: 291

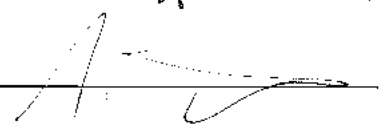
Cleaned By: A. Kowitz

Balance ID #: 23

Audit Weight ID #: 131<sup>4</sup> 2834

Probe ID #	Date: <del>9/1/15</del> 9/1/15 Time: 1000 RH %: 13.4 T (°F): 72.6 Audit: 99998.3	Date: <del>9/1/15</del> 9/5/15 Time: 1230 RH %: 16.7 T (°F): 71.2 Audit: <u>4</u>	Date: 9/8/15 Time: 1130 RH %: <del>21.8</del> T (°F): 71.5 Audit: <u>1</u>	Date: Time: RH %: T (°F): Audit:	Date Used	Project Number	Run No.
1	122771.1	122771.3	-		9/1		
0ES 5	113594.2	113554.4	-				
0ES 6	113701.5	113701.7	-		9/10/15	0135P037E	1
9	115694.3	115694.1	-		1	1	1
29	114281.1	114281.6	114281.4				
30	114334.2	114334.5	114334.3		9/10/15	932315001	22
35	114328.8	114328.9	91432 -				
36	114887.6	114887.8	-		9/1		
38	114152.2	114152.3	-				
53	122929.0	122929.0	-		9/1		
54	122837.4	122937.8	122837.6				
55	123233.9	123234.1	-		9/1		
56	123073.8	123073.7	-				
60	121852.2	121852.5	121852.3		9/1		
14	114548.0	114548.3	114548.1				
	Initials: <u>A</u>	Initials: <u>A</u>	Initials: <u>A</u>	Initials:			

Final Technician Signature: \_\_\_\_\_



Date: 9/8/15

**O-RING TARES**

Date Placed in Desiccator: 6/26/15 Technician: A. Krawitz Balance ID # 23

Thermo/Hygro meter ID #: 343 Audit Weight ID # 131 (Balance audit mfr. Std.: 500 ± 0.72)

O-Ring Size/ID#	Date: 6/24/15 Time: 1130 RH%: 7.7 T (F): 74.6 Initials: A	Date: 7/1/15 Time: 1040 RH%: 15.8 T (F): 77.1 Initials: A	Date: 7/7/15 Time: 1630 RH%: 12.7 T (F): 75.9 Initials: A	Date: Time: RH%: T (F): Initials:	Manufacturer	Appliance	Project No.	Run No.
R337	4154.5	4154.2	4154.0		H			
R338	3433.5	3433.1	3432.0					
R339	3435.9	3435.6	3435.4					
R340	3366.6	3368.3	3368.1					
R341	3371.4	3371.4	-					
R342	3415.0	3414.7	3414.5					
R343	3343.6	3343.4	-					
R344	4135.1	4134.8	4134.6					
R345	3350.3	3350.1	-					
R346	3347.2	3347.9	3346.7		H			
R347	3312.7	3312.6	-					
R348	3372.9	3372.8	-					
R349	3246.1	3245.8	3425.9					
R350	3376.0	3376.0	-					

Final Technician signature: *[Signature]* Date: 7/7/15

### O-RING TARES

Date Placed in Desiccator: 7/1/15 Technician: A. Kravitz Balance ID # 23  
 Thermo/Hygro meter ID #: 343 Audit Weight ID # 131 (Balance audit mfr. Std.: 500 ± 0.72)

O-Ring Size/ID#	Date: 7/1/15 Time: 1030 RH%: 72.7 T (F): 75.5 Initials: A	Date: 7/8/15 Time: 1040 RH%: 72.2 T (F): 76.1 Initials: A	Date: 7/9/15 Time: 1100 RH%: 74.6 T (F): 74.4 Initials: A	Date: Time: RH%: T (F): Initials:	Manufacturer	Appliance	Project No.	Run No.
R351	3330.4	3330.0	3330.0					
R352	3329.3	3329.0	3328.9					
R353	3299.2	3298.7	3298.7					
R354	3392.3	3392.3	-		Harman	Allura 43	013515037 E	1
R355	3304.9	3304.6	3304.5		↓	↓	↓	↓
R356	4109.3	4109.1	-					
R357	3611.9	3611.9	-					
R358	3296.7	3296.4	3296.3					
R359	3510.1	3510.2	-					
R360	3309.0	3308.7	3308.5					
R361	4917.0	4917.0	-					
R362	3380.6	3380.3	3380.2					
R363	4060.4	4060.3	-					
R364	3319.0	3318.7	3318.7					

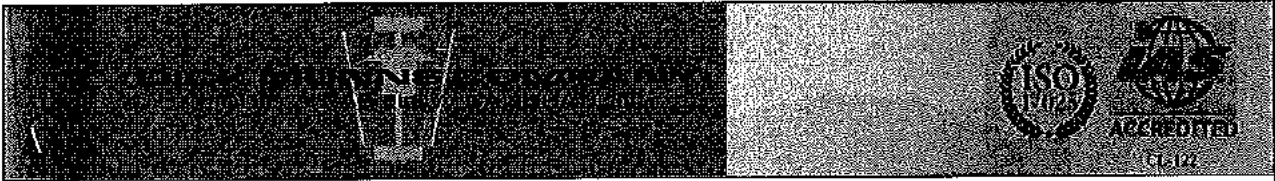
Final Technician signature: [Signature]

Date: 7/9/15

## Calibrations

### EPA Method 28R, ASTM E2515, ASTM E2779

ID #	Lab Name/Purpose	Log Name	Attachment Type
1	Calibrator Dry Gas Meter	Rockwell Int'l Standard Test Meter	Calibration Certificate
23	Scale-Analytical Balance	Mettler Analytical Balance	Calibration Certificate
128	Scale	Acculab V1200	Calibration Log
131	500 mg Weight	Ohaus Weight Standard, 500 mg	Calibration Certificate
132	10 lb Weight	Weight Standard, 10 lb.	Calibration Certificate
185	Platform Scale	Weigh-Tronix Platform Scale	See Test Run Notes
209	Barometer	Barometer – Princo	Manual Cover
283B	Calibration Weights	Troemner Metric Weight Standards	Calibration Certificate
291	Thermohygrometer	Omega Digital Thermohygrometer	Calibration Log
296-T32	Tape Measure	Tape Measure	Calibration Log
335	Sample Box / Dry Gas Meter	Apex Automated Emissions Sampling Box	Calibration Log
336	Sample Box / Dry Gas Meter	Apex Automated Emissions Sampling Box	Calibration Log
410	Microtector	Dwyer Microtector	Manual, Photograph
420	Combustion Gas Analyzer	ZRE Combustion Gas Analyzer	Manual Cover
559	Vaneometer	Dwyer Vaneometer	Manual



## CERTIFICATE OF CALIBRATION

<b>CUSTOMER:</b>	OMNI TEST LABS INC. PORTLAND OR	<b>CALIBRATION DATE:</b>	10/23/14
<b>PO NUMBER:</b>	OTL-14-049	<b>CALIBRATION DUE:</b>	10/23/15
<b>INST. MANUFACTURER:</b>	ROCKWELL	<b>PROCEDURE:</b>	NAVAIR 17-20MG-02
<b>INST. DESCRIPTION:</b>	P.D. METER	<b>CALIBRATION FLUID:</b>	AIR @ 14.7 PSIA 70 F
<b>MODEL NUMBER:</b>	S-275	<b>STANDARD(S) USED:</b>	A4, A24, A321 DUE 02-2015
<b>SERIAL NUMBER:</b>	684390L	<b>NIST TRACE #' S:</b>	1329407628, 1361269184, 1390386562
<b>RATED UNCERTAINTY:</b>	+/- .5 % RD.	<b>AMBIENT CONDITIONS:</b>	760 mm HGA 51 % RH 72 F
<b>UNCERTAINTY GIVEN:</b>	FLOW measurement uncertainty: +/- .101 % RD. K=2	<b>CERTIFICATE FILE #:</b>	426663.14
<b>NOTES:</b>	AS RECEIVED/AS LEFT WITHIN SPECS. REFERENCE CONDITIONS ARE: 760 mm HGA 70 F **OMNI-00001**		

TEST POINT NUMBER	UUT INDICATED	DM.STD. ACTUAL	CORRECTION FACTOR	K FACTOR
1	0.2603	0.26	0.99888	60.067
2	0.5106	0.51	0.99877	60.074
3	1.0213	1.02	0.99868	60.079
4	1.4921	1.49	0.99858	60.085
5	2.0231	2.02	0.99845	60.093
6	2.4946	2.49	0.99817	60.110
7	3.0253	3.02	0.99823	60.106
8	3.4866	3.48	0.99812	60.113
AVERAGE (Y)=			0.99848542	

All instruments used in the performance of the shown calibration have traceability to the National Institute of Standards and Technology (NIST). The uncertainty ratio between the calibration standards (DM.STD.) used and the unit under test (UUT) is a minimum of 4:1, unless otherwise noted. Calibration has been performed per the shown procedure number, in accordance with ISO 10012:2003, ISO 17025:2005, ANSI/NCSL-Z-540.3, and/or MIL-STD-45662A. Test methods: API2530-92 & ASME MFC-3M-1989.

**Dick Munns Company • 10572 Calle Lee #130 • Los Alamitos, CA 90720**  
 Phone (714) 827-1215 • Fax (714) 827-0823

This Calibration Certificate shall not be reproduced or in full or in part without approval by DICK MUNNS COMPANY. The data shown applies only to the instrument being calibrated and under the stated conditions of calibration.

Date:

Approved By:

Calibration Technician:

10/23/2014

Page 1 of 1

# Certificate of Calibration

Certificate Number: **598198**



**JJ Calibrations, Inc.**  
 7007 SE Lake Rd  
 Portland, OR 97267-2105  
 Phone 503.786.3005  
 FAX 503.786.2994

**Omni-Test Laboratories**  
 13327 NE Airport Way  
 Portland, OR 97230

OnSite

PO: **OTL-15-020**  
 Order Date: **07/23/2015**  
 Authorized By: **N/A**



Property #: **OMNI-00023**  
 User: **N/A**  
 Department: **N/A**  
 Make: **Mettler**  
 Model: **AE200**  
 Serial #: **E17657**  
 Description: **Scale, 205g**  
 Procedure: **DCN 500818/500887**  
 Accuracy: **±0.0004g ±1 LSD**

Calibrated on: **07/23/2015**  
 \*Recommended Due: **01/23/2016**  
 Environment: **20 °C 40 % RH**  
 \* As Received: **Out of Tolerance**  
 \* As Returned: **Within Tolerance**  
 Action Taken: **Adjusted**  
 Technician: **111**

Remarks: \* Many factors may cause the unit to drift out of calibration before the recommended due date. Any reported error is the absolute value between the reference and the unit. Uncertainties include the effects of the unit.

### Standards Used

Std ID	Manufacturer	Model	Nomenclature	Due Date	Trace ID
723A	Rice Lake	1mg-200g (Class O)	Mass Set	10/31/2015	569749

### Parameter

### Measurement Data

Measurement Description	Range	Unit	Reference	Min	Max	*Error	UUT	Uncertainty
<b>Before</b>								Accredited = ✓
Force								
		g	0.00100	0.0005	0.0015	0.0000	0.0010 g	5.7E-04 ✓
		g	0.01000	0.0095	0.0105	0.0000	0.0100 g	5.7E-04 ✓
		g	0.10000	0.0995	0.1005	0.0000	0.1000 g	5.7E-04 ✓
		g	0.50000	0.4995	0.5005	0.0000	0.5000 g	5.7E-04 ✓
		g	1.00000	0.9995	1.0005	0.0000	1.0000 g	5.7E-04 ✓
		g	40.00000	39.9995	40.0005	0.0004	40.0004 g	5.7E-04 ✓
		g	80.00000	79.9995	80.0005	0.0006	80.0006 g	5.7E-04 ✓
		g	120.00000	119.9995	120.0005	0.0009	120.0009 g	5.7E-04 ✓
		g	160.00000	159.9995	160.0005	0.0011	160.0011 g	5.8E-04 ✓
		g	200.00000	199.9995	200.0005	0.0015	200.0015 g	5.7E-04 ✓
<b>After</b>								Accredited = ✓
		g	0.00100	0.0005	0.0015	0.0002	0.0008 g	5.7E-04 ✓
		g	0.01000	0.0095	0.0105	0.0002	0.0098 g	5.7E-04 ✓
		g	0.10000	0.0995	0.1005	0.0002	0.0998 g	5.7E-04 ✓
		g	0.50000	0.4995	0.5005	0.0001	0.4999 g	5.7E-04 ✓
		g	1.00000	0.9995	1.0005	0.0001	0.9999 g	5.7E-04 ✓
		g	40.00000	39.9995	40.0005	0.0000	40.0000 g	5.7E-04 ✓
		g	80.00000	79.9995	80.0005	0.0000	80.0000 g	5.7E-04 ✓
		g	120.00000	119.9995	120.0005	0.0001	120.0001 g	5.7E-04 ✓
		g	160.00000	159.9995	160.0005	0.0000	160.0000 g	5.8E-04 ✓
		g	200.00000	199.9995	200.0005	0.0000	200.0000 g	5.7E-04 ✓

## ANALYTICAL BALANCE CALIBRATION DATA SHEET

Balance to be calibrated: Acculab V-1200 Electronic Field Balance

ID Number: OMNI-00128

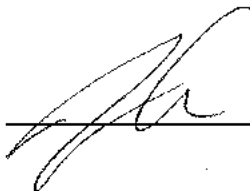
ID Number of Standard Calibration Weights: OMNI-00283 A + B

Date: 2/3/2015 By: J. Clark

Standard Weight (A) (grams)	Weight Verified (B) (grams)	Difference (A - B)
1000.0	999.9	+ 0.1
500.0	500.0	0.0
200.0	199.9	0.1
100.0	99.9	0.1
50.0	49.9	0.1
20.0	19.9	0.1

*This calibration is traceable to NIST using calibrated standard weights.*

Technician signature: \_\_\_\_\_



Date: \_\_\_\_\_

2/3/2015



## SCALE WEIGHT CALIBRATION DATA SHEET

Weight to be calibrated: 10 lb

ID Number: 132

Standard Calibration Weight: 10 lb

ID Number: 256

Scale Used: MTW-150K

ID Number: 353

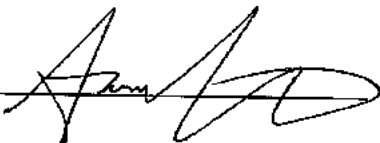
Date: 2/19/13

By: A. Kovitz

Standard Weight (A) (Lb.)	Weight Verified (B) (Lb.)	Difference (A - B)	% Error
10.0	10.0	0.0	Ø

\*Acceptable tolerance is 1%.

*This calibration is traceable to NIST using calibrated standard weights.*

Technician signature:  Date: 2/19/13

# Certificate of Calibration

Certificate Number: 547339



**JJ Calibrations, Inc.**  
7007 SE Lake Rd  
Portland, OR 97267-2105  
Phone 503.786.3005  
FAX 503.786.2994

Omni-Test Laboratories  
13327 NE Airport Way  
Portland, OR 97230

PO: OTL-13-035  
Order Date: 11/19/2013  
Authorized By: N/A



Property #: OMNI-00131  
User: N/A  
Department: N/A  
Make: Ohaus  
Model: 500mg  
Serial #: 27503  
Description: MASS  
Procedure: DCN 500901  
Accuracy: CLASS F ( $\pm 0.72\text{mg}$ )

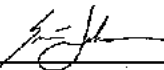
Calibrated on: 12/02/2013  
\*Recommended Due: 12/02/2018  
Environment: 20 °C 34 % RH  
As Received: Within Tolerance  
As Returned: Within Tolerance  
Action Taken: Calibrated  
Technician: 34

Remarks: \* Any number of factors may cause the calibration item to drift out of calibration before the recommended interval has expired  
Refer to attachment for measurement results.


### Standards Used

Std ID	Manufacturer	Model	Nomenclature	Due Date	Trace ID
432A	Sartorius	C-44	Microbalance 5.1g	03/11/2014	517747
723A	Rice Lake	1mg-200g (Class O)	Mass Set	09/05/2014	540048

JJ Calibrations, Inc. certifies that this instrument has been calibrated in accordance with the JJ Calibrations Quality Assurance Manual with the stated procedure using standards that are traceable to the National Institute of Standards and Technology (NIST), or other National Measurement Institutes (NMI's), or by using natural physical constants, intrinsic standards or ratio calibration techniques. The quality system and this certificate are in compliance with ANSI/NCCL Z540-1-1994, ISO/IEC 17025-2005, ISO 10012-1, the ISO 9000 family and QS 9000. The expanded uncertainties of measurements for this calibration are based upon 95% (2 sigma) confidence limits. Unless otherwise stated, a test accuracy ratio (TAR) of 4:1, if achievable, is maintained. The results reported herein apply only to the calibration of the item described above. This report may not be reproduced, except in full, without prior written consent of JJ Calibrations, Inc.  
JJ Calibrations, Inc. quality system has been assessed and accredited to ISO/IEC 17025:2005.

Reviewer 

3 Issued 12/06/2013 Rev # 14

Inspector 

Certificate: 547339

Page 1 of 1

# Instruction Booklet

for use with

# PRINCO

Fortin type mercurial

Barometers

*Manufactured by*

**PRINCO INSTRUMENTS, INC.**

1020 Industrial Blvd.  
Southampton, Pa. 18966-4095  
U.S.A.

Phone: 215 355-1500

Fax: 215 355-7766

458  
National  
Weather  
Service  
Type

458  
NOVA  
Economy  
Model

# Certificate of Calibration

Certificate Number: 466281



**JJ Calibrations, Inc.**  
 7007 SE Lake Rd  
 Portland, OR 97267-2105  
 Phone 503.786.3005  
 FAX 503.786.2994

Omni-Test Laboratories  
 13327 NE Airport Way  
 Portland, OR 97230



PO: OTL-10-085

Order Date: 12/20/2010

Authorized By: N/A

Calibrated on: 12/21/2010

\*Recommended Due: 12/21/2015

Environment: 18 °C 40 % RH

As Received: Within Tolerance

As Returned: Within Tolerance

Action Taken: Calibrated

Technician: 92

Property #: OMNI-00283B  
 User: N/A  
 Department: N/A  
 Make: Troemner Inc  
 Model: 200g-2Kg  
 Serial #: 47883  
 Description: Mass Set, 5 pc  
 Procedure: DCN 500901  
 Accuracy: Class A

Remarks: \* Any number of factors may cause the calibration item to drift out of calibration before the recommended interval has expired

### Standards Used

Std ID	Manufacturer	Model	Nomenclature	Due Date	Trace ID
383A	Setra	2000C	Scale, Digital 2 Kgm	03/25/2011	448104
479A	Sartorius	MC210S	Scale 210g	11/09/2011	461792
432A	Sartorius	C-44	Microbalance 5.1g	11/08/2011	461791
503A	Rice Lake	1mg-200g (Class O)	Mass Set	11/08/2011	460936
515A	Sartorius	LA1200S	Balance, Electronic 1200g	12/13/2011	465509

Parameter	Measurement Description	Range	Unit	Measurement Data						
				Reference	UUT	Variance	Min	Max	Uncertainty	
Before/After									Accredited = ✓	
Mass										
			g	200.0000	200.0031	-0.00314	199.99600	200.00400	0.0003	✓
Dot			g	200.0000	200.0033	-0.00337	199.99600	200.00400	0.0003	✓
			g	500.0000	500.0056	-0.00565	499.98999	500.01001	0.0027	✓
			g	1000.0000	1000.017	-0.0172	999.9800	1000.0200	0.0029	✓
			g	2000.0000	2000.028	-0.0283	1999.9600	2000.0400	0.036	✓

JJ Calibrations, Inc. certifies that this instrument has been calibrated in accordance with the JJ Calibrations Quality Assurance Manual with the stated procedure using standards that are traceable to the National Institute of Standards and Technology (NIST), or other National Measurement institutes (NMIs), or by using natural physical constants, intrinsic standards or ratio calibration techniques. The quality system and this certificate are in compliance with ANSI/NCSL Z540-1-1994, ISO/IEC 17025-2005, ISO 10012-1, the ISO 9000 family and QS 9000. The expanded uncertainties of measurements for this calibration are based upon 95% (2 sigma) confidence limits. Unless otherwise stated, a test accuracy ratio (TAR) of 4:1, if achievable, is maintained. The results reported herein apply only to the calibration of the item described above. This report may not be reproduced, except in full, without prior written consent of JJ Calibrations, Inc.  
 JJ Calibrations, Inc. quality system has been assessed and accredited to ISO/IEC 17025:2005.

*Carolyn Johansen*  
 Reviewer

5 Issued 12/22/2010

Rev # 14

*Q. M. ...*  
 Inspector

# Certificate of Calibration

Certificate Number: **580819**



**JJ Calibrations, Inc.**  
 7007 SE Lake Rd  
 Portland, OR 97267-2105  
 Phone 503.786.3005  
 FAX 503.786.2994

**Omni-Test Laboratories**  
 13327 NE Airport Way  
 Portland, OR 97230

PO: OTL-15-001  
 Order Date: **01/09/2015**  
 Authorized By: **N/A**



Property #: **OMNI-00291**  
 User: **N/A**  
 Department: **N/A**  
 Make: **Omega**  
 Model: **RH82**  
 Serial #: **9190156**  
 Description: **Thermohygrometer**  
 Procedure: **DCN 401013/403410**  
 Accuracy: **Refer to Mfg. Specs.**

Calibrated on: **01/20/2015**  
 \*Recommended Due: **01/20/2016**  
 Environment: **21 °C 40 % RH**  
 \* As Received: **Within Tolerance**  
 \* As Returned: **Within Tolerance**  
 Action Taken: **Calibrated**  
 Technician: **112**

Remarks: \* Many factors may cause the unit to drift out of calibration before the recommended due date. Any reported error is the absolute value between the reference and the unit. Uncertainties include the effects of the unit.

### Standards Used


Std ID	Manufacturer	Model	Nomenclature	Due Date	Trace ID
464A	General Eastern	M4-RH/D2	HUMIDITY STANDARD	12/14/2015	577811
497A	Hart Scientific	1562A	Precision Digital Thermometer	08/11/2015	568028
601A	Burns Engineering	200G05B085	INDUSTRIAL PRT	02/11/2016	554126

### Parameter


### Measurement Data

Measurement Description	Range	Unit	Reference	Min	Max	*Error	UUT	Uncertainty
<b>Before/After</b>								
Relative Humidity		%	20.00	17.0	23.0	1.8	21.8%	5.8E-01 ✓
		%	50.00	47.0	53.0	0.7	50.7%	5.8E-01 ✓
		%	80.00	77.0	83.0	0.5	79.5%	5.8E-01 ✓
Temperature		°C	5.40	4.4	6.4	0.2	5.2 °C	8.1E-02 ✓
		°C	19.10	18.1	20.1	0.2	18.9 °C	8.1E-02 ✓

JJ Calibrations, Inc. certifies that this instrument has been calibrated in accordance with the JJ Calibrations Quality Assurance Manual with the stated procedure using standards that are traceable to the National Institute of Standards and Technology (NIST), or other National Measurement Institutes (NMI's), or by using natural physical constants, intrinsic standards or ratio calibration techniques. The quality system and this certificate are in compliance with ANSI/NCSL Z540-1-1994, ISO/IEC 17025:2005, ISO 10012-1, the ISO 9000 family and QS 9000. The expanded uncertainties of measurements for this calibration are based upon 95% (2 sigma) confidence limits. Unless otherwise stated, a test accuracy ratio (TAR) of 4:1, if achievable, is maintained. The results reported herein apply only to the calibration of the item described above. This report may not be reproduced, except in full, without prior written consent of JJ Calibrations, Inc. JJ Calibrations, Inc. quality system has been assessed and accredited to ISO/IEC 17025:2005.

  
 Reviewer

3 Issued 01/21/2015 Rev #15

  
 Inspector

OMNI Environmental Services, Inc.  
 OMNI-Test Laboratories, Inc.

### Tape Measure Calibration Log

Place the calibrated 12" ruler under the tape measure and verify that each 1/2" (i.e. 1.5", 2", 2.5") between 0 and 36" is within 1/8".

CALIBRATED USING OMNI-00231

Tape Measure Number	Description	Cal Dates				Technician Initials			
00296-T32	Stanley FatMax 16'	7/25/12	7/2/13	7/8/14	7/20/15	JC	JC	JC	JC
00296-T51	Ace 26' Tape Measure	7/7/12	9/13/13	9/23/14		JC	JC	JC	
-T52	Stanley PowerLock 26'	9/7/12	9/13/13	9/22/14		JC	JC	JC	
-T53	Stanley PowerLock 16'	9/7/12				JC			
-T11	Stanley intermatic Tape Measure (cm)	11/30/12	2/28/14	2/25/15		JC	JC	JC	
-T21	MTH Tape Measure (cm)	11/30/12	11/21/13			JC	JC		
-T30	Workforce Tape Measure	11/30/12				JC			
-T31	Stanley Powerlock Tape Measure	11/30/12	11/21/13	11/18/14		JC	JC	JC	
-T47	Workforce Tape Measure	11/30/12	11/21/13	11/26/14		JC	JC	JC	
-T36	Stanley FatMax 16' Tape Measure	11/30/12	11/21/13	11/18/14		JC	JC	JC	
-T42*-T40	Stanley FatMax 16' Tape Measure	11/30/12	11/21/13	11/18/14		JC	JC	JC	
-T54	DeWalt 16' Tape Measure	12/20/12	12/17/13	12/29/14		JC	JC	JC	
-T55	DeWalt 16' Tape Measure	12/20/12	12/17/13	12/29/14		JC	JC	JC	
-T56	DeWalt 25' Tape Measure	12/20/12	12/17/13	12/16/14		JC	JC	JC	
-T57	DeWalt 25' Tape Measure	12/20/12	12/17/13	12/16/14		JC	JC	JC	
-T58	DeWalt 25' Tape Measure	12/20/12	12/17/13	12/16/14		JC	JC	JC	
-T59	DeWalt 25' Tape Measure	12/20/12	12/17/13	12/16/14		JC	JC	JC	
-T42	Stanley Powerlock 26' Tape Measure	11/21/13	11/18/14			JC	JC		

## Thermal Metering System Calibration Y Factor

Manufacturer: Apex Instruments  
 Model: XC-60EP  
 Serial Number: 606002  
 OMNI Tracking No.: OMNI-00336  
 Calibrated Orifice:  Yes

Average Gas Meter y Factor <b>1.003</b>
--

Orifice Meter dH@ <b>N/A</b>
---------------------------------

Calibration Date: 06/04/15  
 Calibrated by: A. Kravitz  
 Calibration Frequency: 6 Months  
 Next Calibration Due: 12/4/15  
 Instrument Range: 1.000 cfm  
 Standard Temp.: 68 °F  
 Standard Press.: 29.92 "Hg  
 Barometric Press., Pb: 30.13 "Hg  
 Signature/Date: [Signature] 11/4/15

### Previous Calibration Comparison

Date	12/3/2014	Acceptable Deviation (5%)	Deviation
y Factor	1.007	0.05035	0.004
Acceptance	Acceptable		

### Current Calibration

Acceptable y Deviation	0.020
Maximum y Deviation	0.003
Acceptable dH@ Deviation	N/A
Maximum dH@ Deviation	N/A
Acceptance	Acceptable

Reference Standard *		
Standard Model	Standard Test Meter	
Calibrator S/N	OMNI-00001	
Calib. Date	23-Oct-14	
Calib. Value	0.9985	y factor (ref)

Calibration Parameters	Run 1	Run 2	Run 3
Reference Meter Pressure ("H2O), Pr	0.00	0.00	0.00
DGM Pressure ("H2O), Pd	0.60	1.20	2.01
Initial Reference Meter	950.981	956.241	964.189
Final Reference Meter	956.241	964.189	971.642
Initial DGM	0	0	0
Final DGM	5.281	8.036	7.536
Temp. Ref. Meter (°F), Tr	72.0	73.0	73.0
Temperature DGM (°F), Td	79.0	82.0	84.0
Time (min)			
Net Volume Ref. Meter, Vr	5.260	7.948	7.453
Net Volume DGM, Vd	5.281	8.036	7.536
Gas Meter y Factor =	1.006	1.001	1.003
Gas Meter y Factor Deviation (from avg.)	0.003	0.002	0.001
Orifice dH@	N/A	N/A	N/A
Orifice dH@ Deviation (from avg.)	N/A	N/A	N/A

where:

1. Deviation = |Average value for all runs - current run value|
- \*\* 2.  $y = [Vr \times (y \text{ factor (ref)}) \times (Pb + (Pr / 13.6)) \times (Td + 460)] / [Vd \times (Pb + (Pd / 13.6)) \times (Tr + 460)]$
- \*\* 3.  $dH@ = 0.0317 \times Pd / (Pb (Td + 460)) \times [(Tr + 460) \times \text{time}] / Vr^2$

\* Reference calibration is traceable to NIST through NIST Test # 40674, Kimble ASTM E1272, or NIST traceable laboratory

\*\* Equations come from EPA Method 5

The uncertainty of measurement is ±0.14 ft<sup>3</sup>/min. This is based on the reference standard having a TAR (Test Accuracy Ratio) of at least 4:1.

**DIFFERENTIAL PRESSURE GAUGE CALIBRATION DATA SHEET**  
**Digital Pressure Gauge 0-1" with Low Range**

*This form is to be used only in conjunction with Standard Procedure C-SPC.*

OMNI ID#: 336 Date: 6/4/15 By: A. Kravitz

**Full Range**

Range: 0-1" WC Calibration Instrument: Digital Manometer OMNI ID# 306

Range of Calibration Point ("WC)	Digital Manometer ("WC) (A)	Pressure Gauge ("WC) (B)	Difference (A - B)	% Error of Full Span
0.0 - 0.2	0.152	0.155	-0.003	-0.3%
0.2 - 0.4	0.454	0.449	0.005	0.5%
0.4 - 0.6	0.534	0.532	0.002	0.2%
0.6 - 0.8	0.768	0.764	0.004	0.4%
0.8 - 1.0	0.982	0.975	0.007	0.7%

\*Acceptable tolerance is 4%.  
 The uncertainty of measurement is ±0.1" WC. This is based on the reference standard having a TAR (Test Accuracy Ratio) of at least 4:1.

**Low Range**

Range: 0-0.10" WC Calibration Instrument: Microtector OMNI ID# 410

Range of Calibration Point ("WC)	Microtector (A) ("WC)	Pressure Gauge (B) ("WC)	Difference (A - B)	% Error of Full Span
0.0 - 0.02	0.010	0.011	-0.001	-1%
0.02 - 0.04	0.034	0.035	-0.001	-1%
0.04 - 0.06	0.046	0.047	-0.001	-1%
0.06 - 0.08	0.068	0.069	-0.001	-1%
0.08 - 0.10	0.092	0.093	-0.001	-1%

\*Acceptable tolerance is 4%.  
 The uncertainty of measurement is ±0.01" WC. This is based on the reference standard having a TAR (Test Accuracy Ratio) of at least 4:1.

*Note: This form is uncontrolled but will be standard by next calibration.*

Technician signature:  Date: 6/4/15

Reviewed by:  Date: 6/5/15



## Thermal Metering System Calibration Y Factor

**Manufacturer:** Apex Instruments  
**Model:** XC-60EP  
**Serial Number:** 606001  
**OMNI Tracking No.:** OMNI-00335  
**Calibrated Orifice:**  Yes

<b>Average Gas Meter y Factor</b> <b>1.001</b>
---

<b>Orifice Meter dH@</b> <b>N/A</b>
--

**Calibration Date:** 06/04/15  
**Calibrated by:** A. Kravitz  
**Calibration Frequency:** 6 Months  
**Next Calibration Due:** ~~11/2016~~ 12/4/16  
**Instrument Range:** 1.000 cfm  
**Standard Temp.:** 68 °F  
**Standard Press.:** 29.92 "Hg  
**Barometric Press., Pb:** 30.12 "Hg  
**Signature/Date:** *AK* 6/4/15

Date	12/3/2014	Acceptable Deviation (5%)	Deviation
y Factor	1.004483232	0.050224162	0.004
Acceptance	Acceptable		

Acceptable y Deviation	0.020
Maximum y Deviation	0.004
Acceptable dH@ Deviation	N/A
Maximum dH@ Deviation	N/A
Acceptance	Acceptable

Standard	Model	Standard Test Meter
Calibrator	S/N	OMNI-00001
	Calib. Date	23-Oct-14
	Calib. Value	0.9985 y factor (ref)

Calibration Parameters	Run 1	Run 2	Run 3
Reference Meter Pressure ("H2O), Pr	0.00	0.00	0.00
DGM Pressure ("H2O), Pd	2.32	1.15	0.70
Initial Reference Meter	927.984	939.742	945.271
Final Reference Meter	939.742	945.271	950.981
Initial DGM	0	0	0
Final DGM	11.794	5.619	5.835
Temp. Ref. Meter (°F), Tr	70.0	72.0	72.0
Temperature DGM (°F), Td	78.0	83.0	84.0
Time (min)			
Net Volume Ref. Meter, Vr	11.758	5.529	5.710
Net Volume DGM, Vd	11.794	5.619	5.835
Gas Meter y Factor	1.005	1.000	0.997
Gas Meter y Factor Deviation (from avg.)	0.004	0.001	0.003
Orifice dH@	N/A	N/A	N/A
Orifice dH@ Deviation (from avg.)	N/A	N/A	N/A

where:

1. Deviation = |Average value for all runs - current run value|
- \*\* 2.  $y = [Vr \times (y \text{ factor (ref)}) \times (Pb + (Pr / 13.6)) \times (Td + 460)] / [Vd \times (Pb + (Pd / 13.6)) \times (Tr + 460)]$
- \*\* 3.  $dH@ = 0.0317 \times Pd / (Pb (Td + 460)) \times [(Tr + 460) \times \text{time}] / Vr^2$

\* Reference calibration is traceable to NIST through NIST Test # 40674, Kimble ASTM E1272, or NIST traceable laboratory

\*\* Equations come from EPA Method 5

The uncertainty of measurement is  $\pm 0.14 \text{ ft}^3/\text{min}$ . This is based on the reference standard having a TAR (Test Accuracy Ratio) of at least 4:1.

## DIFFERENTIAL PRESSURE GAUGE CALIBRATION DATA SHEET 0-0.25" Digital Pressure Gauge

*This form is to be used only in conjunction with Standard Procedure C-SPC.*

Range: 0-0.25" WC ID Number: 335

Calibration Instrument: Digital Manometer ID Number: OMNI- 396

Date: 6/4/15 By: A. Kravitz

Range of Calibration Point ("WC)	Digital Manometer (A) ("WC)	Pressure Gauge (B) ("WC)	Difference (A - B)	% Error of Full Span
0.00 - 0.05	0.016	0.013	0.003	1.2%
0.05 - 0.10	0.068	0.065	0.003	1.2%
0.10 - 0.15	0.135	0.129	0.006	2.4%
0.15 - 0.20	<del>0.18</del> 0.184	0.176	0.008	3.2%
0.20 - 0.25	0.226	0.213	0.007	2.8%

\*Acceptable tolerance is 4%.

The uncertainty of measurement is  $\pm 0.01$ " WC. This is based on the reference standard having a TAR (Test Accuracy Ratio) of at least 4:1.

Technician signature:  Date: 6/4/15

Reviewed by:  Date: 6/5/15

## Emissions Sampling System Thermocouple Calibration Check

Calibration based on NIST Monograph 175 per ASTM E2515-11  
All thermocouples are type "K"

Date: 6/8/15  
Performed By: A. Kavitz

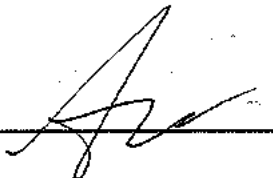
Sampling System ID Numbers: 335/336  
Calibration Instrument ID Number: 373

Reference Temperature (F)	Thermocouple Location				
	Ambient	Filter 1	Filter 2	Meter 1	Meter 2
0	1	1	1	1	1
30	31	31	30	31	31
60	61	61	60	61	61
90	91	91	91	91	91
120	121	121	121	121	121

Reference Temperature (F)	Thermocouple Location
	Dilution Tunnel
0	0
60	60
120	120
180	180
240	240

Reference Temperature (F)	Thermocouple Location						
	FB Top	FB Bottom	FB Back	FB Left	FB Right	Catalyst	Stack
0	0	0	0	0	0	0	0
200	200	200	200	200	200	200	200
400	400	400	400	400	400	401	400
600	600	600	600	600	600	601	600
800	800	800	800	800	800	801	800

Note: This new form will be controlled by next calibration.

Technician Signature: 

Date: 6/4/15

## Operating Maintenance Instructions

### Negative Pressure or Vacuum Measurement

to the gage. Connect the source of vacuum or negative pressure to the right gage connection (5) and proceed as described under Positive Pressure Measurement Section above. Remember that pressure measured in this way is gative.

### Differential Pressure Measurement

Differential pressures may be measured by connecting the higher (more positive) pressure to the left connection (2) and lower pressure to the right connection (5).

### Storage

When meter circuit switch to "off" position and withdraw "hook" point well clear of fluid (by turning Micrometer counter-clockwise) when gage is not in use. This will conserve the batteries and minimize build-up of oxides, etc., on the "hook." Keep the unit covered and in an airtight container with a strong solvent fumes.

### Maintenance

When the meter reading becomes reduced or the pointer movement gets sluggish with circuit on and "hook" point in fluid, the following should be done:

Remove the hook point (by unscrewing) and clean the tip lightly using fine crocus cloth. Wipe off all grit and dirt with a clean rag, reassemble and recheck meter operation.

If the meter operation continues to be sluggish, replace the size AA, 1½ volt battery. (Replace the battery at least once a year to avoid deterioration of battery and damage to gage. Leakproof alkaline battery is recommended.)

To replace the battery, remove center screw (10) located in the back of the

electronic enclosure. Cover (9) will come off exposing the battery. Pull the old battery out and push a new battery into the battery holder with the positive (center) terminal to the right (to the end marked with a + on the holder).

If the fluid becomes contaminated and requires replacement; empty old fluid from gage; flush out with clear water and replace with distilled water and Dwyer A126 Fluorescein Green Color Concentrate mixed 3/4 oz. concentrate to each quart of water. (CAUTION: Do not substitute other gage fluids as proper gage operation depends on use of the specified gage fluid to provide proper surface tension, wetting ability and electrolyte capability with unity specific gravity.)

If the gage bore is very dirty, a mild soap solution may be used to aid in cleaning prior to flushing with clear water. (CAUTION: Do not clean with liquid soaps, special solvents, degreasers, aromatic hydrocarbons, etc. Such cleaners and solvents frequently contain chlorine, fluorine, acetone and related compounds which will permanently damage the gage, and prevent proper operation.)

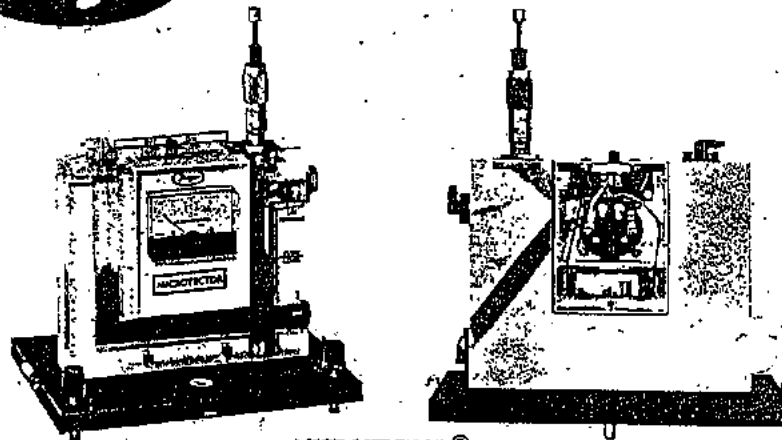
If meter becomes inoperative and cannot be made to operate properly by cleaning "hook" tip or replacing battery, return the entire gage to Dwyer Instruments, Inc., for service.

"Microtektor"®  
A Product From  
Dwyer Instruments, Inc.,  
"The Low Pressure People"

38-440190-00

## MICROTEKTOR®

### Operating and Maintenance Instructions



## MICROTEKTOR®

### Specifications and Features\*

Time Proven Hook Gage Manometer Combined with Modern Electronics For Easier, Faster, more Accurate Precision Pressure Measurements.

Accuracy and Repeatability to ±0.002% of full scale water column (0.00009 P.S.I.).

Pressure Range 0-2" w.c. Positive, Negative or Differential Pressures.

Non Toxic and Inexpensive Gage Fluid Consists of Distilled Water Mixed with a Small Amount of Dwyer Color and Wetting Agent Concentrate.

Convenient, Portable, Light Weight, and Self-Contained, the Unit Requires No External Power Connections and is Operated by a 1½ Volt Penlight Cell.

A.C. Detector Current Eliminates Hook Plating, Fouling and Erosion.

Micrometer Complies with Federal Specification GGG-C-105A and is Traceable to a Master at the National Bureau of Standards.

Three Point Mounting with Dual Leveling Adjustment and Circular Level Assure Rapid Set Up.

Durablock® Precision Machined Acrylic Plastic Gage Body.

Sensitive 0-50 Microamp D.C. Meter Acts as Detector and Also Indicates Battery and Hook Probe Condition.

Heavy One Half Inch Thick Steel Base Plate Provides Steady Mounting.

Top Quality Glass Epoxy Circuit Board and Solid State-Integrated Circuit Electronics.

Electronic Enclosure of Tough Molded Styrene Acrylonitrile Provides Maximum Protection to Components Yet Allows Easy Access to Battery Compartment.

Rugged Sheet Steel Cover and Carrying Case Protects the Entire Unit When Not in Use.

Accessories Included are (2) 3 Foot Lengths Tygon Tubing, (2) 1/8" Pipe Thread Adapters and 3/4 oz. bottle of Fluorescein Green Color Concentrate with Wetting Agent.

\*Patent Applied For

DWYER INSTRUMENTS, INC.

Telephone 218/672-9141

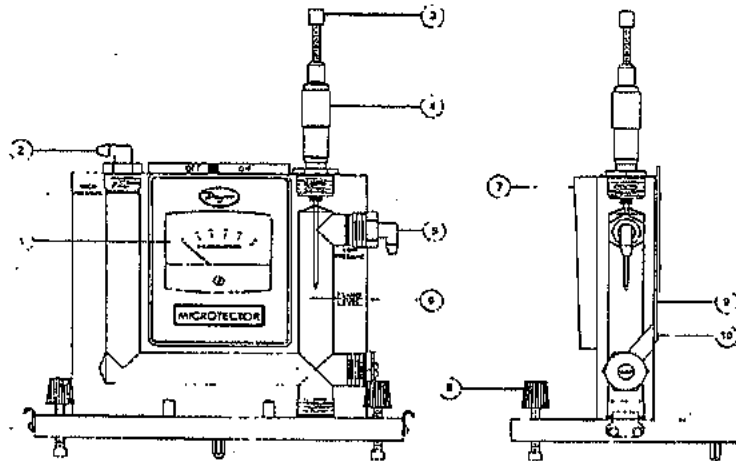


DWYER INSTRUMENTS, INC.

P. O. Box 373, Michigan City, Indiana 46360

Phone: Area 219/872-9141

Direct Chicago Line: Area 312/773-7888



MICROTECTOR® GAGE

**Precision Pressure Measurement**

The Dwyer Microtector® combines the time proven principles of the Hook Gage type manometer and modern solid state integrated circuit electronics. It provides an inexpensive means of achieving accuracy and repeatability within  $\pm .00025$  inches water column throughout its 0 to 2 inches w.c. range. It is truly a new standard in precision pressure measuring devices.

**Principles of Operation**

A pressure to be measured is applied to the manometer fluid which is displaced in each leg of the manometer by an amount equal to  $\frac{1}{2}$  the applied pressure. A micrometer mounted point is then lowered until contacts the manometer gage fluid. The instant of contact is detected by completion of a low power A.C. circuit. Current for this circuit is supplied by a  $1\frac{1}{2}$  volt penlight cell feeding two semiconductor amplifiers which act as a free-running multivibrator operating at a frequency of approximately two kilohertz.

Completion of the A.C. circuit activates a bridge rectifier which provides the signal for indication on a sensitive (0 to 50 microamps) D.C. microammeter.

On indication of contact the operator stops lowering the point and reads the micrometer which indicates one half the applied pressure. By interpolating eight divisions, each being .000125" w.c. between .001 micrometer graduations, a total accuracy of .00025 can easily be achieved. The micrometer complies with Federal Specification GGG-C-105A and is traceable to a master at the National Bureau of Standards.

**Locating and Opening**

Stand the Microtector® and case on a firm flat level surface. Remove the cover by releasing the latches and lifting straight up. If it is necessary to move the gage without case, handle only the base plate or clear acrylic block. (CAUTION: Do not handle gage by grasping meter-electronic package housing Item 7 on drawing.)

**Fluid Level**

Level the gage by adjusting the two front leveling screws (Item 8 on drawing) until the bubble in the spirit level is centered in the small circle. After leveling the gage, open both rapid shut off valve tube connectors (2 and 5). Back off the Micrometer (4), if necessary, to make sure that the point is not immersed in the gage fluid. The fluid level in the gage should now coincide with the mark on the right hand bore plus or minus approximately  $\frac{1}{32}$  inch (6). If the level of fluid is too high, fluid can be removed with an eye dropper pipette or carefully poured out of the right connection (5). If the level is too low, remove the top left rapid shut off valve tube connector (2), and add distilled water pre-mixed with the proper amount of Dwyer green concentrate. (See maintenance instruction for proportions.) After correcting the fluid level, reinstall the rapid shut off connectors and with them in the open position, releve the Microtector.® The gage is now ready to be zeroed.

**Zeroing**

Turn the Micrometer barrel (4) until its lower end just coincides with the zero mark on the internal vertical scale and the zero on the barrel scale coincides with the vertical line on the internal scale. Note that the internal scale is graduated every .025" from 0 to 1.00 inch and the barrel scale is graduated in one thousandths from 0 to .025." Turn the meter circuit switch at the top of gage to the "on" position. While holding the barrel at the zero position (and with the gage level), raise or lower the point by turning the top knurled knob (3) until the point is above, but near the fluid.

Check to be sure that the meter (1) registers zero. Watch the meter, hold the barrel (4) and lower the point slowly by turning the top knurled knob (3). As the knob is turned, the point will contact the fluid and the meter pointer will move from zero to some upscale position. After making contact, turn the point out of the fluid by turning the Micrometer barrel counter-clockwise to a reading of .010 or more. Again watch the meter and, this time, lower the point by turning the Micrometer barrel. The point position where the meter pointer begins to move up scale is the zero position. This position

should correspond to zero reading on the Micrometer. Adjust the point in relation to the Micrometer barrel by turning the top knob while holding the barrel steady. Repeat lowering the point, watching the meter for contact, and adjusting the point until the zero position and zero reading exactly coincide. The gage is now zeroed and should not be moved.

An alternate method of zeroing and reading can be used wherein, instead of zeroing the gage completely, a zero correction reading is taken and record then subtracted from the final read. Comparable results can be obtained with either method.

**Positive Pressure Measurement**

With the fluid at its proper level, a pressure of 2.0" water column maximum can be measured. Positive pressure should be applied to the top left connection (2) with the Micrometer zeroed as described above. This will permit simple direct reading to be taken.

After an unknown pressure has been applied at the top left connection, the fluid level will drop in the left bore and rise over the point in the right bore. Note the indicating meter point has moved upscale because the point is immersed in the fluid. Turn the Micrometer counter-clockwise until the point leaves the fluid as indicated by the meter pointer dropping to zero or scale. Then slowly turn the Micrometer down until its point just touches the fluid surface causing movement of the meter pointer. Withdraw the point and repeat several times noting each time the Micrometer reading where the meter pointer movement begins. The average of these readings multiplied by two is the pressure applied to the gage. (Avg. reading x 2 = pressure applied in inches w.c. The degree of uncertainty for the operator and instrument is indicated by the difference in these readings.)

When the readings are complete the pressure should be removed and the zero-setting of the Microtector® rechecked. Any change in the zero position will indicate inaccurate readings. Should this happen the zero-set and pressure measurement procedure should be repeated.

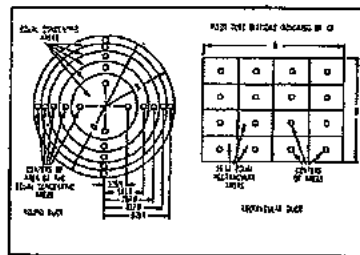
# AIR VELOCITIES WITH THE DWYER PITOT TUBE

## AIR VELOCITY

The total pressure of an air stream flowing in a duct is the sum of the static or bursting pressure exerted upon the sidewalls of the duct and the impact or velocity pressure of the moving air. Through the use of a pitot tube connected differentially to a manometer, the velocity pressure alone is indicated and the corresponding air velocity determined.

For accuracy of plus or minus 2%, as in laboratory applications, extreme care is required and the following precautions should be observed:

1. Duct diameter 4" or greater.
2. Make an accurate traverse per sketch at right, calculate the velocities and average the readings.
3. Provide smooth, straight duct sections a minimum of 8½ diameters in length upstream and 1½ diameters downstream from the pitot tube.
4. Provide an egg crate type straightener upstream from the pitot tube.



In making an air velocity check select a location as suggested above, connect tubing leads from both pitot tube connections to the manometer and insert in the duct with the tip directed into the air stream. If the manometer shows a minus indication reverse the tubes. With a direct reading manometer, air velocities will now be shown in feet per minute. In other types, the manometer will read velocity pressure in inches of water and the corresponding velocity will be found from the curves in this bulletin. If circumstances do not permit an accurate traverse, center the pitot tube in the duct, determine the center velocity and multiply by a factor of .9 for the approximate average velocity. Field tests run in this manner should be accurate within plus or minus 5%.

The velocity indicated is for dry air at 70°F., 29.9" Barometric Pressure and a resulting density of .075#/cu. ft. For air at a temperature other than 70°F. refer to the curves in this bulletin. For other variations from these conditions, corrections may be based upon the following data:

$$\text{Air Velocity} = 1096.2 \sqrt{\frac{PV}{D}}$$

where PV = velocity pressure in inches of water  
D = Air density in #/cu. ft.

$$\text{Air Density} = 1.325 \times \frac{PB}{T}$$

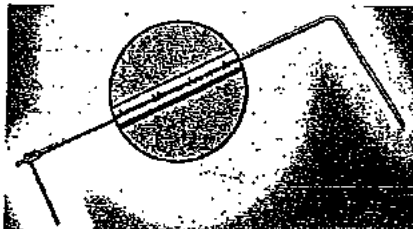
where PB = Barometric Pressure in inches of mercury  
T = Absolute Temperature (indicated temperature °F plus 460)

Flow in cu. ft. per min. = Duct area in square feet x air velocity in ft. per min.



AIR VELOCITY CALCULATOR

Computes velocity based on air density corrected for conditions of temperature and pressure. Eliminates tedious calculations. Ranges from .01 to 10" water corresponding to 400 to 20,000 FPM. Furnished with each pitot tube.



STAINLESS STEEL PITOT TUBES

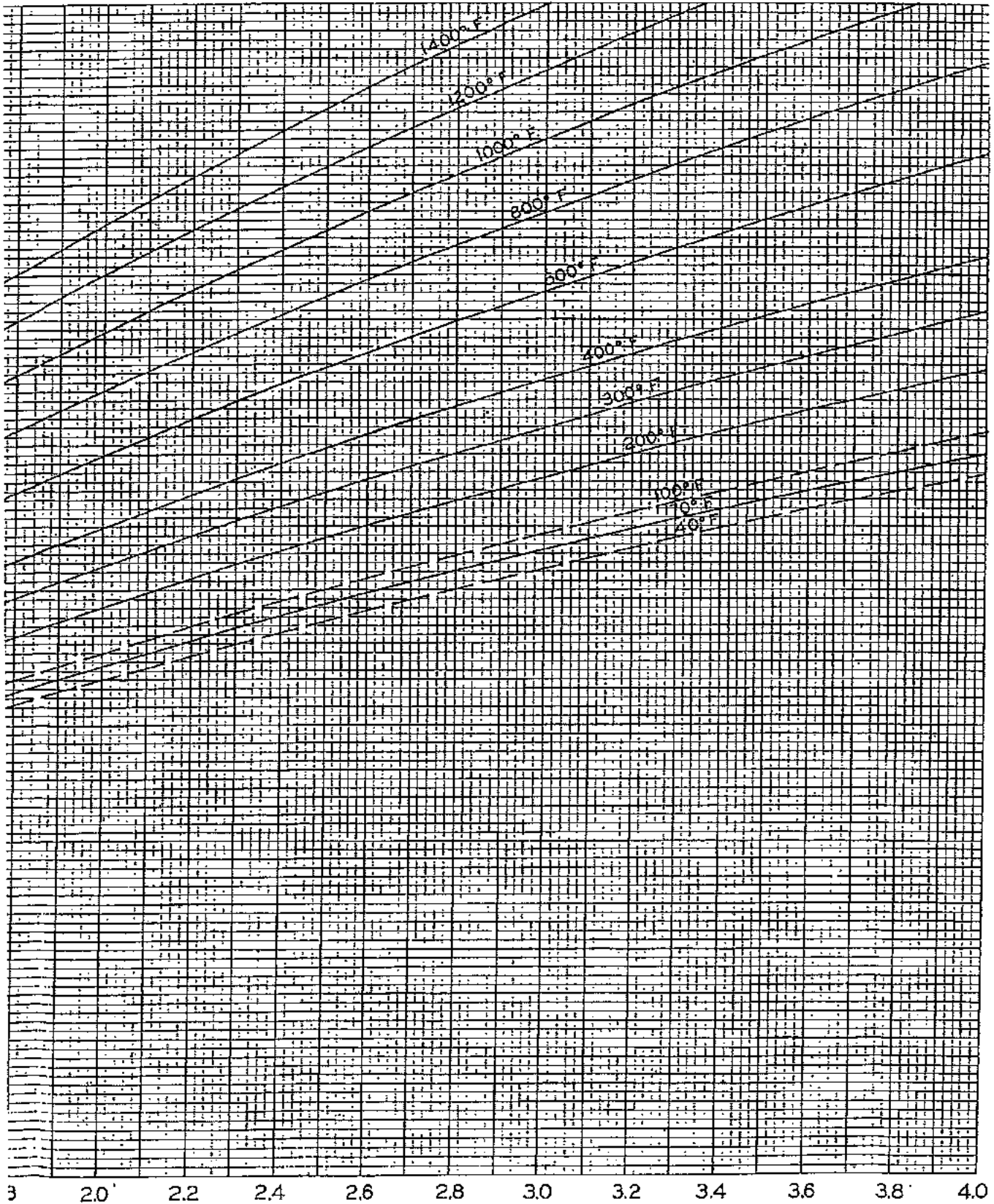
Test confirmed unity coefficient and lifetime construction of No. 304 stainless steel. Inch graduations show depth of insertion for traversing. Complies with AMCA and ASHRAE specifications. Sizes 12" to 60" long. Hand or fixed mounting types.

LITHOGRAPHED IN U.S.A. 3/84

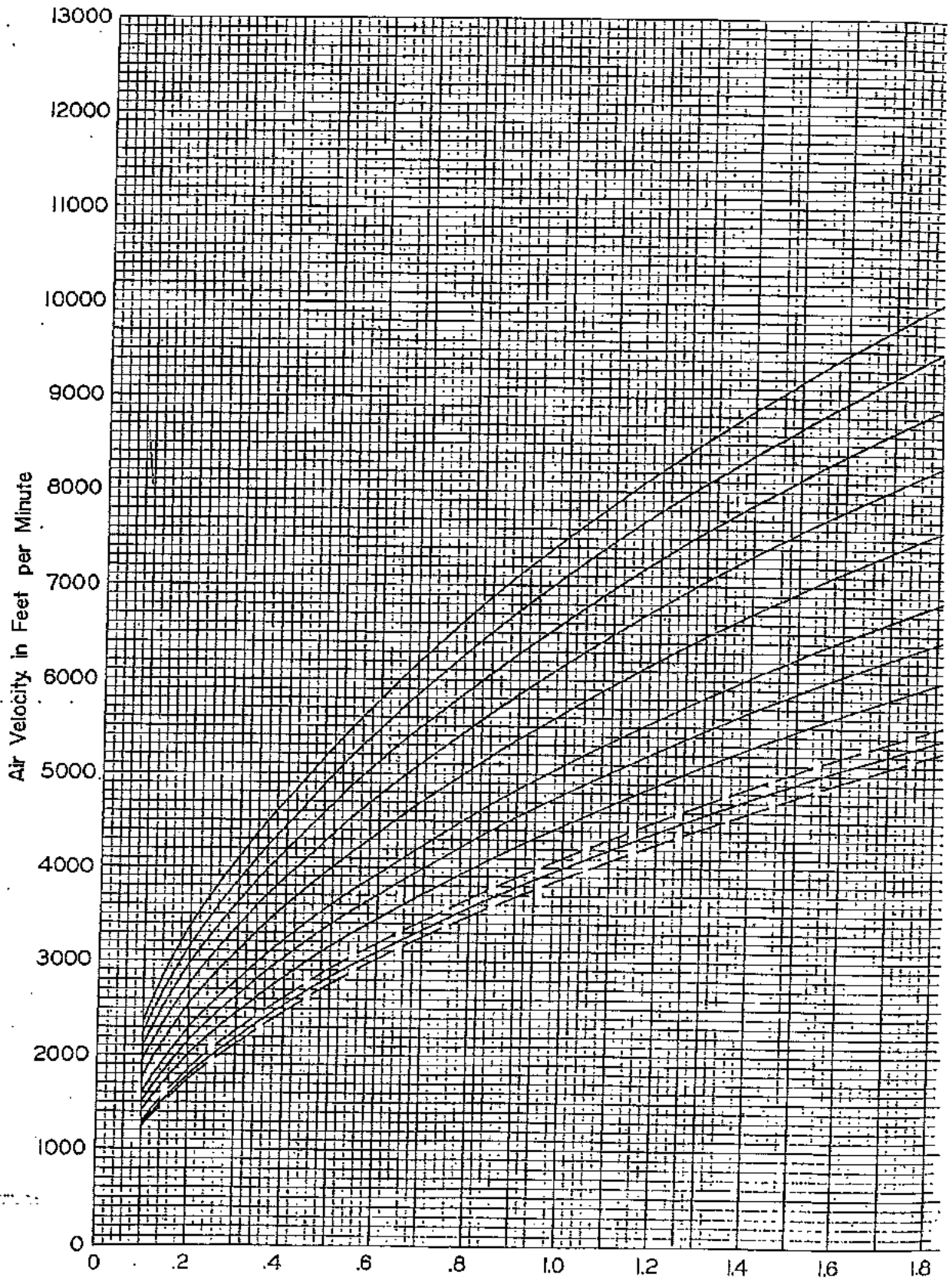
© COPYRIGHT 1984 DWYER INSTRUMENTS, INC.

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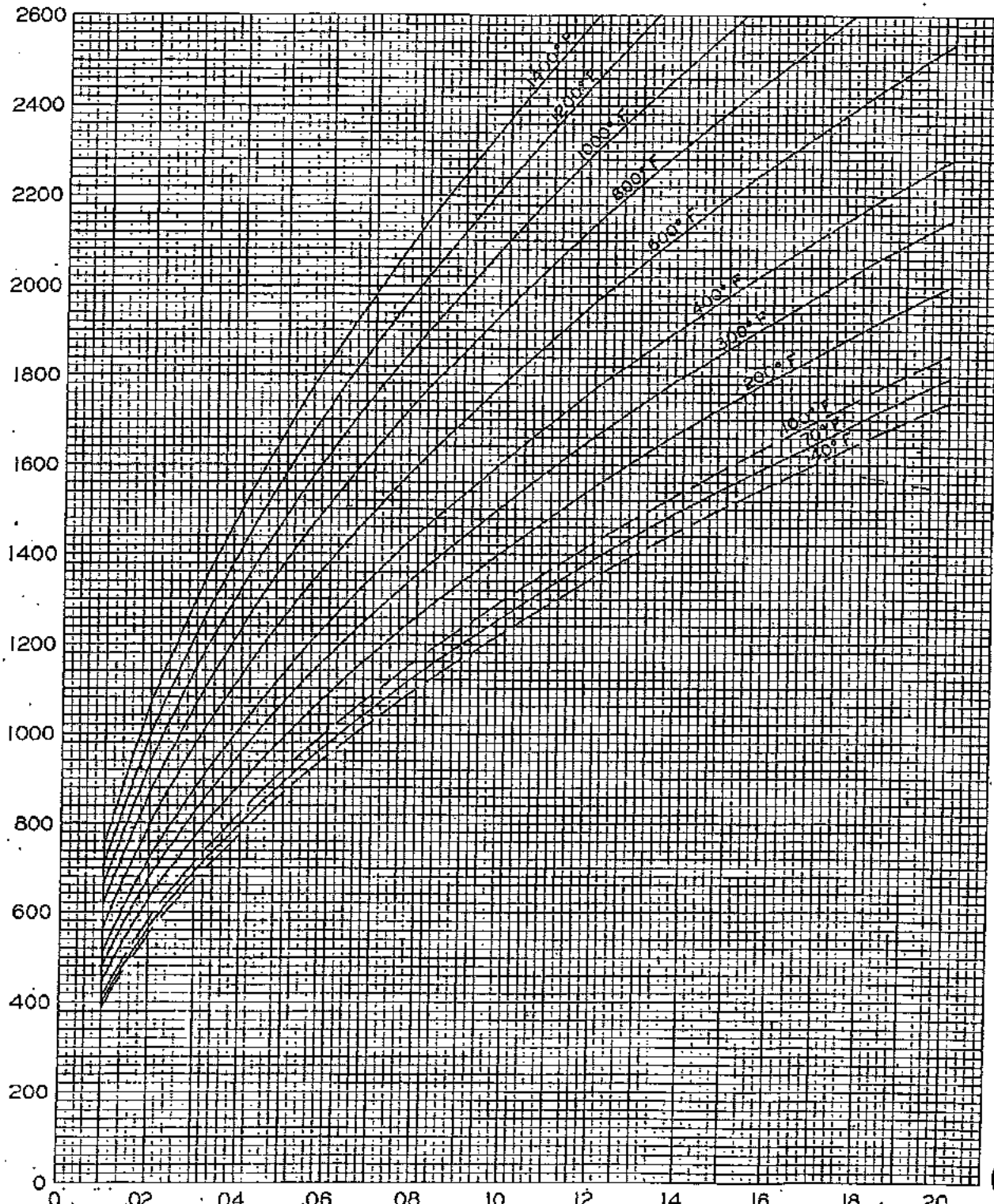
Phone: 219/872-9141



3 2.0 2.2 2.4 2.6 2.8 3.0 3.2 3.4 3.6 3.8 4.0  
 Tube Velocity: Pressure in inches of Water

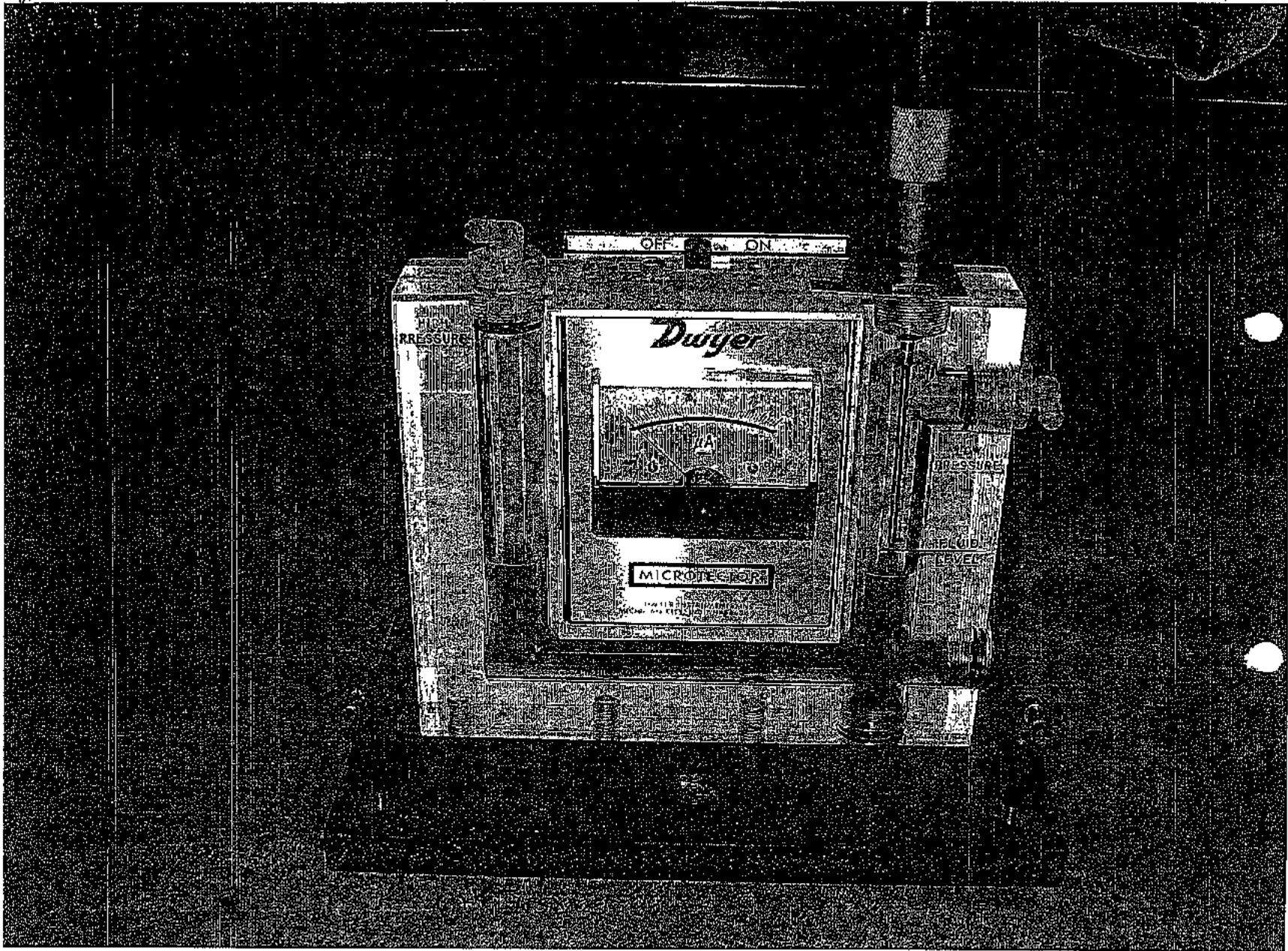






Gage Reading with Pitot Tube (Velocity Pressure) in Inches of Water

114

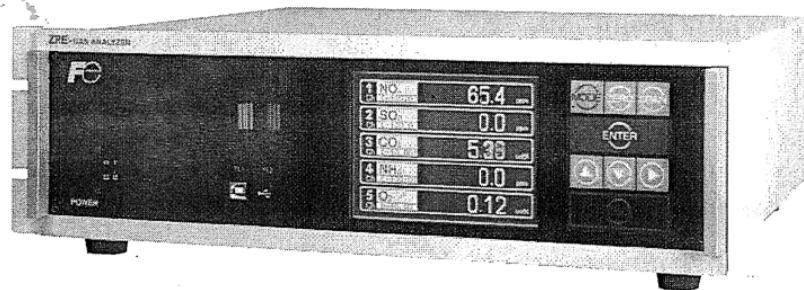




Instruction Manual

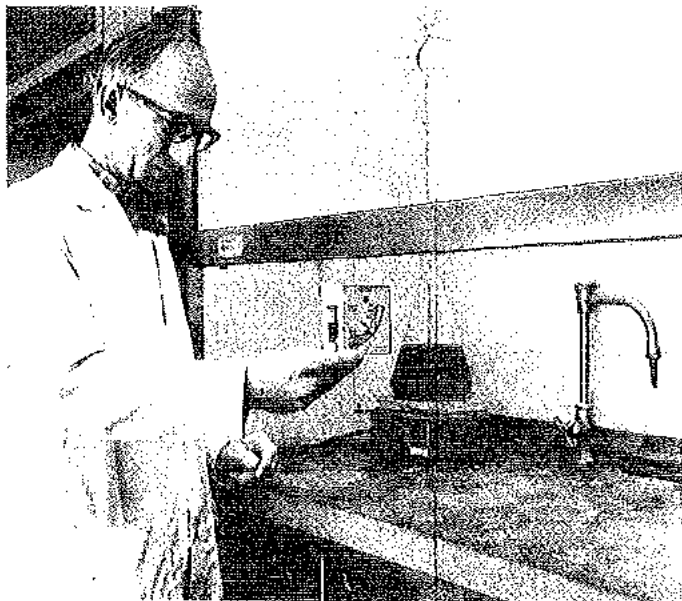
**NDIR TYPE  
INFRARED GAS  
ANALYZER**

TYPE: ZRE



Fuji Electric Systems Co., Ltd.

INZ-TN1ZREc-E



Bulletin H-14

**Dwyer**  
INSTRUMENTS

## INSTRUCTIONS for No. 480 VANEOMETER™ AIR VELOCITY METER

Use a Vaneometer to measure velocity of air flow into laboratory fume hoods and...

...at paint spray booths to determine when to change filters. Or wherever needed to meet OSHA standards of ventilation for smoke, dust or fume removal.



### Use this sensitive new Dwyer Vaneometer™ to measure low air velocities—at low cost.

**THE PROBLEM:** How can you insure that OSHA, EPA and other safety ventilation requirements are met—at paint spray booths and at fume, smoke and dust exhaust hoods—in the plant, laboratory or restaurant? To do this, you need to measure low air velocities—from 25 to 400 feet per minute.\*

Until now, instruments for this purpose have been complex and costly—from four to ten times the modest price of this unit.

**SOLUTION:** The new Dwyer Vaneometer™. It's pocket-size and light in weight—only four ounces. So it's handy to carry from one work station to another to make spot checks of air flow.\* And it's easy to use—for untrained personnel. Just hold meter parallel to air flow—the pendulum vane/pointer indicates air velocity in feet per minute on a large, easy-to-read scale.

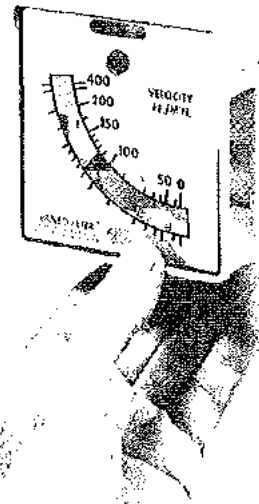
It can be hand held—or permanently mounted if continuous monitoring of face velocity is desired. A versatile steel mounting bracket and operating instructions are included. It's sensitive and accurate to  $\pm 10\%$  of full scale. The Vaneometer has a bubble level and scale visible on both sides.

With housing of tough ABS plastic, it is durable and easy to clean with soap and water. The polyester vane can be cleaned with lacquer thinner. A spare vane is provided.

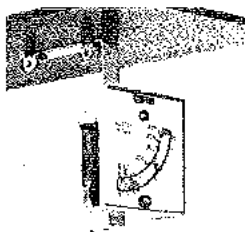
The Vaneometer is a tested, practical instrument for daily use—sensibly designed by Dwyer—"The Low Pressure People". Try one—and judge for yourself.

\*For horizontal air flows only at this time.

+Metric scales are available. Range: 0 to 2.0 meters per second.

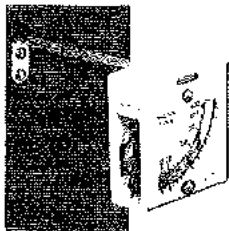


The Vaneometer's large scales are easy to read. Both sides have factory calibrated scales. Recessed bubble level at top helps insure accurate readings.



A versatile steel mounting bracket is included.

Left—Shows overhead mounting of Vaneometer for continuous monitoring.



The same bracket permits wall mounting. Bolts, nuts and screws are included.

### How to Operate Meter



To install vane, pull vane holder from end of Vaneometer. Carefully remove vane from plastic bag and cardboard envelope. (Two vanes are enclosed, one is a spare.) Hang the vane by the wire in the two slots provided in the vane holder, then re-install the vane holder in the meter. Either side of vane may face the air flow. The meter is now ready to take readings. It is precalibrated. If vane becomes damaged, it is easily replaced with spare vane.

The Vaneometer is accurate to  $\pm 5\%$  of full scale from bottom of scale to 100 FPM and  $\pm 10\%$  from 100 FPM to top of scale.

For permanent mounting with bracket, Vaneometer should be located at least 6 inches from wall or side of duct. For accurate readings be sure to keep meter level at all times.

To determine face velocity, take the average of six readings. Readings should be taken at the center of six equal sections, three across top and three across the bottom. When conditions are such that the Vaneometer cannot be permanently mounted, it may be more practical to install a Dwyer Mark II differential pressure manometer and calibrate it to indicate a dirty filter condition. To calibrate a Dwyer Mark II No. 25 Manometer with the Vaneometer, first follow Mark II installation instructions, (Bulletin D-58 included with the gage). Install new filters, start spray booth fan, note and record manometer reading and face velocity. Block-off filter media until face velocity reaches 100 feet per minute or conforms to OSHA,



EPA or governing agency. Record and mark this point on the manometer, then replace filters at this point.

For replacement Vanes, order Part No. A390, package of two.

MARK II MANOMETER

DWYER INSTRUMENTS, INC., P.O. BOX 373, MICHIGAN CITY, INDIANA 46360, U.S.A., Phone: 219/879-8000

*Model: Allure 50  
Harman Home Heating  
352 Mountain House Road  
Halifax, PA 17032*

# **Example Calculations**

## Equations and Sample Calculations – ASTM E2779 & E2515

Manufacturer: Harman  
 Model: Allure 43  
 Run: 2  
 Category: [Integrated]

Equations used to calculate the parameters listed below are described in this appendix. Sample calculations are provided for each equation. The raw data and printout results from a sample run are also provided for comparison to the sample calculations.

$M_{Bdb}$  – Weight of test fuel burned during test run, dry basis, kg

$M_{BSidb}$  – Weight of test fuel burned during test run segment  $i$ , dry basis, kg

BR – Average dry burn rate over full integrated test run, kg/hr

$BR_{Si}$  – Average dry burn rate over test run segment  $i$ , kg/hr

$V_s$  – Average gas velocity Dry burn rate, kg/hr

$Q_{sd}$  – Average gas flow rate Total particulate matter collected, mg

$V_{m(std)}$  – Volume of Gas S Volume of gas sampled corrected to standard conditions, dscf

$m_n$  – Total Particulate Ma Average dilution tunnel gas velocity, ft/sec

$C_s$  - Concentration of part Particulate concentration, g/dscf

$E_T$  – Total Particulate Err Dilution tunnel gas flow rate, dscf/min

PR - Proportional Rate  $V_i$  Particulate emission rate, lbs/hr

$PM_R$  – Average particulat Total particulate emissions, grams

$PM_F$  – Average particulat Average fuel load moisture content, %

**M<sub>Bdb</sub> – Weight of test fuel burned during test run, dry basis, kg**

ASTM E2779 equation (1)

$$M_{Bdb} = (M_{Swb} - M_{Ewb})(100/(100 + FM))$$

Where,

FM = average fuel moisture of test fuel, % dry basis

M<sub>Swb</sub> = weight of test fuel in hopper at start of test run, wet basis, kg

M<sub>Ewb</sub> = weight of test fuel in hopper at end of test run, wet basis, kg

Sample Calculation:

5.1 %

M<sub>Swb</sub> = 41.1 lbs

M<sub>Ewb</sub> = 23.4 lbs

0.4536 = Conversion factor from lbs to kg

$$M_{Bdb} = [(41.1 \times 0.4536) - (23.4 \times 0.4536)] (100/(100 + 5.05))$$

$$M_{Bdb} = 7.6 \text{ kg}$$

**$M_{BSidb}$  – Weight of test fuel burned during test run segment  $i$ , dry basis, kg**  
ASTM E2779 equation (2)

$$M_{BSidb} = (M_{SSiwb} - M_{ESiwb})(100/(100 + FM))$$

Where,

$M_{SSiwb}$  = weight of test fuel in hopper at start of test run segment  $i$ , wet basis, kg

$M_{ESiwb}$  = weight of test fuel in hopper at end of test run segment  $i$ , wet basis, kg

Sample Calculation (from medium burn rate segment):

$$FM = 5.1 \%$$

$$M_{SSiwb} = 34.3 \text{ lbs}$$

$$M_{ESiwb} = 28.4 \text{ lbs}$$

0.4536 = Conversion factor from lbs to kg

$$M_{BSidb} = [(34.3 \times 0.4536) - (28.4 \times 0.4536)] (100/(100 + 5))$$

$$M_{BSidb} = 2.5 \text{ kg}$$



**BR – Average dry burn rate over full integrated test run, kg/hr**  
ASTM E2779 equation (3)

$$BR = \frac{60 M_{Bdb}}{\theta}$$

Where,

$\theta$  = Total length of full intergrated test run, min

Sample Calculation:

$$M_{Bdb} = 7.64 \quad \text{kg}$$

$$\theta = 363 \quad \text{min}$$

$$BR = \frac{60 \times 7.64}{363}$$

$$BR = 1.26 \quad \text{kg/hr}$$

**BR<sub>Si</sub> – Average dry burn rate over test run segment *i*, kg/hr**

ASTM E2779 equation (4)

$$BR_{Si} = \frac{60 M_{BSidb}}{\theta_{Si}}$$

Where,

$$\theta_{Si} = \text{Total length of test run segment } i, \text{ min}$$

Sample Calculation (from medium burn rate segment):

$$M_{BSidb} = 2.55 \text{ kg}$$

$$\theta = 121 \text{ min}$$

$$BR = \frac{60 \times 2.55}{121}$$

$$BR = 1.26 \text{ kg/hr}$$

**V<sub>s</sub> – Average gas velocity in the dilution tunnel, ft/sec**

ASTM E2515 equations (9)

$$V_s = F_p \times K_p \times C_p \times (\sqrt{\Delta P})_{avg} \times \sqrt{\frac{T_s}{P_s \times M_s}}$$

Where:

- F<sub>p</sub> = Adjustment factor for center of tunnel pitot tube placement,  $F_p = \frac{V_{strav}}{V_{scent}}$ , ASTM E2515 Equation (1)
- V<sub>scent</sub> = Dilution tunnel velocity calculated after the multi-point pitot traverse at the center, ft/sec
- V<sub>strav</sub> = Dilution tunnel velocity calculated after the multi-point pitot traverse, ft/sec
- K<sub>p</sub> = Pitot tube constant, 85.49
- C<sub>p</sub> = Pitot tube coefficient: 0.99, unitless
- ΔP\* = Velocity pressure in the dilution tunnel, in H<sub>2</sub>O
- T<sub>s</sub> = Absolute average gas temperature in the dilution tunnel, °R; (°R = °F + 460)
- P<sub>s</sub> = Absolute average gas static pressure in dilution tunnel, = P<sub>bar</sub> + P<sub>g</sub>, in Hg
- P<sub>bar</sub> = Barometric pressure at test site, in. Hg
- P<sub>g</sub> = Static pressure of tunnel, in. H<sub>2</sub>O; (in Hg = in H<sub>2</sub>O/13.6)
- M<sub>s</sub> = \*\*The dilution tunnel wet molecular weight; M<sub>s</sub> = 28.78 assuming a dry weight of 29 lb/lb-mole

Sample calculation:

$$F_p = \frac{13.92}{15.93} = 0.874$$

$$V_s = 0.874 \times 85.49 \times 0.99 \times 0.230 \times \left( \left( \frac{101.8 + 460}{30.08 + \frac{-0.53}{13.6}} \right) \times 28.78 \right)^{1/2}$$

$$V_s = \mathbf{13.69 \text{ ft/s}}$$

\*The ASTM test standard mistakenly has the square root of the average delta p instead of the average of the square root of delta p. The current EPA Method 2 is also incorrect. This was verified by Mike Toney at EPA.

\*\*The ASTM test standard mistakenly identifies M<sub>s</sub> as the dry molecular weight. It should be the wet molecular weight as indicated in EPA Method 2.

**Q<sub>sd</sub> – Average gas flow rate in dilution tunnel, dscf/hr**

ASTM E2515 equation (3)

$$Q_{sd} = 3600 \times (1 - B_{ws}) \times v_s \times A \times \frac{T_{std}}{T_s} \times \frac{P_s}{P_{std}}$$

Where:

- 3600 = Conversion from seconds to hours (ASTM method uses 60 to convert in minutes)
- B<sub>ws</sub> = Water vapor in gas stream, proportion by volume; assume 2%
- A = Cross sectional area of dilution tunnel, ft<sup>2</sup>
- T<sub>std</sub> = Standard absolute temperature, 528 °R
- P<sub>s</sub> = Absolute average gas static pressure in dilution tunnel, = P<sub>bar</sub> + P<sub>g</sub>, in Hg
- T<sub>s</sub> = Absolute average gas temperature in the dilution tunnel, °R; (°R = °F + 460)
- P<sub>std</sub> = Standard absolute pressure, 29.92 in Hg

Sample calculation:

$$Q_{sd} = 3600 \times (1 - 0.02) \times 13.69 \times 0.196 \times \frac{528}{#### + 460} \times \frac{30.1 + \frac{-0.53}{13.6}}{29.92}$$

Q<sub>sd</sub> = **8950.3** dscf/hr

**$V_{m(std)}$  – Volume of Gas Sampled Corrected to Dry Standard Conditions, dscf**  
 ASTM E2515 equation (6)

$$V_{m(std)} = K_1 \times V_m \times Y \times \frac{P_{bar} + \left( \frac{\Delta H}{13.6} \right)}{T_m}$$

Where:

- $K_1$  = 17.64 °R/in. Hg
- $V_m$  = Volume of gas sample measured at the dry gas meter, dcf
- $Y$  = Dry gas meter calibration factor, dimensionless
- $P_{bar}$  = Barometric pressure at the testing site, in. Hg
- $\Delta H$  = Average pressure differential across the orifice meter, in. H<sub>2</sub>O
- $T_m$  = Absolute average dry gas meter temperature, °R

Sample Calculation:

Using equation for Train 1:

$$V_{m(std)} = 17.64 \times 53.623 \times 1.001 \times \frac{\left( 30.08 + \frac{1.06}{13.6} \right)}{\left( 89.7 + 460 \right)}$$

$$V_{m(std)} = \mathbf{51.954} \text{ dscf}$$

Using equation for Train 2:

$$V_{m(std)} = 17.64 \times 55.194 \times 1.003 \times \frac{\left( 30.08 + \frac{0.93}{13.6} \right)}{\left( 89.3 + 460 \right)}$$

$$V_{m(std)} = \mathbf{53.602} \text{ dscf}$$

Using equation for ambient train:

$$V_{m(std)} = 17.64 \times 74.99 \times 1.009 \times \frac{\left( 30.08 + \frac{0.00}{13.6} \right)}{\left( 79.4 + 460 \right)}$$

$$V_{m(std)} = \mathbf{74.441} \text{ dscf}$$

**$m_n$  – Total Particulate Matter Collected, mg**  
ASTM E2515 Equation (12)

$$m_n = m_p + m_f + m_g$$

Where:

- $m_p$  = mass of particulate matter from probe, mg
- $m_f$  = mass of particulate matter from filters, mg
- $m_g$  = mass of particulate matter from filter seals, mg

Sample Calculation:

Using equation for Train 1 (first hour):

$$m_n = 0.6 + 2.2 + 0.8$$
$$m_n = 3.6 \text{ mg}$$

Using equation for Train 1 (remainder):

$$m_n = 1.0 + 3.4 + 0.7$$
$$m_n = 5.1 \text{ mg}$$

Train 1 Aggregate = **8.7 mg**

Using equation for Train 2:

$$m_n = 1.2 + 7.5 + 0.3$$
$$m_n = \mathbf{9.0 \text{ mg}}$$

**C<sub>s</sub> - Concentration of particulate matter in tunnel gas, dry basis, corrected to standard conditions, g/dsc**  
ASTM E2515 equation (13)

$$C_s = K_2 \times \frac{m_n}{V_{m(\text{std})}}$$

Where:

- K<sub>2</sub> = Constant, 0.001 g/mg
- m<sub>n</sub> = Total mass of particulate matter collected in the sampling train, mg
- V<sub>m(std)</sub> = Volume of gas sampled corrected to dry standard conditions, dscf

Sample calculation:

For Train 1:

$$C_s = 0.001 \times \frac{8.7}{51.95}$$

$$C_s = \mathbf{0.00017} \text{ g/dscf}$$

For Train 2

$$C_s = 0.001 \times \frac{9.0}{53.60}$$

$$C_s = \mathbf{0.00017} \text{ g/dscf}$$

For Ambient Train

$$C_r = 0.001 \times \frac{0.2}{74.44}$$

$$C_r = \mathbf{0.000003} \text{ g/dscf}$$

**E<sub>T</sub> – Total Particulate Emissions, g**

ASTM E2515 equation (15)

$$E_T = (C_s - C_r) \times Q_{std} \times \theta$$

Where:

- C<sub>s</sub> = Concentration of particulate matter in tunnel gas, g/dscf
- C<sub>r</sub> = Concentration particulate matter room air, g/dscf
- Q<sub>std</sub> = Average dilution tunnel gas flow rate, dscf/hr
- θ = Total time of test run, minutes

Sample calculation:

For Train 1

$$E_T = ( \underline{0.000167} - 0.000003 ) \times \underline{8950.3} \times \underline{363} /60$$

$$E_T = \underline{8.92} \text{ g}$$

For Train 2

$$E_T = ( \underline{0.000168} - 0.000003 ) \times \underline{8950.3} \times \underline{363} /60$$

$$E_T = \underline{8.95} \text{ g}$$

Average

$$E = \underline{8.93} \text{ g}$$

Total emission values shall not differ by more than 7.5% from the total average emissions

$$7.5\% \text{ of the average} = \underline{0.67}$$

$$\text{Train 1 difference} = \underline{0.01}$$

$$\text{Train 2 difference} = \underline{0.01}$$



**PR - Proportional Rate Variation**

ASTM E2515 equation (16)

$$PR = \left[ \frac{\theta \times V_{mi} \times V_s \times T_m \times T_{si}}{\theta_i \times V_m \times V_{si} \times T_{mi} \times T_s} \right] \times 100$$

Where:

- $\theta$  = Total sampling time, min
- $\theta_i$  = Length of recording interval, min
- $V_{mi}$  = Volume of gas sample measured by the dry gas meter during the "ith" time interval, dcf
- $V_m$  = Volume of gas sample as measured by dry gas meter, dcf
- $V_{si}$  = Average gas velocity in the dilution tunnel during the "ith" time interval, ft/sec
- $V_s$  = Average gas velocity in the dilution tunnel, ft/sec
- $T_{mi}$  = Absolute average dry gas meter temperature during the "ith" time interval, °R
- $T_m$  = Absolute average dry gas meter temperature, °R
- $T_{si}$  = Absolute average gas temperature in the dilution tunnel during the "ith" time interval, °R
- $T_s$  = Absolute average gas temperature in the dilution tunnel, °R

Sample calculation (for the first 1 minute interval of Train 1):

$$PR = \left( \frac{363 \times 0.131 \times 13.69 \times (113.0 + 460) \times (89.7 + 460)}{1 \times 53.62 \times 14.00 \times (101.8 + 460) \times (78.0 + 460)} \right) \times 100$$

$$PR = \underline{90} \%$$

**PM<sub>R</sub> – Average particulate emissions for full integrated test run, g/hr**  
ASTM E2779 equation (5)

$$PM_R = 60 (E_T/\theta)$$

Where,

E<sub>T</sub> = Total particulate emissions, grams

θ = Total length of full integrated test run, min

Sample Calculation:

$$E_T(\text{Dual train average}) = 8.93 \text{ g}$$

$$\theta = 363 \text{ min}$$

$$PM_R = 60 \times ( 8.93 / 363 )$$

$$PM_R = 1.48 \text{ g/hr}$$

**PM<sub>F</sub> – Average particulate emission factor for full integrated test run, g/dry kg of fuel burned**  
ASTM E2779 equation (6)

$$PM_F = E_T / M_{Bdb}$$

Where,

E<sub>T</sub> = Total particulate emissions, grams

M<sub>Bdb</sub> = Weight of test fuel burned during test run, dry basis, kg

Sample Calculation:

$$E_T \text{ (Dual train average)} = 8.93 \text{ g}$$

$$M_{Bdb} = 7.64 \text{ kg}$$

$$PM_F = 8.93 / 7.64 )$$

$$PM_F = 1.17 \text{ g/kg}$$

*Model: Allure 50  
Harman Home Heating  
352 Mountain House Road  
Halifax, PA 17032*

# **Section 4**

## **Owner's Manual**

# Installation Manual

## Installation and Appliance Setup

**INSTALLER:** Leave this manual with party responsible for use and operation.

**OWNER:** Retain this manual for future reference.

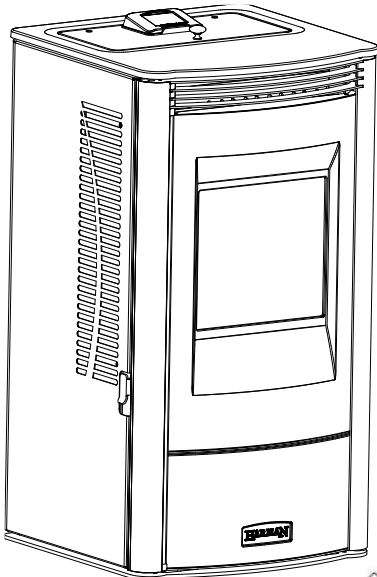
**NOTICE: SAVE THESE INSTRUCTIONS**

# HARMAN®

**BUILT TO A STANDARD, NOT A PRICE**

**Model(s):**

**Allure50 Freestanding Pellet Stove**



Tested & Listed By  Portland Oregon USA  
OMNI-Test Laboratories, Inc.

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

### CAUTION

Tested and approved for wood pellet fuel only. Burning of any other type of fuel voids your warranty.

### CAUTION

Check building codes prior to installation.

- Installation **MUST** comply with local, regional, state and national codes and regulations.
- Contact local building or fire officials about restrictions and installation inspection requirements in your area.

### WARNING



Please read this entire manual before installation and use of this pellet fuel-burning room heater.

Failure to follow these instructions could result in property damage, bodily injury or even death.

- Do not store or use gasoline or other flammable vapors and liquids in the vicinity of this or any other appliance.
- Do not overfire - If any external part starts to glow, you are overfiring. Reduce feed rate. Overfiring will void your warranty.
- Comply with all minimum clearances to combustibles as specified. Failure to comply may cause house fire.

### WARNING



#### **HOT SURFACES!**

Glass and other surfaces are hot during operation AND cool down.

**Hot glass will cause burns.**

- Do not touch glass until it is cooled
- **NEVER** allow children to touch glass
- Keep children away
- **CAREFULLY SUPERVISE** children in same room as stove.
- Alert children and adults to hazards of high temperatures.
- **High temperatures may ignite clothing or other flammable materials.**
- Keep clothing, furniture, draperies and other flammable materials away.

### **NOTE**

To obtain a French translation of this manual, please contact your dealer or visit [www.harmanstoves.com](http://www.harmanstoves.com)

Pour obtenir une traduction française de ce manuel, s'il vous plaît contacter votre revendeur ou visitez [www.harmanstoves.com](http://www.harmanstoves.com)

# TABLE OF CONTENTS

Installation Standard Work Checklist . . . . . 3

**1 Product Specific and Important Safety Information**

A. Appliance Certification . . . . . 4

B. Glass Specifications . . . . . 4

C. Mobile Home Approvals . . . . . 4

D. BTU Specifications . . . . . 4

E. Electrical Codes . . . . . 4

**2 Getting Started**

A. Design and Installation Considerations . . . . . 5

B. Tools and Supplies Needed . . . . . 6

C. Inspect Appliance and Components . . . . . 6

**3 Clearances**

A. Appliance Dimension Diagram . . . . . 7

B. Non-Combustible Materials Specification . . . . . 8

C. Combustible Materials Specification . . . . . 8

D. Clearances to Combustibles . . . . . 8

E. Floor Protection . . . . . 9

F. Mobile Home Installation . . . . . 9

## **4 Termination Location and Vent Information**

A. Vent Termination Minimum Clearances . . . . . 10-13

B. Chimney Diagram . . . . . 14

C. Venting & Use of Elbows . . . . . 15-16

D. Outside Air . . . . . 17

E. Locating Your Appliance and Chimney . . . . . 18

F. Draft . . . . . 18

G. Negative Pressure . . . . . 18

H. Avoiding Smoke & Odors . . . . . 19

I. Fire Safety . . . . . 20

J. Inspect Appliance & Components . . . . . 20

## **5 Appliance Setup**

A. Unpacking . . . . . 21

B. Firebox Draft and Combustion Fan RPM . . . . . 21

## **6 Reference Materials**

A. Safety Reminders . . . . . 22

B. Wiring Diagram . . . . . 23

### **Safety Alert Key:**

- **DANGER!** Indicates a hazardous situation which, if not avoided will result in death or serious injury.
- **WARNING!** Indicates a hazardous situation which, if not avoided could result in death or serious injury.
- **CAUTION!** Indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.
- **NOTICE:** Indicates practices which may cause damage to the stove or to property.


# Installation Standard Work Checklist

## ATTENTION INSTALLER: Follow this Standard Work Checklist

This standard work checklist is to be used by the installer in conjunction with, not instead of, the instructions contained in this installation manual.

**Customer:** \_\_\_\_\_  
**Lot/Address:** \_\_\_\_\_  
 \_\_\_\_\_  
**Model:** \_\_\_\_\_

**Date Installed:** \_\_\_\_\_  
**Location of Stove:** \_\_\_\_\_  
**Installer:** \_\_\_\_\_  
**Dealer/Distributor Ph #** \_\_\_\_\_  
**Serial Number:** \_\_\_\_\_

 **WARNING! Risk of Fire or Explosion! Failure to install appliance to these instructions can lead to a fire or explosion.**

**Appliance Install**

	YES	IF NO, WHY?
Required non-combustible floor protection (Pg. 9)	<input type="checkbox"/>	_____
Verified clearances to combustible. (Pg. 10-14)	<input type="checkbox"/>	_____
Unit is Leveled and secured.	<input type="checkbox"/>	_____

**Venting/Chimney Section 4 (Pg. 10-19)**

Venting Configuration complies to vent diagrams.	<input type="checkbox"/>	_____
Venting installed, sealed and secured in place with proper clearances.	<input type="checkbox"/>	_____
Exterior wall/roof flashing installed and sealed	<input type="checkbox"/>	_____
Terminations installed and sealed.	<input type="checkbox"/>	_____

**Electrical Section 1 (Pg. 4)**

120VAC unswitched power provided to the appliance.	<input type="checkbox"/>	_____
--	--------------------------	-------

**Appliance Setup Section 5 (Pg. 20-21)**

All packaging and protective materials are removed	<input type="checkbox"/>	_____
Accessories installed properly	<input type="checkbox"/>	_____
Manual bag and all it's contents are removed from inside the appliance and given to party responsible for use and operation	<input type="checkbox"/>	_____
Started appliance and verified that all motors and blowers operate as they should.	<input type="checkbox"/>	_____

Hearth and Home Technologies recommends the following:  
 Photographing the installation and copying this checklist for your file.  
 This checklist remain visible at all times on the appliance until the installation is complete.

Comments: Further description of the issues, who is responsible (Installer/Builder/Other Trades, etc.) and corrective action needed \_\_\_\_\_

\_\_\_\_\_

Comments communicated to party responsible \_\_\_\_\_ by \_\_\_\_\_ on \_\_\_\_\_  
 (Builder / Gen Contractor) (Installer) (Date)

# 1 Product Specific and Important Safety Information

## A. Appliance Certification

<b>MODEL:</b>	Allure50 Pellet Stove
<b>LABORATORY:</b>	OMNI Test Laboratories, Inc
<b>REPORT NO.</b>	0135P50375
<b>TYPE:</b>	Pellet Fueled/Supplementary For Residential Use
<b>STANDARD(s):</b>	ASTM E 2779-10, ASTM E 2515-11, ASTM E 1509-04, ULC-S627-00, EPA Method 28R
<b>GLASS SPECIFICATION:</b>	5mm mirrored ceramic glass

The Allure50 is Certified to comply with 2015 particulate emission standards. Not approved for sale after May 15, 2020.



**NOTE:** This installation must conform with local codes. In the absence of local codes you must comply with the **ASTM E1509-2012, ULC S628-93, (UM) 84-HUD**

## B. Glass Specifications

This appliance is equipped with 5mm mirrored ceramic glass. Replace glass only with 5mm mirrored ceramic glass. Please contact your dealer for replacement glass.

## C. Mobile Home Approved

This appliance is approved for mobile home installations when not installed in a sleeping room and when an outside combustion air inlet is provided.

The structural integrity of the mobile home floor, ceiling, and walls must be maintained. The appliance must be properly grounded to the frame of the mobile home and use only listed pellet vent, Class "PL" connector pipe.

**A Harman® Outside Air Kit must be installed in a mobile home installation.**

<b>WARNING</b>
<b>THE STRUCTURAL INTEGRITY OF THE MANUFACTURED HOME FLOOR, WALL, AND CEILING/ROOF MUST BE MAINTAINED.</b>
<b>DO NOT INSTALL IN SLEEPING ROOM.</b>

## D. BTU & Efficiency Specifications

<b>EPA Certification Number:</b>	
<b>EPA Certified Emissions:</b>	1.49 g/hr
<b>*EPA Default Efficiency:</b>	79.9%
<b>**Actual Tested Efficiency:</b>	74.6
<b>***EPA BTU Output:</b>	39,100
<b>****BTU Input</b>	52,600
<b>Vent Size:</b>	3 Inch
<b>Hopper Capacity:</b>	92 lbs
<b>Fuel</b>	Wood Pellet

\* Weighted average LHV efficiency using data collected during EPA emissions test.

\*\*Weighted average HHV efficiency using data collected during EPA emissions test.

\*\*\*A range of BTU outputs based on EPA Default Efficiency and the burn rates from the low and high EPA tests.

\*\*\*\*Based on the maximum feed rate per hour multiplied by approximately 8600 BTU's which is the average BTU's from a pound of pellets.

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

This wood heater needs periodic inspection and repair for proper operation. It is against federal regulations to operate this wood heater in a manner inconsistent with operating instructions in this manual.

## E. Electrical Codes

115 VAC, 60 Hz, Start 3.5 AMPS, Run 2.5 AMPS

**Note:** Some generator or battery back-up systems may not be compatible with the micro-processor electronics on this appliance. Please consult the power supply manufacturer for compatible systems.

**Note:** Hearth & Home Technologies, manufacturer of this appliance, reserves the right to alter its products, their specifications and/or price without notice.

Harman® is a registered trademark of Hearth & Home Technologies.



# 2 Getting Started

## A. Design and Installation Considerations

### 1. Appliance Location

**NOTE:** Check building codes prior to installation.

- Installation MUST comply with local, regional, state and national codes and regulations.
- Consult insurance carrier, local building inspector, fire officials or authorities having jurisdiction over restrictions, installation inspection and permits.

It is a good idea to plan your installation on paper, using exact measurements for clearances and floor protection, before actually beginning the installation

Consideration must be given to:

- Safety, convenience, traffic flow.
- Placement of the chimney and chimney connector.
- If you are not using an existing chimney, place the appliance where there will be a clear passage for a factory-built listed chimney through the ceiling and roof.
- Installing an optional outside air kit would affect the location of the vent termination.

**NOTE:** Locating the appliance in a location of considerable air movement can cause intermittent smoke spillage from appliance. Do not locate appliance near:

- Frequently open doors
- Central heat outlets or returns

Since pellet exhaust can contain ash, soot or sparks, you must consider the location of:

- Windows
- Air Intakes
- Air Conditioner
- Overhang, soffits, porch roofs, adjacent walls
- Landscaping, vegetation

When locating vent and venting termination, vent above roof line when possible.

**⚠ WARNING**

**Risk of Fire!**  
Damaged parts could impair safe operation. Do NOT install damaged, incomplete or substitute components.

Installation and service of this appliance should be performed by qualified personnel. Hearth & Home Technologies recommends HHT Factory Trained or NFI certified professionals.

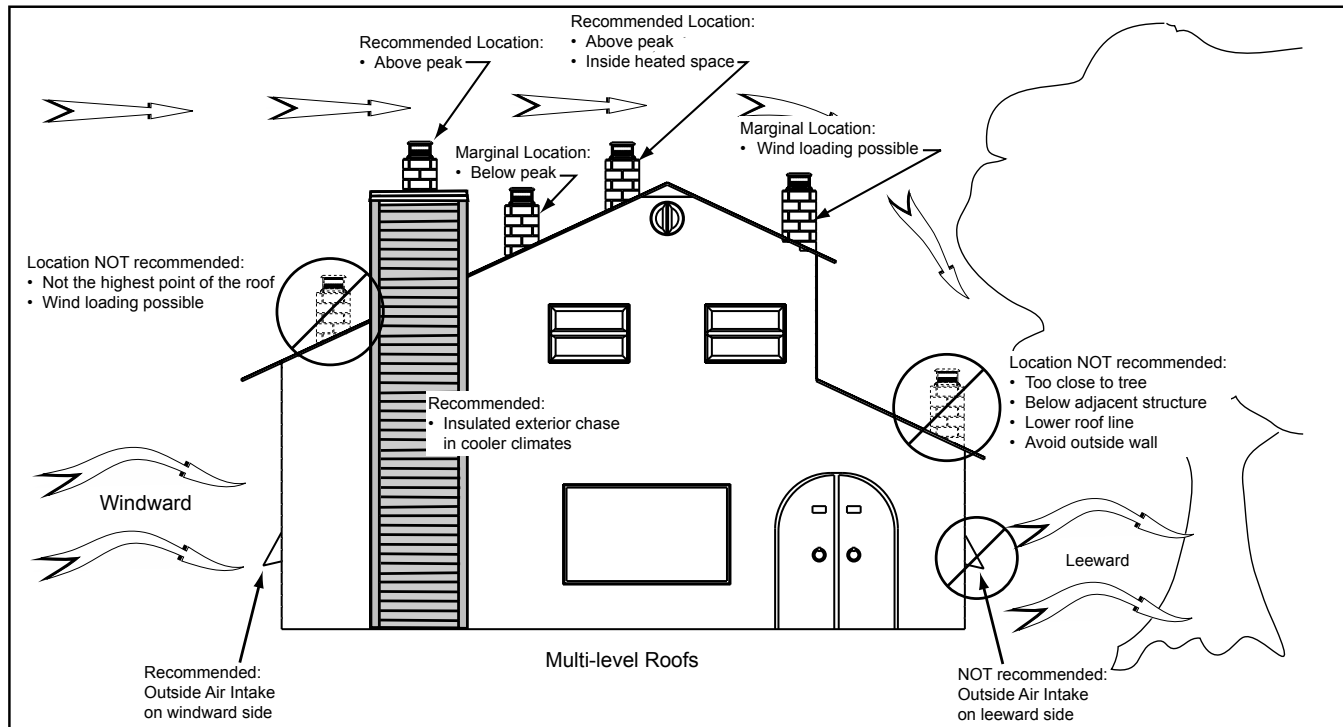


Figure 2.1

## B. Tools And Supplies Needed

Tools and building supplies normally required for installation, unless installing into an existing masonry fireplace:

- Reciprocating Saw
  - Hammer
  - Phillips Screwdriver
  - Tape Measure
  - Level
  - Non-Combustible Sealant
  - Gloves
  - Safety Glasses
  - Electric Drill & Bits
- May also need:**
- Vent Support Straps
  - Venting Paint

## C. Inspect Appliance and Components

- Carefully remove the appliance and components from the packaging.
- Report to your dealer any parts damaged in shipment, particularly the condition of the glass.
- **Read all of the instructions before starting the installation. Follow these instructions carefully during the installation to ensure maximum safety and benefit.**

### DO NOT:

- *Install or operate damaged appliance.*
- *Modify appliance.*
- *Install other than as instructed by Hearth & Home Technologies.*
- *Operate the appliance without fully assembling all components.*
- *Overfire.*
- *Install any component not approved by Hearth & Home Technologies.*
- *Install parts or components not Listed or approved.*
- *Disable safety switches.*

*Improper installation, adjustment, alteration, service or maintenance can cause injury or property damage.*

*For assistance or additional information, consult a qualified installer, service agency or your dealer.*

Hearth & Home Technologies disclaims any responsibility for, and the warranty will be voided by the following actions:

- Installation and use of any damaged appliance or vent system component.
- Modification of the appliance or vent system.
- Installation other than as instructed by Hearth & Home Technologies.
- Installation and/or use of any component part not approved by Hearth & Home Technologies.

**Any such action may cause a fire hazard.**



### WARNING

***Risk of Fire, Explosion or Electric Shock! DO NOT use this appliance if any part has been under water. Call a qualified service technician to inspect the appliance and to replace any part of the control system which has been under water.***



### WARNING



***RISK OF FIRE OR EXPLOSION!  
DAMAGED PARTS COULD IMPAIR SAFE OPERATION. DO NOT install damaged, incomplete or substitute components.  
Keep appliance dry.***

# 3 Clearances

## A. Appliance Dimension Diagram

Dimensions are actual appliance dimensions. Use for reference only.

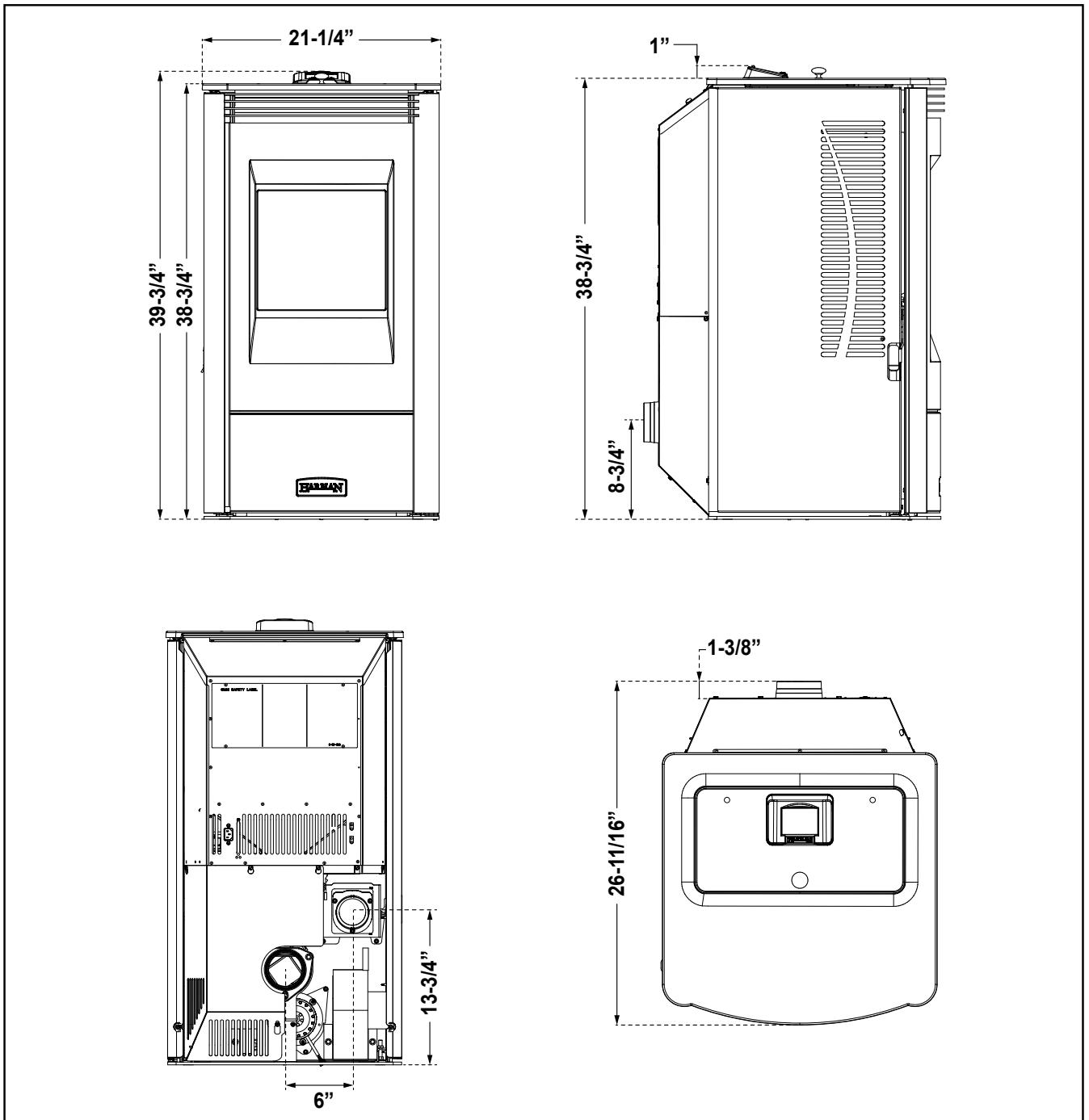


Figure 3.1

## B. Non-Combustible Materials Specification

Material which will not ignite and burn. Such materials are those consisting entirely of steel, iron, brick, tile, concrete, slate, glass or plasters, or any combination thereof.

Materials that are reported as passing **ASTM E 136, Standard Test Method for Behavior of Materials in a Vertical Tube Furnace at 750° C** and **UL763** shall be considered non-combustible materials.

## C. Combustible Materials Specification

Materials made of or surfaced with wood, compressed paper, plant fibers, plastics, or other material that can ignite and burn, whether flame proofed or not, or plastered or unplastered shall be considered combustible materials.

## D. Clearances to Combustibles

When selecting a location for the appliance it is important to consider the required clearances to walls (see Figure 3.2).



### WARNING

**RISK OF FIRE OR BURNS! Provide adequate clearance around air openings and for service access. Due to high temperatures, the appliance should be located out of traffic and away from furniture and draperies.**

**NOTE:** Illustrations reflect typical installations and are FOR DESIGN PURPOSES ONLY. Actual installation may vary due to individual design preference.

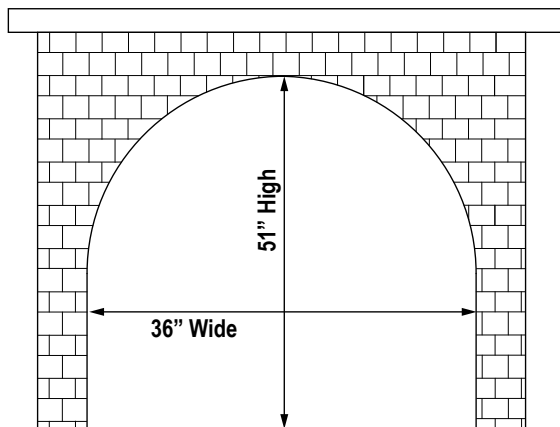
Place the stove away from combustible walls at least as far as shown in Figure 3.2.

Note that the clearances shown are minimum for safety but do not leave much room for access when cleaning or servicing. Please take this into account when placing the stove.

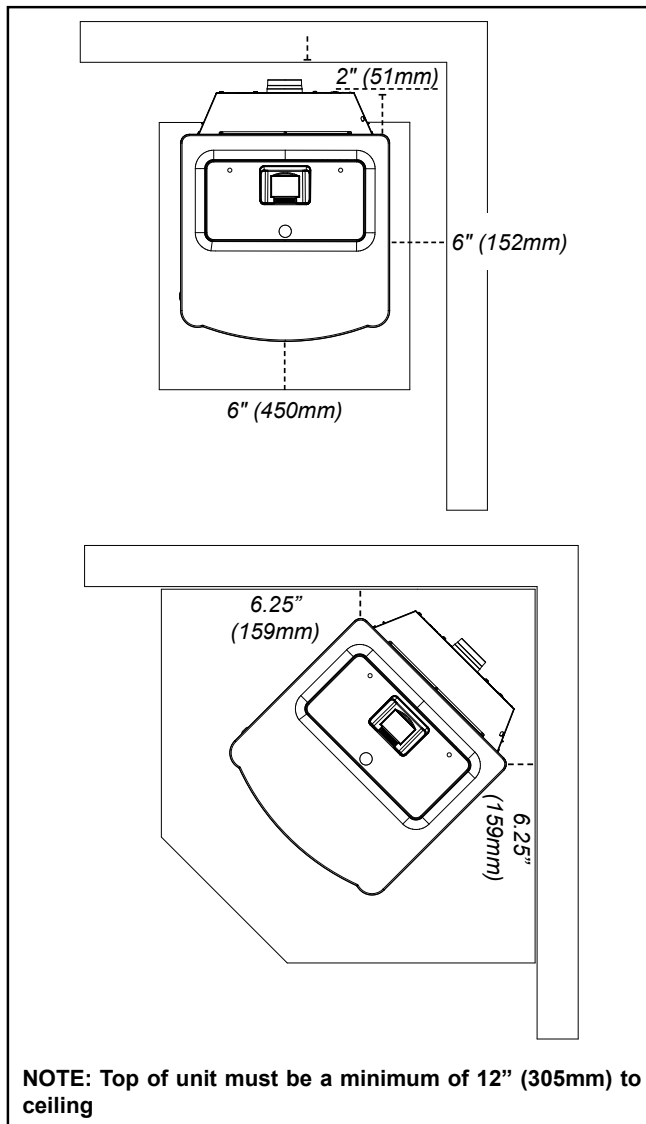
**Alternate floor protector dimension may be used as long as they satisfy the measurement requirements shown below.**

**Minimum size floor protection for a corner installation hearth pad is 36" x 36". NOTE: Floor protector WILL NOT touch the wall.**

When installing the unit into an alcove it is important to consider the required clearances listed below.



Height = 51", Width = 36, Depth = 24"



**NOTE:** Top of unit must be a minimum of 12" (305mm) to ceiling

Figure 3.2



### CAUTION

**THIS APPLIANCE MUST BE VENTED TO THE OUTSIDE.**

### NOTICE

Clearances may only be reduced by means approved by the regulatory authority having jurisdiction.

Due to high temperatures, the stove should be placed away from traffic, furniture and draperies.

Children and adults should be alerted to the hazards of high surface temperatures and should stay away to avoid burns to skin and/or clothing.

Young children should be carefully supervised when they are in the same room as the stove.

Clothing and other flammable materials should not be placed on or near this unit.

## E. Floor Protection

Place the stove on a noncombustible floor or floor protector that extends a minimum of 6 inches (152mm) to the front of the load door opening, 6 inches (152mm) to the sides of the door opening, and 0 inches to the rear. Floor protection must also extend 2 inches (51mm) beyond each side of any horizontal flue pipe. The minimum floor protector material is 20 gauge sheet metal. Other floor protector materials are ceramic tile, stone, brick, etc. Figure 3.3

**NOTE for Canadian installation only:** Per ULC-S627-00, if installed on a combustible floor, the need to provide a noncombustible *floor protector* covering the area beneath the *space heater* and extending at least 17.72" (450mm) on the firing side and at least 7.87" (200mm) on the other sides.

**In Canada, you may follow the smaller U.S. floor protection requirements ONLY if the user agrees to completely shut-down the appliance, and allow it to cool to where all fire is extinguished and the combustion blower and its indicator light shuts off, prior to opening the firebox door or ash door.**

Minimum Size floor protection (USA) is 25-7/8" wide By 28" deep (658mm X 711mm).

\*Floor protection dimensions for the front and sides are measured from the appliance door opening in The United States. In Canada, the side dimension is measured from the widest part of the appliance.

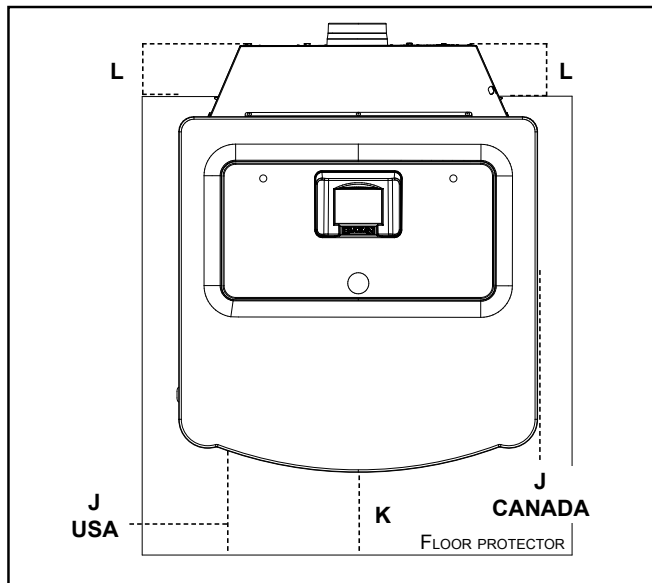


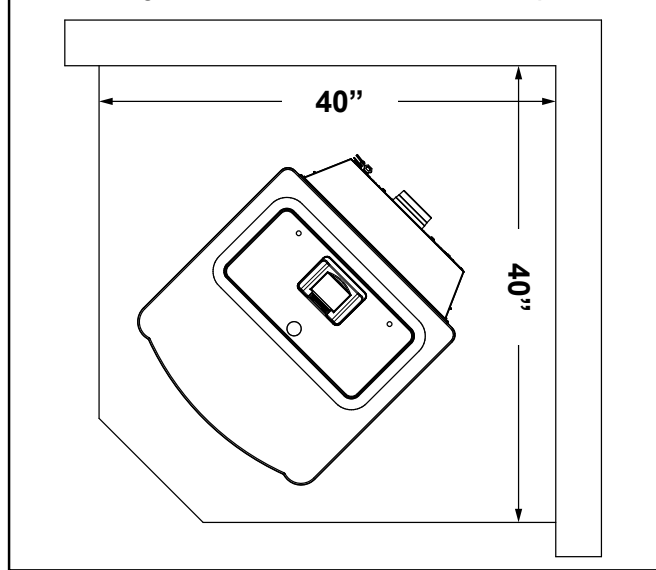
Figure 3.3

Floor Protection Requirements		US	Canada
J	Sides	6"	200mm
K	Front	6"	450mm
L	Rear	1"	25mm

**NOTE:** Measurement "L" is even with the rear of the hopper in the US ONLY

**NOTE:** Measurement "K" is measured from the glass in the US ONLY

Corner to edge dimension for corner installation floor protection.



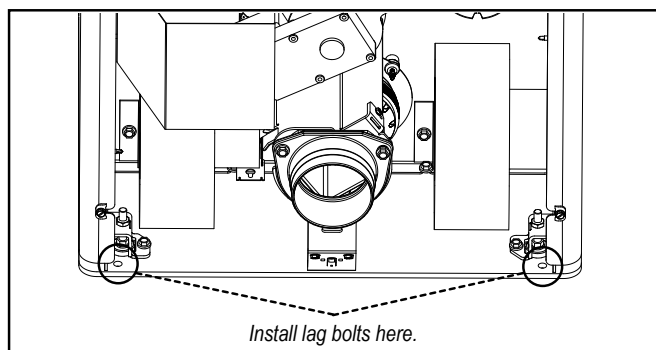
Alternate floor protector dimension may be used as long as they satisfy the measurement requirements shown below.

Minimum size floor protection for a corner installation hearth pad is 40" x 40" (USA ONLY). This also allows the floor pad to touch the wall.

## F. Mobile Home Installation

When installing this unit in a mobile home, several requirements must be followed:

1. The unit must be bolted to the floor in places. This can be done using lag screws through the skid bolt down holes located at the base of the unit. **Note:** Lag bolt must be installed from the bottom up.
2. The unit must be connected to an outside combustion air inlet. Proper supports and spark arresters must be considered when installing venting. See "Termination Location and Vent Information" Section D.
3. Floor protection and clearances must be followed as shown.
4. Unit must be grounded to the metal frame of the mobile home.



# 4 Termination Location and Vent Information

## A. Vent Termination Minimum Clearances

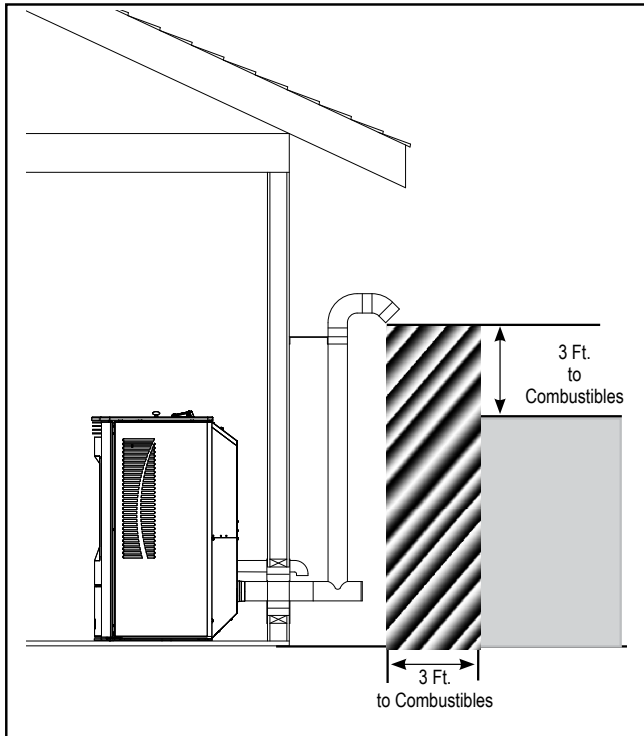


Figure 4.1

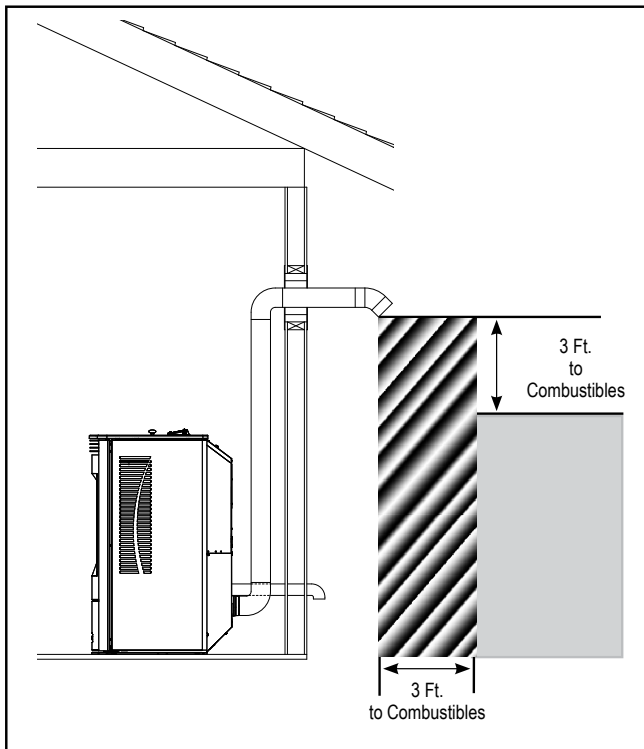


Figure 4.2

### #1 Preferred method (Figure 4.1)

This method provides excellent venting for normal operation and allows the stove to be installed closest to the wall. Two inches from the wall is safe; however, four inches allows better access to remove the rear panel. The vertical portion of the vent should be three to five feet high. This vertical section will help provide natural draft in the event of a power failure.

Seal pipe joints with silicone or aluminum tape in addition to the sealing system used by the manufacturer.

**Note: Do not place joints within wall pass-through.**

**THE CHIMNEY MUST BE OF A TYPE SUITABLE FOR SOLID-FUEL BURNING.**



**WARNING**

**THE CHIMNEY AND CONNECTOR MUST BE MAINTAINED IN GOOD CONDITION AND KEPT CLEAN.**



**CAUTION**

**DO NOT USE MAKESHIFT COMPROMISES WHEN INSTALLING THIS APPLIANCE. DAMAGE AND/OR INJURY MAY RESULT.**

### #2 Preferred method (Figure 4.2)

This method also provides excellent venting for normal operation but requires the stove to be installed farther from the wall. The vertical portion of the vent should be three to five feet high and at least 1" from a combustible wall. This vertical section will provide natural draft in the event of a power failure.

Seal pipe joints with silicone or aluminum tape in addition to the sealing system used by the manufacturer.

If the stove is installed below grade be sure the vent termination is at least 12" above grade (**with outside air only**). The outlet must also be 12" from the house/building.

**Note: Do not place joints within wall pass-through.**



**CAUTION**

**Keep combustible materials (such as grass, leaves, etc.) at least 3 feet away from the flue outlet on the outside of the building.**

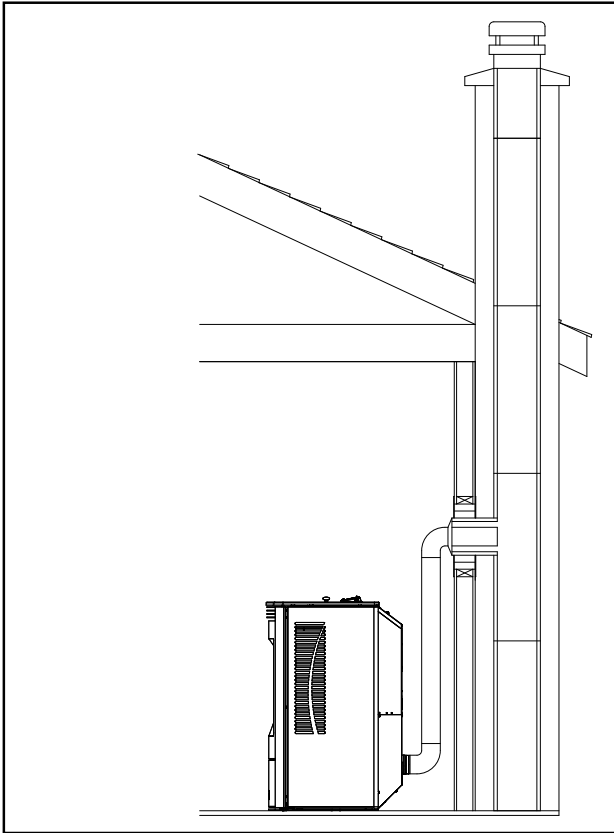


Figure 4.3

### #3 Installing into an existing chimney (Figure 4.3)

This method provides excellent venting for normal operation. This method also provides natural draft in the event of a power failure. If the chimney condition is questionable\* you may want to install a liner as in method #6.

In some places in the US and Canada it is required that the vent pipe extend all the way to the top of the chimney.

\*The chimney should be inspected and cleaned before installing your stove. If you discover that the chimney does not have a clay tile liner or has cracks or flaking of the tile liner you will need to install a stainless steel liner within the chimney. In most cases the inside diameter of this liner should be 4". Either flexible or rigid liner may be used for this purpose. Refer to Method 5 & 6. Seal pipe joints with silicone or aluminum tape in addition to the sealing system used by the manufacturer.

Be sure to design the venting so that it can be easily cleaned.

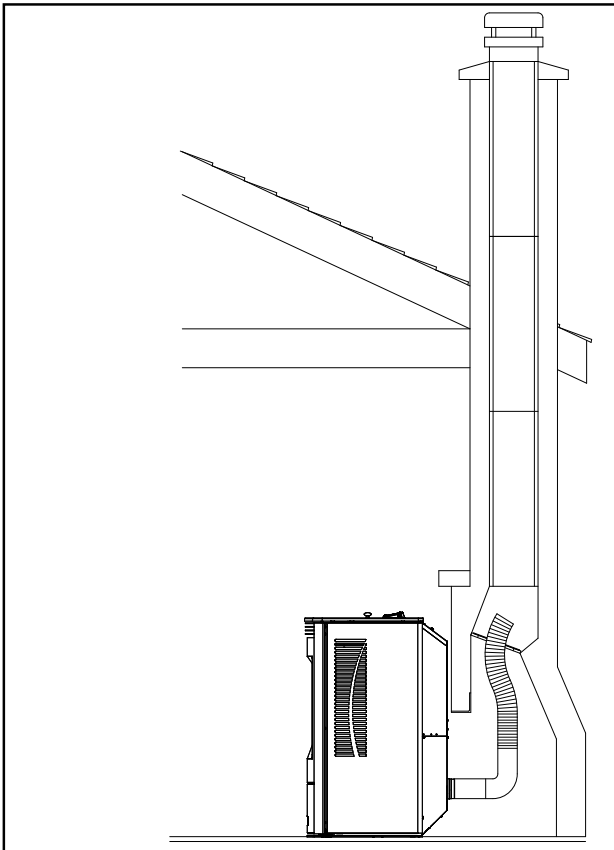


Figure 4.4

### #4 Installing into an existing fireplace chimney (Figure 4.4)

This method provides excellent venting for normal operation. This method also provides natural draft in the event of a power failure. If the chimney condition is questionable\* you may want to install a liner as in method #5.

In some places in the US and Canada it is required that the vent pipe extend all the way to the top of the chimney.

\*The chimney should be inspected and cleaned before installing your stove. If you discover that the chimney does not have a clay tile liner or has cracks or flaking of the tile liner you will need to install a stainless steel liner within the chimney. In most cases the inside diameter of this liner should be 4". Either flexible or rigid liner may be used for this purpose. Refer to Method 5 & 6.

The chimney should be sealed at the damper using a steel plate. Kaowool, mineral wool or an equivalent non-combustible insulation is recommended to be installed on top of the sealing plate to reduce the possibility of condensation. The connector pipe should extend through the smoke chamber to the base or into the first flue tile. Seal pipe joints with silicone or aluminum tape in addition to the sealing system used by the manufacturer.

Be sure to design the venting so that it can be easily cleaned.

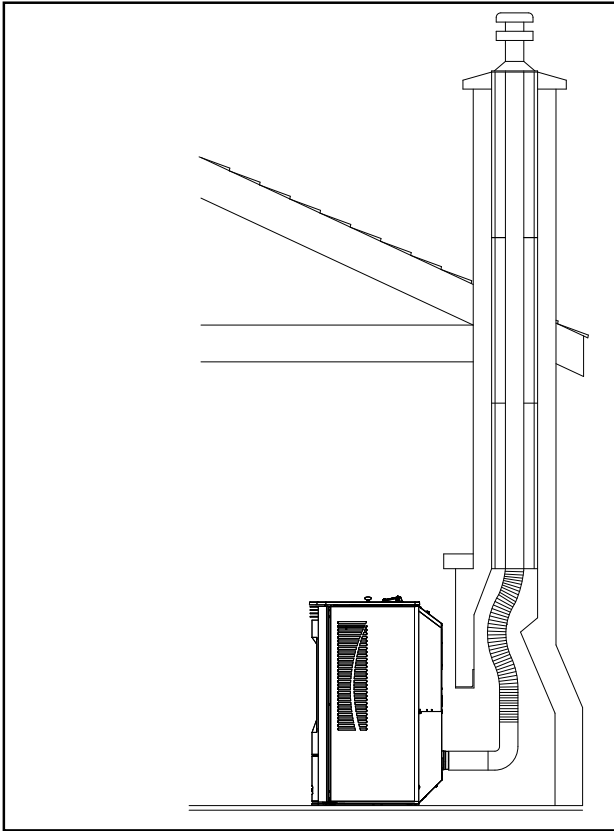


Figure 4.5

#### #5 Installing into an existing fireplace chimney (Figure 4.5) w/Full Liner

This method provides excellent venting for normal operation. This method also provides natural draft in the event of a power failure.

In some places in the US and Canada it is required that the vent pipe extend all the way to the top of the chimney. The pipe or liner inside the chimney should be 4" diameter.

In this method a cap should also be installed on the chimney to keep out rain. Be sure to use approved pellet vent pipe fittings. Seal pipe joints with silicone or aluminum tape in addition to the sealing system used by the manufacturer. Pipe size should be increased to 4" using this method.

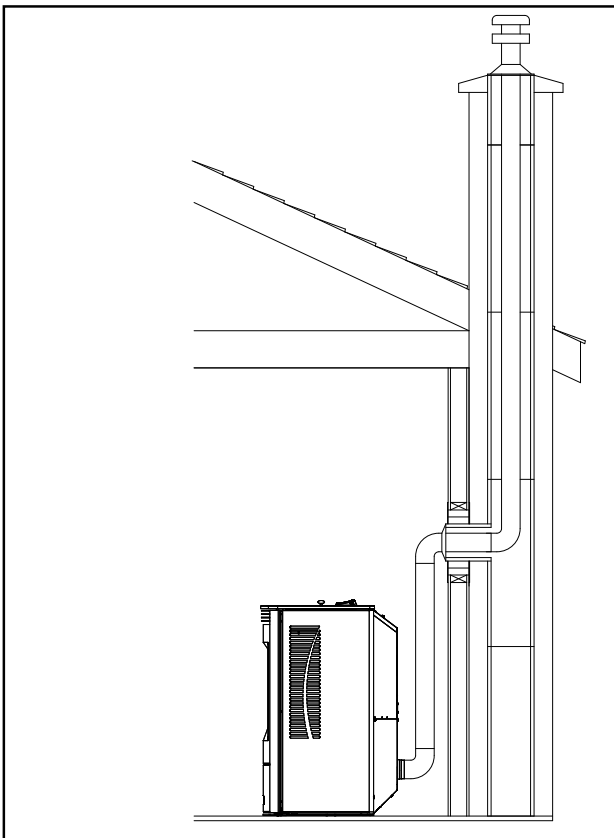


Figure 4.6

#### #6 Installing into an existing chimney (Figure 4.6) w/Full liner

This method provides excellent venting for normal operation. This method also provides natural draft in the event of a power failure.

In some places in the US and Canada it is required that the vent pipe extend all the way to the top of the chimney. Seal pipe joints with silicone or aluminum tape in addition to the sealing system used by the manufacturer. The pipe or liner inside the chimney should be 4" diameter.

In this method a cap should also be installed on the chimney to keep out rain.



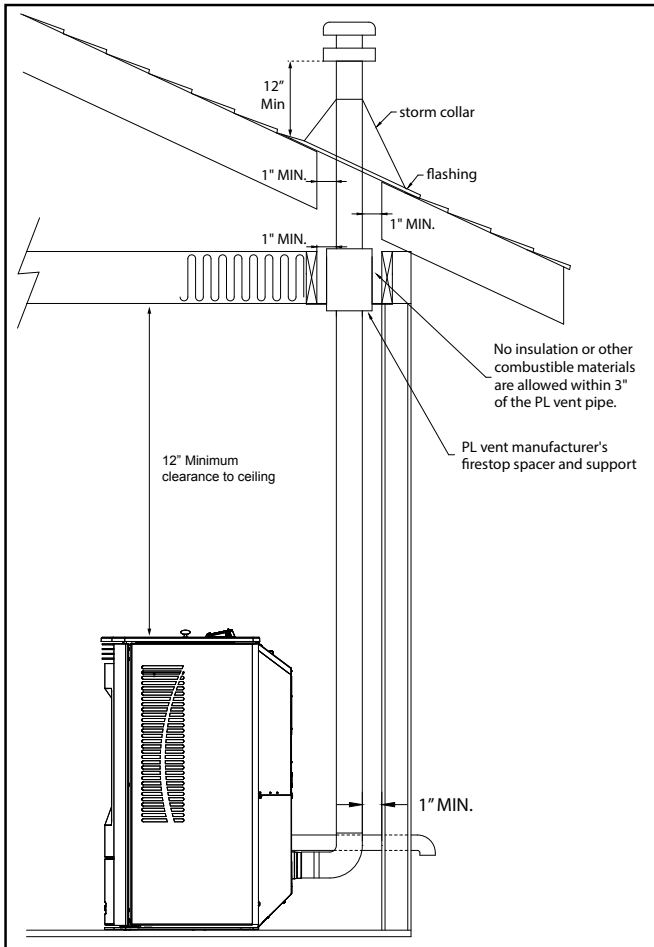


Figure 4.7

**#7 Installing through the ceiling (Figure 4.7)**

Follow PL vent manufacturers recommendations when using wall and ceiling pass through.

Seal pipe joints with silicone or aluminum tape in addition to the sealing system used by the manufacturer.

**Note: Do not place joints within wall pass-through.**

 <b>CAUTION</b>
<b>DO NOT USE MAKESHIFT COMPROMISES WHEN INSTALLING THIS APPLIANCE. DAMAGE AND/OR INJURY MAY RESULT.</b>

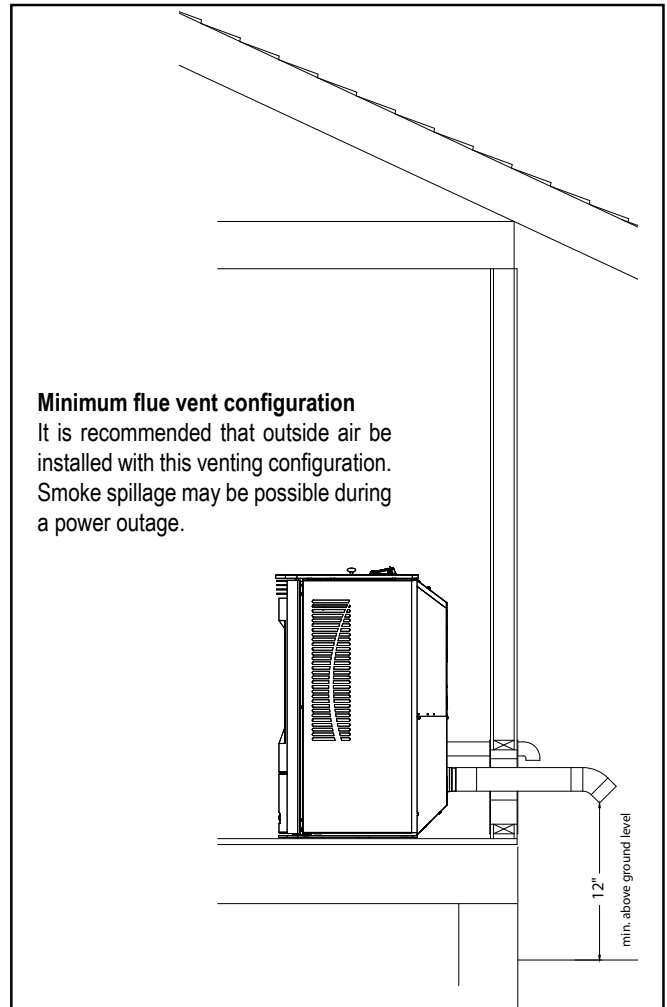


Figure 4.8

**Minimum flue vent configuration**

It is recommended that outside air be installed with this venting configuration. Smoke spillage may be possible during a power outage.

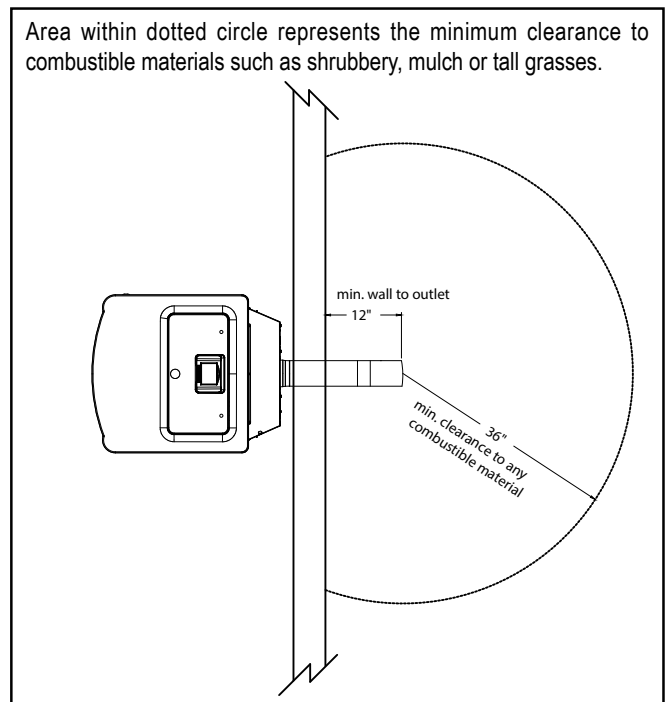


Figure 4.9

## B. Chimney Diagram

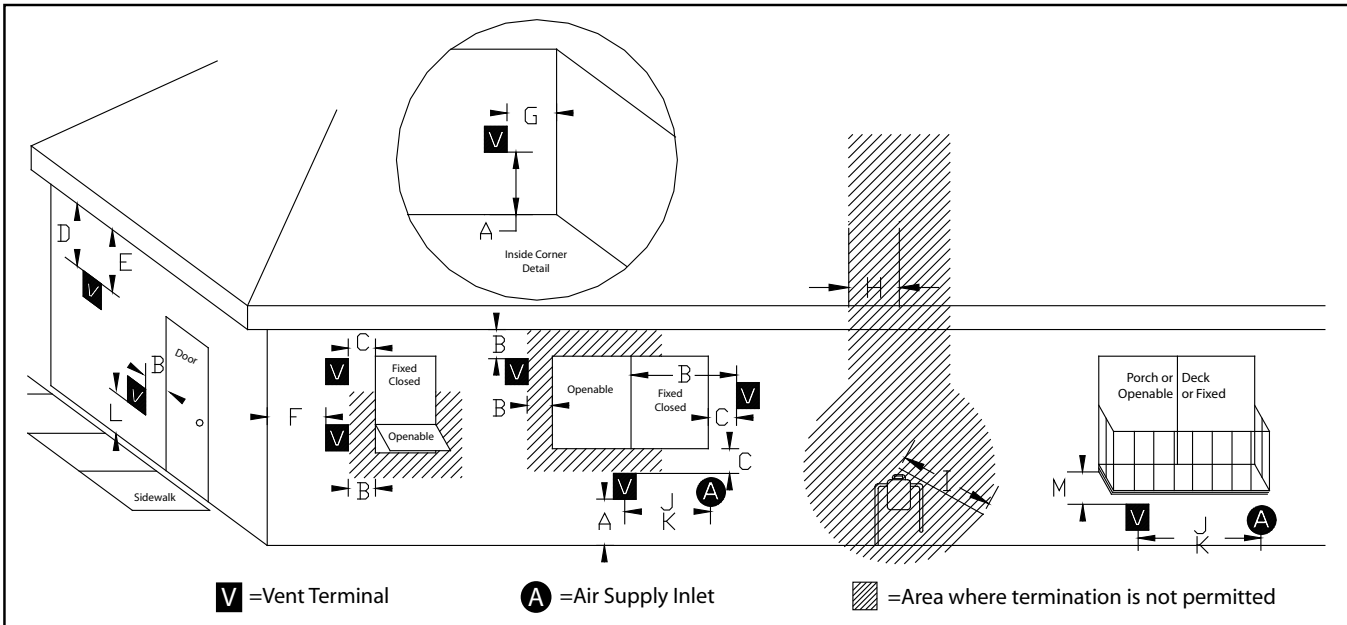


Figure 4.10

### Requirements for Terminating the Venting



**WARNING**

**Venting terminals must not be recessed into a wall or siding.**

**NOTE: Only PL vent pipe wall pass-through and fire stops should be used when venting through combustible materials.**

**Always take into consideration the effect the prevailing wind direction or other wind currents will cause with flyash and /or smoke when placing the termination.**

**In addition, the following must be observed:**

- A. The clearance above grade must be a minimum of 12".
- B. The clearance to a window or door that may be opened must be a minimum of 48" to the side, 48" below the window/door, 12" above the window/door. **(with outside air installed, 12" to side and below)**
- C. A 12" clearance to a permanently closed window is recommended to prevent condensation on the window.
- D. The vertical clearance to a ventilated soffit located above the terminal within a horizontal distance of 2 feet (60 cm) from the center-line of the terminal must be a minimum of 18".
- E. The clearance to an unventilated soffit must be a minimum of 12".
- F. The clearance to an outside corner is 11" from center of pipe.
- G. The clearance to an inside corner is 12".
- H. A vent must not be installed within 3 feet (90 cm) above a gas meter/regulator assembly when measured from the horizontal center-line of the regulator.

- I. The clearance to service regulator vent outlet must be a minimum of 6 feet.
- J. The clearance to a non-mechanical air supply inlet to the building or the combustion air inlet to any other appliance must be a minimum of 48".
- K. The clearance to a mechanical air supply inlet must be a minimum of 10 feet. **(with outside air installed, 6 feet)**
- L. The clearance above a paved sidewalk or a paved driveway located on public property must be a minimum of 7 feet.
- M. The clearance under a veranda, porch, deck or balcony must be a minimum of 12 inches. **(B. also)**

**NOTE: The clearance to vegetation and other exterior combustibles such as mulch is 36" as measured from the center of the outlet or cap. This 36" radius continues to grade or a minimum of 7 feet below the outlet.**

Certain Canadian and or Local codes or regulations may require different clearances.

A vent shall not terminate directly above a side-walk or paved driveway which is located between two single family dwellings and serves both dwellings.

Only permitted if veranda, porch, deck, or balcony is fully open on a minimum of 2 sides beneath the floor.

**See NFPA 211 for more installation clearance reductions when using outside air.**

**NOTE: Where passage through a wall, or partition of combustible construction is desired, the installation shall conform to CAN/CSA-B365. (if in Canada)**

## C. Venting & Use of Elbows

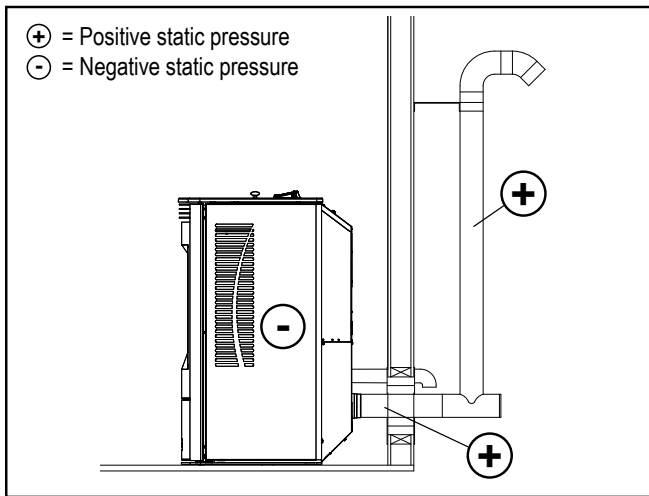


Figure 4.11

Harman pellet stoves depend on a combustion fan to pull air through the unit for combustion. The venting system restricts the ability of the combustion fan to move the required amount of air through the unit. A system with too much resistance will result in incomplete combustion, more frequent required cleaning and poor unit performance. It is always best to choose a location for the appliance that will result in a venting system with the shortest equivalent vent length (EVL).

It is best to have your venting system designed by a Harman authorized dealer before you finalize your purchase of an appliance.

**Equivalent Vent Length:** *The equivalent vent length for common pellet vent components are:*

- 90° Elbows or Tee: 5 EVL Units
- 45° elbow: 3 EVL Units
- Vertical Pipe or Liner: ½ EVL Unit
- Horizontal Pipe or liner: 1 EVL Unit

**The total allowable equivalent vent length is:**

- 20 EVL for 3" pellet vent pipe or liner.
- 30 EVL for 4" pellet vent pipe or liner.

Due to the potential for fly ash accumulation in horizontal venting sections, the maximum permissible horizontal venting length is:

- 4 ft. for 3" & 4" pellet vent pipe.

### Example: First Floor Installation

A unit is to be installed using 3" Pellet Pipe with 3 feet of horizontal pipe, a Tee, 10 feet of vertical pipe, a 90° elbow and a termination cap.

***The equivalent vent length is:***

3 ft. of Horizontal Pipe (1 x 3 EVL)	= 3 EVL
90° Elbow or Tee (1 x EVL)	= 5 EVL
10 ft. of Vertical Pipe (10 x .5 EVL)	= 5 EVL
90° Elbow or Tee (1 x EVL)	= 5 EVL
Termination Cap	= 0 EVL
<b>Equivalent Vent Length</b>	<b>= 18 EVL</b>

In the example system detailed above, the EVL was 18 which is less than the maximum of 20 EVL for 3" pellet vent pipe, thus this is a satisfactory venting configuration.

### Example: Connection to Masonry Chimney

A unit is to be installed using 3" Pellet Pipe with 2 feet of horizontal pipe, a Tee, 4 feet of vertical pipe, an elbow, a Tee, 21 feet of vertical liner, and a termination cap.

***The equivalent vent length is:***

2 ft. of Horizontal Pipe (1 x 2 EVL)	= 2 EVL
90° Tee (1 x 5 EVL)	= 5 EVL
4 ft. of Vertical Pipe (4 x .5 EVL)	= 2 EVL
90° Elbow (1 x 5 EVL)	= 5 EVL
90° Tee (1 x 5 EVL)	= 5 EVL
21 ft. of Vertical Liner (21 x .5 EVL)	= 10.5 EVL
Termination Cap	= 0 EVL
<b>Equivalent Vent Length</b>	<b>= 29.5 EVL</b>

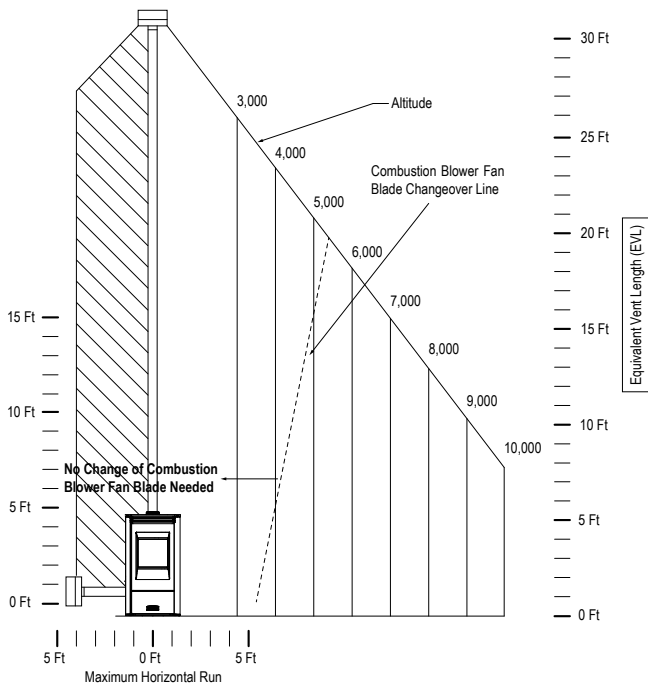
In the example system detailed above, the EVL was 29.5 which exceeds the maximum of 20 ft. for 3" pellet vent pipe, thus 3" vent pipe should not be used in this installation. However, since 4" pipe can support an EVL up to 30, the use of 4" pipe would create a satisfactory installation.

### C. Venting & Use of Elbows *continued*

**Note:** When the amount of vertical pellet vent pipe in the system exceeds 15 feet, 4" pellet vent pipe should be used.

**Note:** Equivalent Venting Length decreases as altitude increases.

**Note:** When the High Altitude Fan Blade is used, the maximum length of Outside Air Pipe decreases to 20 ft.



#### Example:

A unit with an EVL of 13, is to be installed at an altitude of 3,000 feet above sea level.

From the chart to the left, at 3,000 feet of altitude, the maximum permissible equivalent venting length is 26 feet. Therefore this would be an acceptable installation with no need to change the combustion blower fan.

However, if the same unit (EVL 13) was to be installed at an altitude of 9,000 feet above sea level, the installation would no longer be acceptable and the equivalent vent length of the pipe would have to be reduced for proper unit operation.

- Long runs of flex or PL vent pipe installed directly vertical from the flue stub may require more frequent cleaning due to fly ash falling off inside and collecting directly above the combustion blower outlet.
- 4" stainless steel flex vent piping is only allowed for use in masonry fireplaces and chimneys or factory built wood-burning fireplaces with Class A metal chimneys.
- All pellet vent pipe must be secured together either by means provided by pipe manufacturer or by 3 screws at each joint.
- Use only the specified venting components. Use of any other components will void the product warranty and may pose a hazard.
- Do Not Install a Flue Damper In The Exhaust Venting System of This Appliance.
- DO NOT CONNECT THIS UNIT TO A CHIMNEY FLUE SERVING ANOTHER APPLIANCE.
- Simpson DuraVent PelletVent Pro Harman® Adapter Part #3PVP-ADHB and PelletVent Pro Harman® Adapter Inceaser Part #3PVPX4ADHB are highly recommended to be installed on the starter collar to insure a proper pipe connection to the unit.
- **INSTALL VENT AT CLEARANCES SPECIFIED BY THE VENT MANUFACTURER**
- Use silicone to create an effective vapor barrier at the location where the chimney or outside air ducting passes through to the exterior of the structure

## D. Outside Air

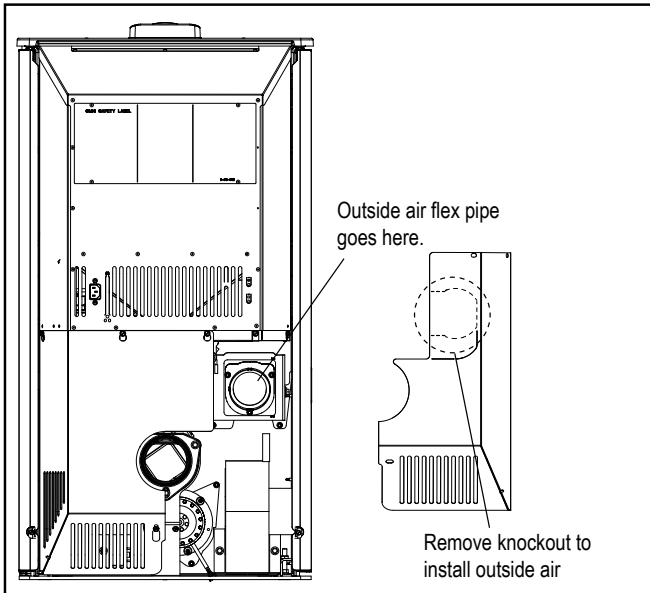


Figure 4.12

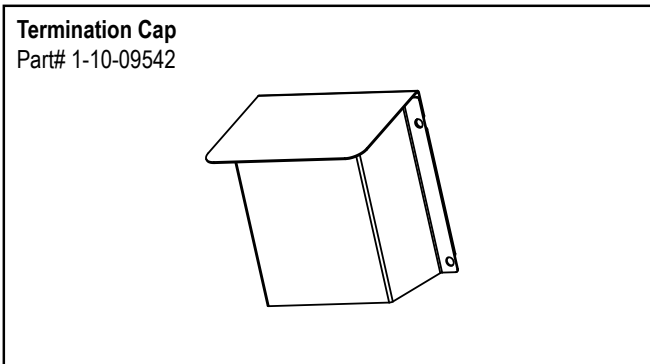


Figure 4.13

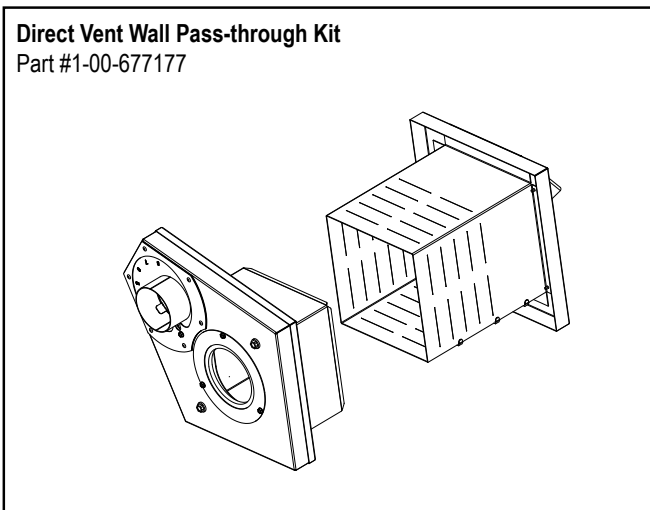


Figure 4.14

### Outside Air:

**Hearth & Home Technologies recommend attaching outside air in all installations, especially lower level and main floor locations.**

Per national building codes, consideration must be given to combustion air supply to all combustion appliances. Failure to supply adequate combustion air for all appliance demands, may lead to back-drafting of those and other appliances.

When the appliance is side-wall vented: The air intake is best located on the same exterior wall as the exhaust vent outlet and located lower on the wall than the exhaust vent outlet.

When the appliance is roof vented: The air intake is best located on the exterior wall oriented towards the prevailing wind direction during the heating season.

The outside air connection will supply the demands of the pellet appliance, but consideration must be given to the total house demand. House demand may consume some air needed for the stove, especially during a power failure. It may be necessary to add additional ventilation to the space in which the pellet appliance is located. Consult with your local HVAC professional to determine the ventilation demands for your house.

To install outside air use 3" non-combustible flex pipe. There is a break-away hole on the rear panel of the Allure50 stove which must be removed before connecting the flex pipe, Figure 4.12. The pipe should be run outside and terminate to the side or below the vent pipe outlet so the flue outlet is more than 12" from the inlet cover. The Termination Cap should be used to keep birds, rodents, etc. out of the pipe, Figure 4.13.

You may choose to use the optional Direct Vent Wall Pass-through Kit which incorporates the venting pass-through and outside air inlet into one component. Figure 4.14.

## E. Locating Your Appliance & Chimney

Location of the appliance and chimney will affect performance.

- Install through the warm airspace enclosed by the building envelope. This helps to produce more draft, especially during lighting and die-down of the fire.
- Penetrate the highest part of the roof. This minimizes the effects of wind loading.
- Locate termination cap away from trees, adjacent structures, uneven roof lines and other obstructions.
- Minimize the use of chimney offsets.
- Consider the appliance location relative to floor and ceiling and attic joists.



### CAUTION

- DO NOT CONNECT THIS UNIT TO A CHIMNEY FLUE SERVICING ANOTHER APPLIANCE.
- DO NOT CONNECT TO ANY AIR DISTRIBUTION DUCT OR SYSTEM.

May allow flue gases to enter the house

## F. Draft

Draft is the pressure difference needed to vent appliances successfully. When an appliance is drafting successfully, all combustion byproducts are exiting the home through the chimney.

Considerations for successful draft include:

- Negative pressure in the firebox
- Location of appliance and chimney

To measure the draft or negative pressure on your appliance use a manometer or a digital pressure gauge capable of reading 0 - 1 inches of water column (W.C.).

The appliance should be running on high for at least 15 minutes for the test.

With the stove running on high you should have a negative pressure equal to or greater than the number given in the chart below. If you have a lower reading than you find on the chart, your appliance does not have adequate draft to burn the fuel properly.

<b>Minimum Vacuum Requirements:</b>	<b>.20</b>
-------------------------------------	------------

Prior to installing the flue pipe, connect a draft meter. (The draft meter must have a minimum range of 0 - .5") Record the first reading. Connect flue pipe to stove and be sure all doors and windows in the home are closed. Record the second draft reading \_\_\_\_\_. If the second reading is more than .05" lower than the first reading, check for possible restrictions or the need for outside air. For more information on the draft test procedure, refer to "Appliance Set-Up" Section C.

## G. Negative Pressure



### WARNING

**Risk of Asphyxiation!** Negative pressure can cause spillage of combustion fumes and soot.

Negative pressure results from the imbalance of air available for the appliance to operate properly. It can be strongest in lower levels of the house.

Causes include:

- Exhaust fans (kitchen, bath, etc.)
- Range hoods
- Combustion air requirements for furnaces, water heaters and other combustion appliances.
- Clothes dryers
- Location of return-air vents to furnace or air conditioning.
- Imbalances of the HVAC air handling system.
- Upper level air leaks such as:
  - Recessed lighting
  - Attic hatch
  - Duct leaks

To minimize the effects of negative air pressure:

- Install the outside air kit with the intake facing prevailing winds during the heating season.
- Ensure adequate outdoor air for all combustion appliances and exhaust equipment.
- Ensure furnace and air conditioning return vents are not located in the immediate vicinity of the appliance.
- Avoid installing the appliance near doors, walkways or small isolated spaces.
- Recessed lighting should be a "sealed can" design.
- Attic hatches weather stripped or sealed.
- Attic mounted duct work and air handler joints and seams taped or sealed

### NOTICE

Hearth & Home Technologies assumes no responsibility for the improper performance of the chimney system caused by:

- Inadequate draft due to environmental conditions
- Downdrafts
- Tight sealing construction of the structure
- Mechanical exhausting devices

## H. Avoiding Smoke and Odors

### Negative Pressure, Shut-down, and Power Failure:

**To reduce the probability of back-drafting or burn-back in the pellet burning appliance during power failure or shut-down conditions, the stove must be able to draft naturally** without exhaust blower operation. Negative pressure in the house will resist this natural draft if not accounted for in the pellet appliance installation.

Heat rises in the house and leaks out at upper levels. This air must be replaced with cold air from outdoors, which flows into lower levels of the house. Vents and chimneys into basements and lower levels of the house can become the conduit for air supply, and reverse under these conditions.

### Outside Air

An outside air kit is recommended in all installations. The Outside Air Kit must be ordered separately.

Per national building codes, consideration must be given to combustion air supply to all combustion appliances. Failure to supply adequate combustion air for all appliance demands may lead to back drafting of those and other appliances.

When the appliance is roof vented (strongly recommended):

The air intake is best located on the exterior wall oriented towards the prevailing wind direction during the heating season.

When the appliance is side-wall vented:

The air intake is best located on the same exterior wall as the exhaust vent outlet and located lower on the wall than the exhaust vent outlet.

The outside air supply kit can supply most of the demands of the pellet appliance, but consideration must be given to the total house demand.

House demand may consume the air needed for the appliance. It may be necessary to add additional ventilation to the space in which the pellet appliance is located.

Consult with your local HVAC professional to determine the ventilation demands for your house.

### Vent Pipe

Be sure to use approved pellet vent pipe wall and ceiling pass-through fittings to go through combustible walls and ceilings. Be sure to use a starting collar to attach the venting system to the stove. The starting collar must be secured to the flue stub with at least three screws, and sealed with high temp silicone caulking.

4" stainless steel flex vent piping is only allowed for use in masonry fireplaces and chimneys or factory built wood-burning fireplaces with Class A metal chimneys.

Pellet venting pipe is constructed of two layers with air space between the layers. This air space acts as an insulator and reduces the outside surface temperature to allow a clearance to combustibles of only 1 inch. The sections of pipe lock together to form an air tight seal in most cases; however, in some cases a perfect seal is not achieved. For this reason and the fact that the Allure50 operates with a positive vent pressure, we specify that the joints also be sealed with silicone or aluminum tape in addition to the sealing system used by the manufacturer.

Where passing through an exterior wall or roof, use silicone to maintain an effective vapor barrier at the location where the chimney or component penetrates to the exterior of the structure.

### Vent Configurations:

To reduce probability of reverse drafting during shut-down conditions, Hearth & Home Technologies strongly recommends:

- Installing the pellet vent with a minimum vertical run of five feet.
- Installing outside air.

To prevent soot damage to exterior walls of the house and to prevent re-entry of soot or ash into the house:

- Maintain specified clearances to windows, doors, and air inlets, including air conditioners.
- Vents should not be placed below ventilated soffits. Run the vent above the roof.
- Avoid venting into alcove locations.
- Vents should not terminate under overhangs, decks or onto covered porches.
- Maintain minimum clearance of 12 inches from the vent termination to the exterior wall. If you see deposits developing on the wall, you may need to extend this distance to accommodate your installation conditions.

**Hearth & Home Technologies assumes no responsibility for, nor does the warranty extend to, smoke damage caused by reverse drafting of pellet appliances under shut-down or power failure conditions.**

## I. Fire Safety

To provide reasonable fire safety, the following should be given serious consideration:

- Install at least one smoke detector and CO detector on each floor of your home. The National Fire Protection Association (NFPA), recommends one Smoke Alarm on every floor, in every sleeping area, and in every bedroom.
- Locate smoke detector away from the heating appliance and close to the sleeping areas.
- Follow the smoke detector manufacturer's placement and installation instructions and maintain regularly.
- Conveniently locate a Class A fire extinguisher to contend with small fires.
- In the event of a hopper fire:
  - Evacuate the house immediately.
  - Notify fire department.



### WARNING



#### Fire Risk.

Hearth & Home Technologies disclaims any responsibility for, and the warranty will be voided by the following actions:

- Installation and use of any damaged appliance.
- Modification of the appliance.
- Installation other than as instructed by Hearth & Home Technologies.
- Installation and/or use of any component part not approved by Hearth & Home Technologies.
- Operating appliance without fully assembling all components.
- Do NOT Overfire.

**Or any such action that may cause a fire hazard.**

## J. Inspect Appliance & Components

- Remove appliance and components from packaging and inspect for damage.
- Report to your dealer any parts damaged in shipment.
- **Read all the instructions before starting the installation. Follow these instructions carefully during the installation to ensure maximum safety and benefit.**



### WARNING



Inspect appliance and components for damage. Damaged parts may impair safe operation.

- Do NOT install damaged components.
- Do NOT install incomplete components.
- Do NOT install substitute components.

Report damaged parts to dealer.



# 5 Appliance Set-Up

## A. Unpacking

The Allure50 is bolted (1/4 x 1" hex head bolts) to the skid to prevent movement during shipping.

To free the stove from the skid you must remove the hold-down bolts from both the left and right hand side shipping brackets using a 7/16" socket or wrench. Figure 5.1.

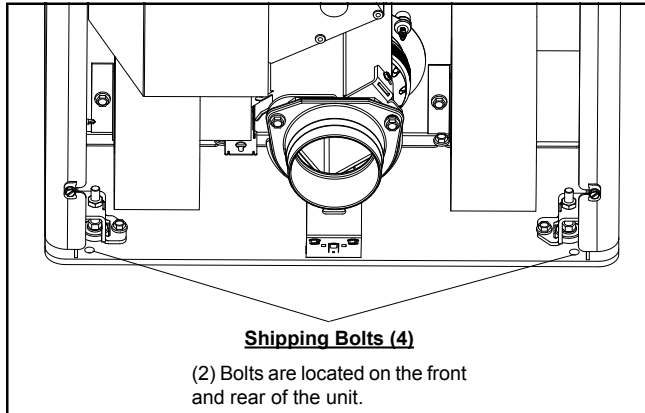


Figure 5.1

## B. Firebox Draft and Combustion Fan RPM

These units are pre-tested at the factory with exactly 120 VAC, 60 Hz. They are checked and adjusted for firebox tightness, gasket leakage, motor operation and igniter operation. The Allure50 is then factory set at a mid-point adjustment and in most cases will not need any adjustments.

Check and record the firebox draft before installing venting and after venting is installed (**before starting fire**).

There is a draft meter port located in the back of the unit at the pressure switch where draft can be measured. Install the magnahelic meter (*capable of at least .5" of water column*) Figure 5.2.

Connect the power cord to a 120 VAC, 60Hz grounded receptacle. (A surge protector is recommended to protect the circuit board.) Also be sure that the polarity of the outlet that the stove is plugged into is correct.

Go to the "Home Screen", the power icon should be gray. Press menu, on the first menu page press "test" icon.

The test page has 4 component test modes. The second icon is for the combustion fan test.

One press of the icon turns the combustion fan to full line voltage. (**Note: During this test , the combustion fan will not achieve its top RPM of 3200 due to the density of the ambient air.**) All RPM displays could vary +/- 50 from that of the set RPM's. Allow several minutes for the fan motor to warm up.

Press the icon a second time, the combustion fan will go to "Maximum" (as set in the **Authorized Dealer Only** area under the combustion fan icon)

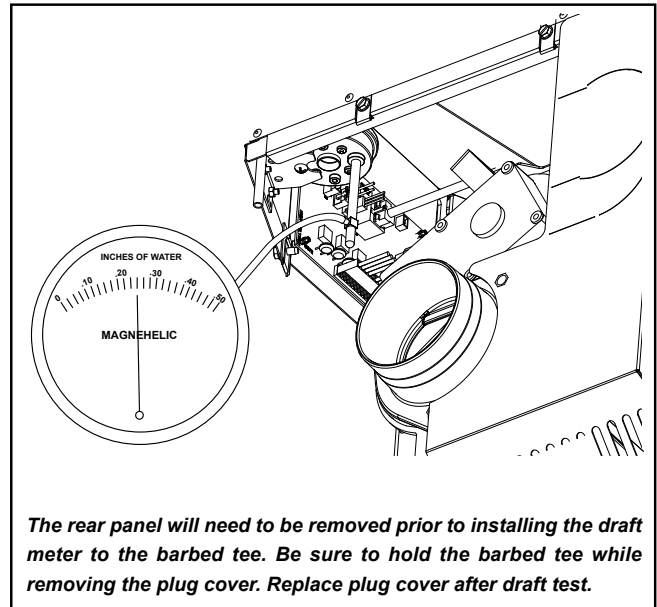


Figure 5.2

The "Maximum" is factory set at 2900 RPM. Allow the RPM to stabilize and record the firebox draft Maximum.

Before Install: \_\_\_\_\_ IWC

After Install: \_\_\_\_\_ IWC

### (Firebox Draft and Combustion Fan RPM Cont.)

Press the icon a third time, the combustion fan will go to "Minimum" (as set in the **Authorized Dealer Only** area under the combustion fan icon) allow the RPM to stabilize and record the firebox draft minimum.

Before Install: \_\_\_\_\_ IWC

After Install: \_\_\_\_\_ IWC

### Cold Stove Draft:

2500 RPM      Low -.20 and -.25

2900 RPM      High -.45 and -.50

Leaving the test page will end any tests in progress and goes back to whatever mode of operation it was set to on the home page.

If the unit is not adjusted properly, it does not cause a safety concern. If the unit is adjusted too high, only efficiency is lost. If the unit is adjusted too low, the low draft pressure switch will not allow the feed motor or the igniter to operate.

# 6 Reference Material

## A. Safety Reminders

When installing and operating your Harman® Allure50, respect basic safety standards. Read these instructions carefully before you attempt to install or operate the Allure50. Failure to do so may result in damage to property or personal injury and may void the product warranty.

Consult with your local building code agency and insurance representative before you begin your installation to ensure compliance with local codes, including the need for permits and follow-up inspections.

Due to high temperatures, this stove should be placed out of traffic and away from furniture and draperies.

Children and adults should be alerted to the hazards of high surface temperatures and should stay away to avoid burn to skin and/or clothing.

Young children should be carefully supervised when they are in the same room as the stove.

Clothing and other flammable materials should not be placed on or near this stove.

Installation and repair of this stove should be done by a qualified service person. The appliance should be inspected before use and at least annually by a qualified service person. More frequent cleaning may be required. It is imperative that control compartments, burners, and circulating air passageways of this stove be kept clean.

 **WARNING**

**MOBILE/MANUFACTURED HOME GUIDELINES DO NOT ALLOW INSTALLATION IN A SLEEPING ROOM.**

 **CAUTION**

**THE STRUCTURAL INTEGRITY OF THE MOBILE HOME FLOOR, WALL, AND CEILING/ROOF MUST BE MAINTAINED.**

 **WARNING**

**KEEP COMBUSTIBLE MATERIALS SUCH AS GRASS, LEAVES, ETC. AT LEAST 3 FEET AWAY FROM THE POINT DIRECTLY UNDER THE VENT TERMINATION.**

 **WARNING**

**USE OF IMPROPER FUELS, FIRE STARTERS OR ALTERING THE STOVE FOR HIGHER HEAT OUTPUT MAY CAUSE DAMAGE TO THE STOVE AND COULD RESULT IN A HOUSE FIRE. USE ONLY APPROVED FUELS AND OPERATION GUIDELINES.**

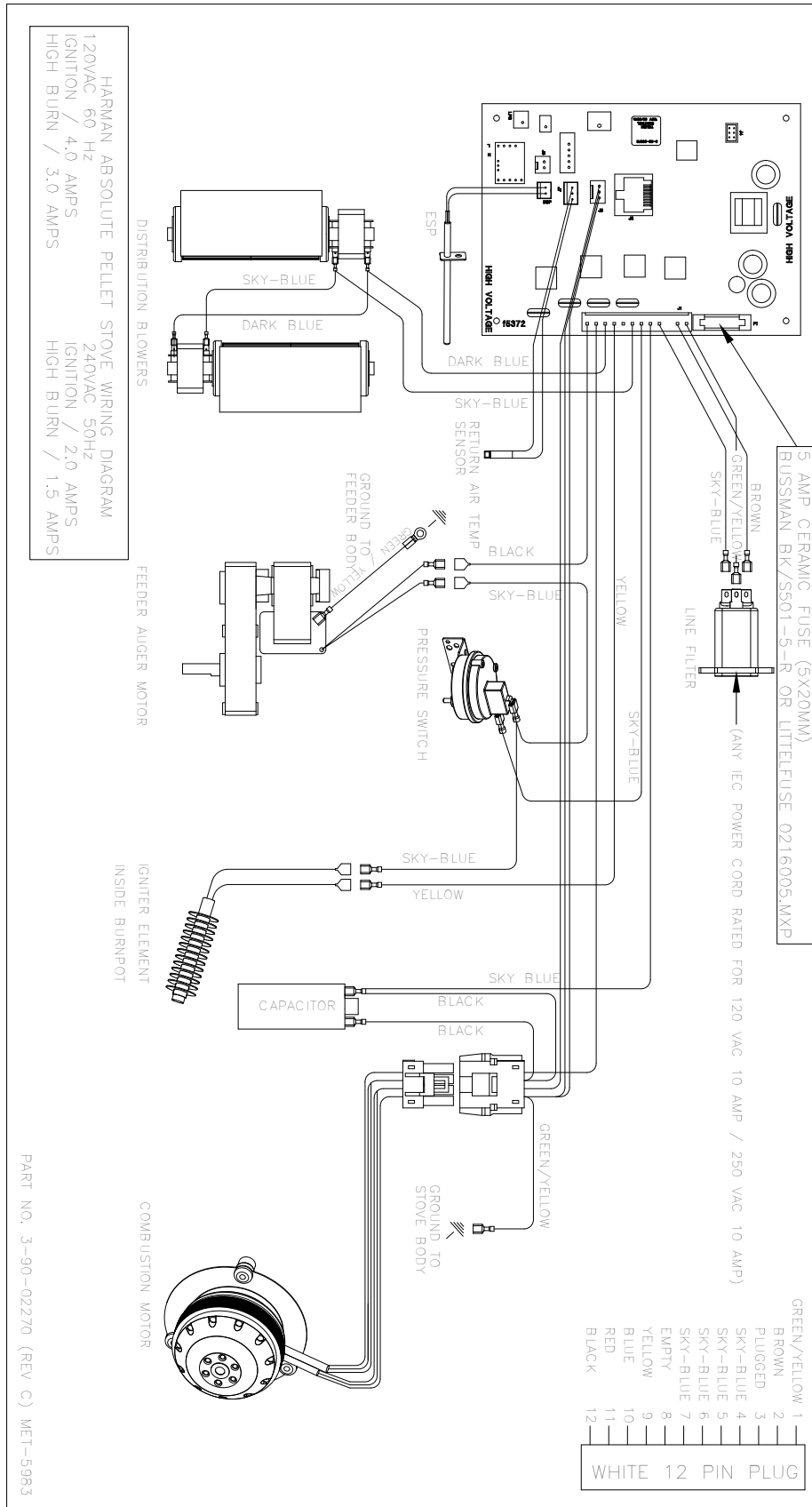
 **CAUTION**

**THIS APPLIANCE MUST BE VENTED TO THE OUTSIDE.**

 **CAUTION**

**THE STOVE IS HOT WHILE IN OPERATION. KEEP CHILDREN, CLOTHING AND FURNITURE AWAY. CONTACT MAY CAUSE SKIN BURNS.**

# B. Wiring Diagram



Harman®, a brand of Hearth & Home Technologies Inc.  
352 Mountain House Road, Halifax, PA 17032  
[www.harmanstoves.com](http://www.harmanstoves.com)

Please contact your Harman® dealer with any questions or concerns.  
For the location of your nearest Harman® dealer,  
please visit [www.harmanstoves.com](http://www.harmanstoves.com).

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# Owner's Manual

## Care and Operation

**INSTALLER:** Leave this manual with party responsible for use and operation.  
**OWNER:** Retain this manual for future reference.  
 Contact your local dealer with questions on installation, operation or service.

**NOTICE: SAVE THESE INSTRUCTIONS**

# HARMAN®

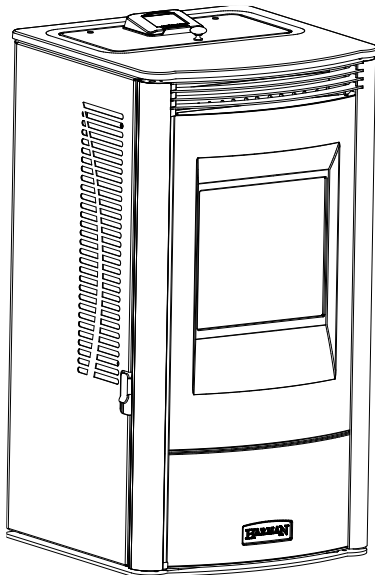
**BUILT TO A STANDARD, NOT A PRICE**

**Model(s):**

**Allure50 Freestanding Pellet Stove**



Allure50  
Use & Care Video



### CAUTION

Tested and approved for wood pellet fuel only. Burning of any other type of fuel voids your warranty.

### CAUTION

Check building codes prior to installation.

- Installation **MUST** comply with local, regional, state and national codes and regulations.
- Contact local building or fire officials about restrictions and installation inspection requirements in your area.

### WARNING



**Please read this entire manual before installation and use of this pellet fuel-burning room heater.**

**Failure to follow these instructions could result in property damage, bodily injury or even death.**

- Do not store or use gasoline or other flammable vapors and liquids in the vicinity of this or any other appliance.
- Do not overfire - If any external part starts to glow, you are overfiring. Reduce feed rate. Overfiring will void your warranty.
- Comply with all minimum clearances to combustibles as specified. Failure to comply may cause house fire.

### WARNING



#### HOT SURFACES!

Glass and other surfaces are hot during operation AND cool down.

**Hot glass will cause burns.**

- Do not touch glass until it is cooled
  - NEVER allow children to touch glass
  - Keep children away
  - CAREFULLY SUPERVISE children in same room as stove.
  - Alert children and adults to hazards of high temperatures.
- High temperatures may ignite clothing or other flammable materials.**
- Keep clothing, furniture, draperies and other flammable materials away.

### NOTE

To obtain a French translation of this manual, please contact your dealer or visit [www.harmanstoves.com](http://www.harmanstoves.com).

Pour obtenir une traduction française de ce manuel, s'il vous plaît contacter votre revendeur ou visitez [www.harmanstoves.com](http://www.harmanstoves.com).



# Table of Contents

## 1 Product Specifications and Important Safety Information

A. Appliance Certification / Specifications	4
B. Mobile Home Approval	4
C. BTU & Efficiency Specifications	4
D. Appliance Safety	5
E. Clear Space	5
F. Helpful Hints	6
G. Fuel Specifications	6
H. Quick Start Guide	8
I. Frequently Asked Questions	9
J. Cleaning Prompts, Messages and Errors	10

## 2 Maintenance and Service

A. Proper Shutdown Procedure	11
B. Quick Reference Maintenance Chart	11
C. Burnpot Maintenance	12
D. Combustion Fan Chamber	13
E. Glass Maintenance	13
F. Firebox	12

### ▲ Safety Alert Key:

- **DANGER!** Indicates a hazardous situation which, if not avoided **will** result in death or serious injury.
- **WARNING!** Indicates a hazardous situation which, if not avoided **could** result in death or serious injury.
- **CAUTION!** Indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.
- **NOTICE:** Used to address practices not related to personal injury.

## 3 Reference Materials

A. Service Parts	14
B. Limited Lifetime Warranty	19
C. Loss of Power Addendum	21
D. Emergency Manual Ignition	21
E. Troubleshooting	22
F. Glass Installation and Cleaning	23
G. Contact Information	24

➔ = Contains updated information

# 1 Product Specifications and Important Safety Information

## A. Appliance Certification / Specifications

<b>MODEL:</b>	Allure50 Pellet Stove
<b>LABORATORY:</b>	OMNI Test Laboratories, Inc
<b>REPORT NO.</b>	0135P50375
<b>TYPE:</b>	Pellet Fueled/Supplementary For Residential Use
<b>STANDARD(s):</b>	ASTM E 2779-10, ASTM E 2515-11, ASTM E 1509-04, ULC-S627-00, EPA Method 28R
<b>ELECTRICAL RATING:</b>	115 VAC, 60 Hz, Start 3.5 AMPS, Run 2.5 AMPS
<b>GLASS SPECIFICATION:</b>	5mm mirrored ceramic glass

The Allure50 is certified to comply with 2015 particulate emission standards. Not approved for sale after May 15, 2020.



**NOTE:** This installation must conform with local codes. In the absence of local codes you must comply with the **ASTM E 1509-12, ULC-S627-00, (UM) 84-HUD**

## B. Mobile Home Approval

This appliance is approved for mobile and manufactured home installations when not installed in a sleeping room and when an outside combustion air inlet is provided.

The structural integrity of the mobile home floor, ceiling, and walls must be maintained. The appliance must be properly grounded to the frame of the mobile home and use only listed pellet vent, Class "PL" or "L" connector pipe.

A Harman® Outside Air Kit must be installed in a mobile home installation.



### WARNING

**THE STRUCTURAL INTEGRITY OF THE MANUFACTURED HOME FLOOR, WALL, AND CEILING/ROOF MUST BE MAINTAINED.**

**DO NOT INSTALL IN SLEEPING ROOM.**

**NOTE:** Hearth & Home Technologies, manufacturer of this appliance, reserves the right to alter its products, their specifications and/or price without notice.

Harman® is a registered trademark of Hearth & Home Technologies.

## C. BTU & Efficiency Specifications

<b>EPA Certification Number:</b>	
<b>EPA Certified Emissions:</b>	1.49 g/hr
<b>*EPA Default Efficiency:</b>	79.7%
<b>**Actual Tested Efficiency:</b>	74.4%
<b>***EPA BTU Output:</b>	39,100
<b>****BTU Input</b>	52,600
<b>Vent Size:</b>	3 Inch
<b>Hopper Capacity:</b>	92 lbs
<b>Fuel</b>	Wood Pellet

\* Weighted average LHV efficiency using data collected during EPA emissions test.

\*\*Weighted average HHV efficiency using data collected during EPA emissions test.

\*\*\*A range of BTU outputs based on EPA Default Efficiency and the burn rates from the low and high EPA tests.

\*\*\*\*Based on the maximum feed rate per hour multiplied by approximately 8600 BTU's which is the average BTU's from a pound of pellets.

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

This wood heater needs periodic inspection and repair for proper operation. It is against federal regulations to operate this wood heater in a manner inconsistent with operating instructions in this manual.

**Risk of Fire!** *Hearth & Home Technologies disclaims any responsibility for, and the warranty and agency listing will be voided by the below actions.*

### DO NOT:

- Install or operate damaged appliance.
- Modify appliance.
- Install other than as instructed by *Hearth & Home Technologies*.
- Operate the appliance without fully assembling all components.
- Overfire.
- Install any component not approved by *Hearth & Home Technologies*.
- Install parts or components not Listed or approved.
- Disable safety switches.

*Improper installation, adjustment, alteration, service or maintenance can cause injury or property damage.*

*For assistance or additional information, consult a qualified installer, service agency or your dealer.*



## D. Appliance Safety (Cont.)

### WARNING

If you expect that small children or vulnerable adults may come into contact with this appliance, the following precautions are recommended:

- Install a physical barrier such as:
  - A decorative fire screen.
  - Adjustable safety gate.
- Never leave children alone near a hot stove, whether operating or cooling down.
- Teach children to **NEVER** touch the stove.
- Consider not using the stove when children will be present.
- Use only specified components as replacement parts. Other components may not allow your stove to operate as it was intended.

Contact your dealer for more information, or visit: [www.hpba.org/safety-information](http://www.hpba.org/safety-information).

To prevent unintended operation when not using your stove for an extended period of time (summer months, vacations, trips, etc):

- Unplug stove from receptacle.

Due to high temperatures, this stove should be placed away from traffic, furniture and draperies.

Children and adults should be alerted to the hazards of high surface temperatures and should stay away to avoid burns to the skin and/or clothing.

Young children should be carefully supervised when they are in the same room as the stove.

Clothing and other flammable materials should not be placed on or near this stove.

Installation and repair of this stove should be done by a qualified service person. The appliance should be inspected before use and at least annually by a qualified service person. More frequent cleaning will be required. It is imperative that control compartments and circulating air passageways of this stove be kept clean.

### WARNING

**THIS WOOD HEATER HAS A MANUFACTURER-SET MINIMUM LOW BURN RATE THAT MUST NOT BE ALTERED. IT IS AGAINST FEDERAL REGULATIONS TO ALTER THIS SETTING OR OTHERWISE OPERATE THIS WOOD HEATER IN A MANNER INCONSISTENT WITH OPERATING INSTRUCTIONS IN THIS MANUAL.**

## E. Clear Space

### WARNING

**RISK OF FIRE! Do NOT place combustible objects in front or to the sides of the appliance. High temperatures may ignite clothing, furniture or draperies.**

**NOTICE:** Clearances may only be reduced by means approved by the regulatory authority having jurisdiction.

### WARNING

**RISK OF FIRE! Keep combustible materials, gasoline and other flammable vapors and liquids clear of appliance.**

- Do **NOT** store flammable materials in the appliance's vicinity.
- Do **NOT** use gasoline, lantern fuel, kerosene, charcoal lighter fluid or similar liquids to start or "freshen up" a fire in this heater.

Keep all such liquids well away from the heater while it is in use as combustible materials may ignite.

### WARNING

**MOBILE/MANUFACTURED HOME GUIDELINES: DO NOT ALLOW INSTALLATION IN A SLEEPING ROOM.**

### WARNING

**USE OF IMPROPER FUELS, FIRESTARTERS OR ALTERING THE STOVE FOR HIGHER HEAT OUTPUT MAY CAUSE DAMAGE TO THE STOVE AND COULD RESULT IN A HOUSE FIRE. USE ONLY APPROVED FUELS AND OPERATION GUIDELINES.**

### CAUTION

**THE STOVE IS HOT WHILE IN OPERATION. KEEP CHILDREN, CLOTHING AND FURNITURE AWAY. CONTACT MAY CAUSE SKIN BURNS.**

## F. Helpful Hints

When operating your Harman® Allure50 Pellet Stove, follow basic safety standards. Read these instructions carefully before you attempt to operate the Allure50 Pellet Stove. Failure to do so may result in damage to property or personal injury and may void the product warranty.

**Cleaning Burn Pot:** Whenever your stove is not burning, take the opportunity to scrape the burn pot to remove carbon buildup. A vacuum cleaner is handy to remove the residue. Be sure the stove is cold if you use a vacuum.

Carbon buildup can be scraped loose with the fire burning using the special tool provided with your stove. Scrape the floor and sides of the burn pot. The carbon will be pushed out by the incoming fuel. Always wear gloves when scraping the burnpot.

**Disposal of Ashes:** Ashes should be placed in a steel container with a tight fitting lid. The closed container of ashes should be placed on a non-combustible floor or on the ground, well away from all combustible materials, pending final disposal. If the ashes are disposed of by burial in soil or otherwise locally dispersed, they should be retained in the closed container until all cinders have thoroughly cooled. Other waste shall not be placed in this container.

**Soot and Flyash Formation and Need for Removal:** The products of combustion will contain small particles of flyash. The flyash will collect in the exhaust venting system and restrict the flow of the flue gases. Incomplete combustion, such as occurs during startup, shutdown, or incorrect operation of the room heater will lead to some soot formation which will collect in the exhaust venting system. The exhaust venting system should be inspected at least once every year to determine if cleaning is necessary.

When burning wood pellets on low, the potential exists for creosote to form. The venting system should be inspected periodically throughout the heating season to determine if creosote buildup has occurred. If a significant layer of creosote has accumulated (1/8" or more), it should be removed to reduce the risk of a chimney fire. If a fire occurs, call the fire department, shut down the stove, and evacuate the residence. Before using the appliance, have the venting system thoroughly inspected and replace any damaged components.

With any hearth appliance, installation of smoke detectors is recommended on every level of the home.

**Possible causes of smoke detector activation:**

Paint curing process - Open a window near the appliance for the first few hours of burning.

Exhaust being drawn back inside the dwelling - Outside air connection to the appliance is necessary.

Vent leakage - All interior seams and joints should be sealed with silicone where applicable. Follow vent manufacturers instructions for proper sealing.



**CAUTION**

**This appliance must be vented to the outside**

## G. Fuel Specifications

The Allure50 Pellet Stove is approved for burning any grade of pelletized bio-mass fuel.

It should be noted, however, that higher ash content will require more frequent cleaning.

The moisture content of pellets must not exceed 8%. Higher moisture will rob BTU's and may not burn properly.

Fuel should **not** be stored within the stove installation clearances or within the space required for cleaning and ash removal.

### Fuel and Fuel Storage

Pellet fuel quality can fluctuate from manufacturer to manufacturer, and even from bag to bag.

Hearth & Home Technologies recommends using only fuel that is certified by the Pellet Fuels Institute (PFI).

#### Fuel Material

- Made from sawdust and/or other wood by-products
- Source material typically determines ash content

#### Higher Ash Content Material

- Hardwoods with high mineral content
- Bark and leaves as source material
- "Standard" grade pellets and other biomass

#### Lower Ash Content Material

- Softwood; pine, fir, etc.
- Materials with lower mineral content
- "Premium" grade pellets

#### Performance

- Higher ash content requires more frequent maintenance.
- "Premium" grade pellets will produce the highest heat output.
- Burning pellets longer than 1-1/2 inches (38mm) can cause inconsistent feeding and/or ignition.

#### Clinkers

- Minerals and other non-combustible materials, like sand, will turn into a hard glass-like substance when heated.
- Trees from different areas will vary in mineral content. For this reason, some fuels will produce more clinkers than others.

#### Moisture

- Always burn dry fuel. Burning fuel with high moisture content takes energy to dry and tends to cool the appliance thus, robbing heat from your home.
- Damp pellet fuel could turn back into sawdust which does not flow properly through the feed system.

## G. Fuel Specifications (Cont.)

### Storage

- Wood pellets should be left in their original sealed bag until ready to use, to prevent moisture.
- Do not store fuel within the specified clearance areas, or in a location that will interfere with routine cleaning and maintenance procedures.

### NOTICE

Hearth & Home Technologies is not responsible for stove performance or extra maintenance required as a result of using fuel with higher ash or mineral content.

### CAUTION

***Do not burn fuel that contains an additive.***

- May cause hopper fire
  - Damage to product may result
- Read the list of ingredients on the packaging.

### CAUTION

Tested and approved for use with wood pellets ONLY. Burning of any other fuel will void your warranty.

### WARNING

**BURNING COLORED PAPER, CARDBOARD, SOLVENTS, TRASH AND GARBAGE OR ALTERING THE STOVE FOR HIGHER HEAT OUTPUT MAY CAUSE DAMAGE TO THE STOVE AND COULD RESULT IN A HOUSE FIRE. USE ONLY APPROVED FUELS AND FOLLOW ONLY THESE OPERATION GUIDELINES.**

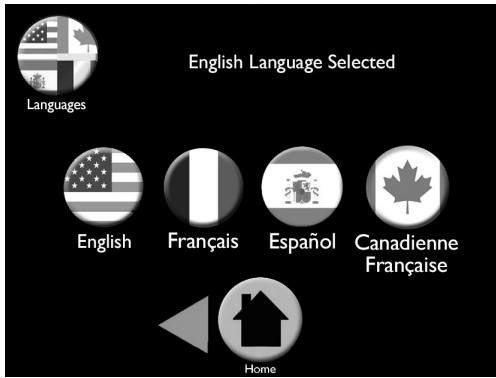
### WARNING

**NEVER USE GASOLINE, GASOLINE-TYPE LANTERN FUEL, KEROSENE, CHARCOAL LIGHTER FLUID, OR SIMILAR LIQUIDS TO START OR 'FRESHEN UP' A FIRE IN THIS HEATER. KEEP ALL SUCH LIQUIDS WELL AWAY FROM THE HEATER, WHILE IN USE.**

### WARNING

*Tested and approved for use with wood pellets ONLY. Burning of any other fuel will void your warranty.*

## H. Quick Start Guide



### **Initial start-up Only**

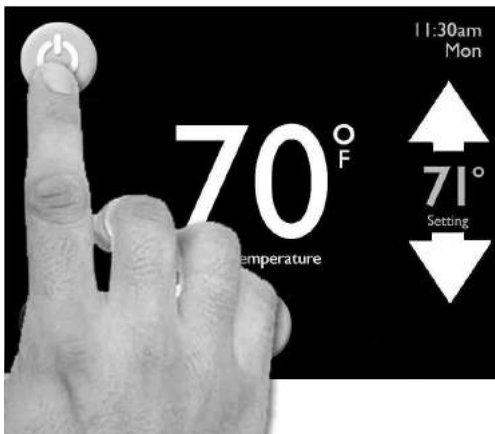
1. Select Language



2. Fill hopper with pellets



3. Adjust arrows to set room desired temperature.



4. Touch the On/Off Power Icon.  
*Refer to Touch Manual for all other operations.*

## I. Frequently Asked Questions








With proper installation, operation, and maintenance your appliance will provide years of trouble-free service. If you do experience a problem, this troubleshooting guide will assist a qualified service person in the diagnosis of a problem and the corrective action to be taken.

**Contact your dealer for additional information regarding operation and troubleshooting. Visit [www.harmanstoves.com](http://www.harmanstoves.com) to find a dealer.**

ISSUES	SOLUTIONS
Metallic noise.	Noise is caused by metal expanding and contracting as it heats up and cools down, similar to the sound produced by a furnace or heating duct. This noise does not affect the operation or longevity of your appliance.
White ash buildup on glass.	This is normal. Clean the glass using any non-abrasive glass cleaner.
Glass has buildup of black soot.	Excessive build-up of ash. The lower burn settings will produce more ash, the higher burn settings produce less. The more it burns on low the more frequent cleaning of the glass is required.
Glass has turned dirty.	Excessive build up of ash. The lower burn settings will produce more ash, the higher burn settings produce less. The more it burns on low the more frequent cleaning of the glass is required.
Fire has tall flames with black tails and is lazy.	The feed rate needs to be reduced or the burnpot needs cleaning. Heat exchanger or exhaust blower needs cleaning.
Smoky start-up or puffs of smoke from the airwash.	Burnpot may be dirty, clean the burnpot.
Large flame at start-up.	This is normal. Flame will settle down once the fire is established.
Missed Ignition.	<p>Ensure pellets in burnpot</p> <p>Ensure holes in burnpot are clear of obstructions above the igniter. See Burnpot Maintenance.</p> <p>Check to see if the ignitor is getting hot, if not replace ignitor.</p> <p>*See manual ignition instructions for emergency heating needs.</p>

## J. Cleaning Prompts, Messages and Errors



Your EASY Touch Control communicates with you by showing messages on the top center of the EASY Touch Control home screen. If you have more than one message, the messages will show consecutively until you acknowledge the message by performing the task and reset. These communications include:

<b>PROMPTS</b>	Scrape Burn Pot and Reset Here 	When prompted, scrape burnpot. Press checkmark to reset.
	Empty Ash Pan and Press Here 	When prompted, inspect and empty ash pan as needed. Press checkmark to reset.
	Total Clean and Reset 	When prompted, inspect and perform total clean. Press checkmark to reset.
<b>MESSAGES</b>	Touch Here If Hopper Was Filled 	Press checkmark if you filled the hopper. If you did not fill hopper, The message will disappear in 30 seconds.
	Wireless Sensor Low Battery Warning	Replace the 2 "AA" batteries in the Wireless Remote Sensor.
	Using Backup Sensor	If Wireless Remote Sensor batteries die, the Back Up Sensor will continue to heat your home.
<b>ERRORS</b>	Warning: Door Open	Check and close the front and ash doors for the stove to continue to heat.
	Warning: Hopper Lid Open	Close the hopper lid for the stove to continue to heat.
	Error: Check Fuel and Reset 	Fill the hopper with pellets. Press checkmark to reset. If you did not fill the hopper, the message will stop after 30 seconds. This error only appears if "Show Fuel Gauges" is turned on.
	Wireless Signal Lost Replace Batteries in Wireless Sensor	Batteries in Wireless Remote Sensor have expired. Replace the 2 "AA" batteries.
	Return Air Sensor Failure	Return Air Sensor has failed. Call your Harman Dealer.
	Ignition Failure Correct and Reset 	Unit has failed to ignite. Scrape the burnpot. Call your Harman Dealer if problem persists.
	Connection Failure Control <===> Display	Touch Control has lost communication to the stove. Call your Harman Dealer.
	Exhaust Sensing Probe Failure	Exhaust Sensing Probe (ESP) as failed. Clean the ESP. If issue persists, call your Harman Dealer.
	Combustion Error Correct and Reset 	Clean your stove. Call your Harman Dealer if problem persists.

## 2 Maintenance and Service

When properly maintained, your stove will give you many years of trouble-free service. **Contact your dealer** to answer questions regarding proper operation, trouble-shooting and service for your appliance. Visit [www.harmanstoves.com](http://www.harmanstoves.com) to find a dealer. We recommend annual service by a qualified service technician.

### A. Proper Shutdown Procedure

 <b>CAUTION</b>	
	<p><b>Shock and Smoke Hazard</b></p> <ul style="list-style-type: none"> <li>• Turn unit to the off position, let appliance completely cool and combustion fan must be off. Now you can unplug appliance before servicing.</li> <li>• Smoke spillage into room can occur if appliance is not cool before unplugging.</li> <li>• Risk of shock if appliance not unplugged before servicing appliance.</li> </ul>

### NOTICE

The type of fuel you are burning will dictate how often you have to clean your burnpot. Clean more frequently if you encounter heavy build-up of ash at the recommended interval or you see soot coming from the vent. **Not properly cleaning your appliance on a regular basis will void your warranty.**

Follow the detailed instructions found in this section for each step listed in the chart below.

### B. Quick Reference Maintenance Chart

Cleaning or Inspection	Frequency		Daily	Weekly	Monthly	Yearly
Ash Pan	Every 5 bags of fuel depending on the fuel type or ash build-up	OR		X		
Ash Removal from Firebox	Every 5 bags or more frequently depending on the fuel type or ash build-up	OR		X		
Heat Exchanger	Every 1 ton of fuel	OR			X	
Fan, Combustion (Exhaust)	More frequently depending on the fuel type	OR				X
Fan, Distribution	Every 25 bags or more frequently depending on the fuel type	OR			X	
Door Gasket Inspection	Prior to heating season	OR				X
Exhaust Path	More frequently depending on ash build-up	OR				X
Firebox - Prepare for Non-Burn Season	At end of heating season	OR				X
Burnpot - Burning pellets - hardwood	Every 3 bags	OR	X			
Burnpot - Burning pellets - softwood	Every 5 bags	OR	X			
Glass	When clear view of burnpot becomes obscure	OR		X		
Hopper / Hopper Lid Gasket	Every 50 bags of fuel or when changing fuel types	OR			X	
Venting System	More frequently depending on the fuel type	OR				X

## C. Burnpot Maintenance

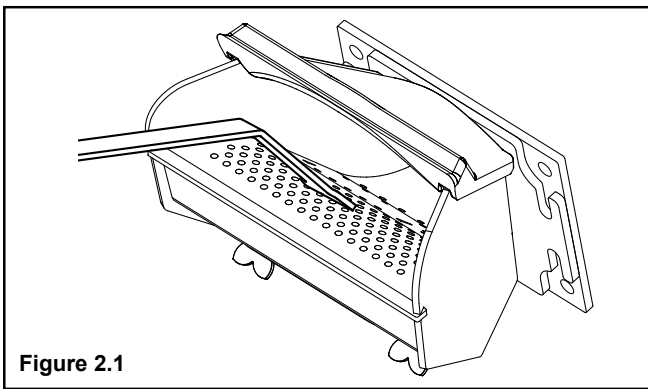


Figure 2.1

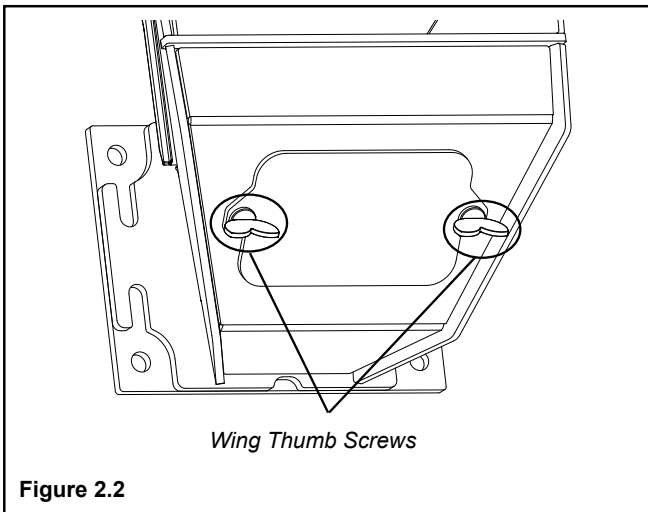


Figure 2.2

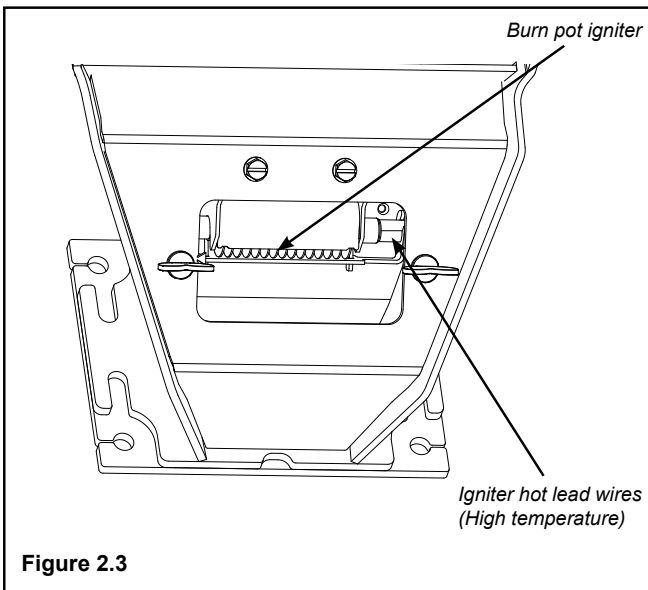


Figure 2.3

Viewed from below through the ash pan opening.

Whenever adding fuel, take the opportunity to clean the burn pot. **(Weekly at minimum)**

- Scrape the top holed surface and sides of the burn pot down to auger tube Figure 2.1. It is not necessary to completely remove all material from the burn pot. The excess will be pushed out during the next use.
- With the fire out and burn pot cold, use the supplied allen wrench to remove any build-up that may have accumulated in the holes of the burn pot grate. Simply push the allen wrench down through each hole ensuring it is clear of any build-up paying attention not to damage the igniter element in the process.

### Monthly, or after each ton of fuel burned:

- Loosen the (2) wing thumb screws on the lower front angle of the burn pot. Figure 2.2
- Lift off the clean-out cover to open the bottom clean-out chamber. Figure 2.3



**DANGER**

**Disconnect the power to the unit before removing cover.**

- Clean ash buildup from inside the chamber while cover is off. Use the scraper to tap on the top front edge of the burn pot. This will help knock pieces of ash, loosened by the scraping process, down through the holes. It also helps knock scale off of the igniter element.

### Figure 2.3

The igniter is made to be removable for service by insulated male/female wire connectors. These connections between the hot leads (the wires inside the burn pot) and the cold leads (the wires from the control board) are always pulled to the inside rear of the feeder body. **(Not coiled inside the burn pot.)**

It is very important that these connections are to the inside rear of the feeder body. Also, the extra wire of the igniter wire service loop must be pulled out through the rear of the feeder and tied up so that it will not be damaged by any moving parts.



**WARNING**

**When cleaning burn pot clean-out chamber. Do not damage the high temperature igniter wires.**

**Note: The hot lead/cold lead connection must always be pulled to the rear of the feeder body before operation.**



## D. Combustion Fan Chamber

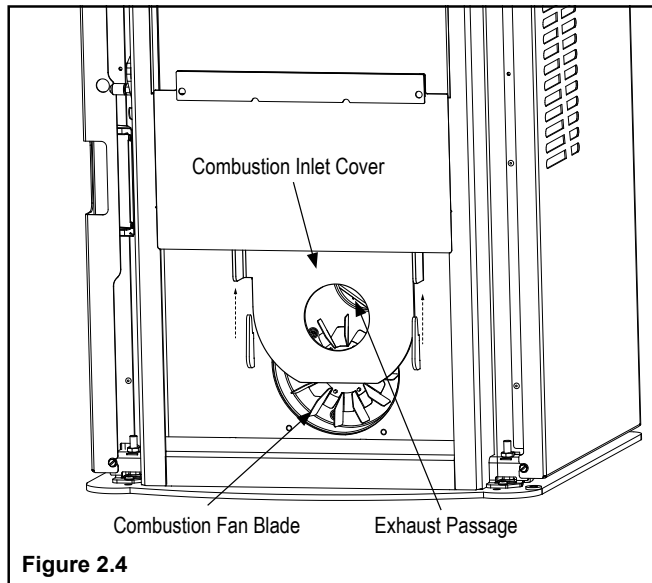
### Monthly Cleaning- continued:

The combustion inlet cover is located behind the ash pan that must be removed to properly clean the combustion fan blade. Figure 2.4.

- Remove combustion inlet cover by pulling up on cover. This allows access to the combustion fan blade and exhaust path. Figure 2.4.
- Remove any flyash or debris that has collected around combustion fan blade with the provided paint brush.
- Clean exhaust passage.

**NOTE: The ESP Sensor is located just inside the exhaust passage. Be sure not to damage the ESP Sensor while cleaning the exhaust passage.**

- Once cleaned replace combustion inlet cover and ashpan.



## E. Glass Maintenance

The glass used in your stove is manufactured to exact standards to withstand the high heat of the fire, but like all glass, it must be treated with common sense and care. Never abuse the glass by slamming the door shut or striking the glass with a heavy object. If the glass is broken or damaged, do not operate the stove until it has been replaced.

### Glass - Cleaning

It will be necessary to clean accumulated ash from the glass surface; allowing this ash to remain on the glass for long periods can result in "etching" due to the acidity of the ash. Never clean the glass while it is hot, and **do not** use abrasive substances. Wash the surface with cool water, and rinse thoroughly. You may wish to use a non-abrasive cleaner specifically designed for use on stove glass. In any case, dry thoroughly before relighting your stove.

### Glass - Replacement

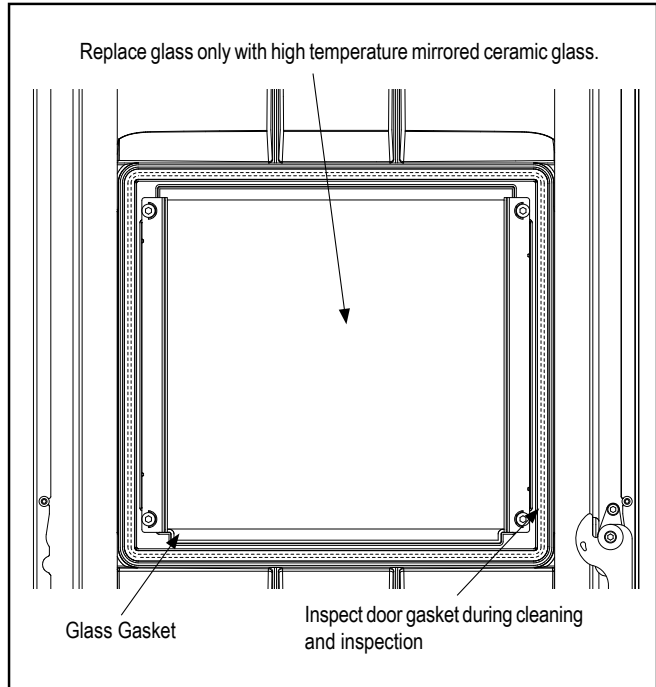
If the stove's glass is cracked or broken, you must replace it before operating your stove. Remove pieces carefully. Replace glass only with Harman® replacement glass; **do not use substitutes.**

### Glass - Replacement (Cont.)

Carefully remove damaged glass, gasket material, and hold down clips (set aside).

Install the self adhesive 1/4" gasket material around the front face of the glass. Set the glass panel and gasket gently onto the door. Install the hold down clips and tighten with bolts.

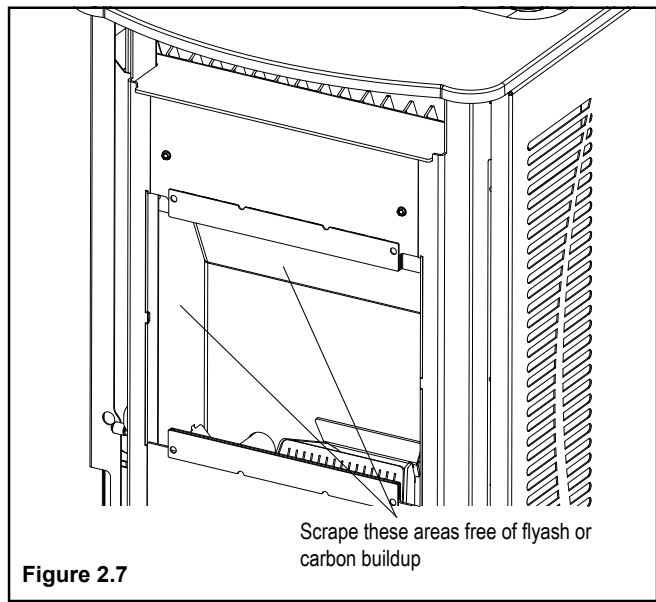
Be sure to keep firing and de-ashing doors closed and ensure all seals are maintained and are in good condition



## F. Firebox

### Yearly Cleaning:

Remove flyash and carbon buildup from the smooth surfaces of the heat exchanger as well as other surfaces inside the firebox. Figure 2.7.



# 3 Reference Material

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## A. Service Parts

**Service Parts  
List**

# Service Parts List

# Service Parts List

# Service Parts List

# Service Parts List

## B. Limited Lifetime Warranty

### Hearth & Home Technologies LIMITED LIFETIME WARRANTY

Hearth & Home Technologies, on behalf of its hearth brands ("HHT"), extends the following warranty for HHT gas, wood, pellet, coal and electric hearth appliances that are purchased from an HHT authorized dealer.

#### **WARRANTY COVERAGE:**

HHT warrants to the original owner of the HHT appliance at the site of installation, and to any transferee taking ownership of the appliance at the site of installation within two years following the date of original purchase, that the HHT appliance will be free from defects in materials and workmanship at the time of manufacture. After installation, if covered components manufactured by HHT are found to be defective in materials or workmanship during the applicable warranty period, HHT will, at its option, repair or replace the covered components. HHT, at its own discretion, may fully discharge all of its obligations under such warranties by replacing the product itself or refunding the verified purchase price of the product itself. The maximum amount recoverable under this warranty is limited to the purchase price of the product. This warranty is subject to conditions, exclusions and limitations as described below.

#### **WARRANTY PERIOD:**

Warranty coverage begins on the date of original purchase. In the case of new home construction, warranty coverage begins on the date of first occupancy of the dwelling or six months after the sale of the product by an independent, authorized HHT dealer/ distributor, whichever occurs earlier. The warranty shall commence no later than 24 months following the date of product shipment from HHT, regardless of the installation or occupancy date. The warranty period for parts and labor for covered components is produced in the following table.

The term "Limited Lifetime" in the table below is defined as: 20 years from the beginning date of warranty coverage for gas appliances, and 10 years from the beginning date of warranty coverage for wood, pellet, and coal appliances. These time periods reflect the minimum expected useful lives of the designated components under normal operating conditions.

Warranty Period		HHT Manufactured Appliances and Venting							Components Covered
Parts	Labor	Gas	Wood	Pellet	EPA Wood	Coal	Electric	Venting	
1 Year		X	X	X	X	X	X	X	All parts and material except as covered by Conditions, Exclusions, and Limitations listed
2 years				X	X	X			Igniters, electronic components, and glass
		X	X	X	X	X			Factory-installed blowers
			X						Molded refractory panels
3 years				X					Firepots and burnpots
5 years	1 year			X	X				Castings and baffles
7 years	3 years		X	X	X				Manifold tubes, HHT chimney and termination
10 years	1 year	X							Burners, logs and refractory
Limited Lifetime	3 years	X	X	X	X	X			Firebox and heat exchanger
90 Days		X	X	X	X	X	X	X	All replacement parts beyond warranty period

See conditions, exclusions, and limitations on next page.

## **B. Limited Lifetime Warranty (*continued*)**

### **WARRANTY CONDITIONS:**

- This warranty only covers HHT appliances that are purchased through an HHT authorized dealer or distributor. A list of HHT authorized dealers is available on the HHT branded websites.
- This warranty is only valid while the HHT appliance remains at the site of original installation.
- This warranty is only valid in the country in which the HHT authorized dealer or distributor that sold the appliance resides.
- Contact your installing dealer for warranty service. If the installing dealer is unable to provide necessary parts, contact the nearest HHT authorized dealer or supplier. Additional service fees may apply if you are seeking warranty service from a dealer other than the dealer from whom you originally purchased the product.
- Check with your dealer in advance for any costs to you when arranging a warranty call. Travel and shipping charges for parts are not covered by this warranty.

### **WARRANTY EXCLUSIONS:**

This warranty does not cover the following:

- Changes in surface finishes as a result of normal use. As a heating appliance, some changes in color of interior and exterior surface finishes may occur. This is not a flaw and is not covered under warranty.
- Damage to printed, plated, or enameled surfaces caused by fingerprints, accidents, misuse, scratches, melted items, or other external sources and residues left on the plated surfaces from the use of abrasive cleaners or polishes.
- Repair or replacement of parts that are subject to normal wear and tear during the warranty period. These parts include: paint, wood, pellet and coal gaskets, firebricks, grates, flame guides, batteries and the discoloration of glass.
- Minor expansion, contraction, or movement of certain parts causing noise. These conditions are normal and complaints related to this noise are not covered by this warranty.
- Damages resulting from: (1) failure to install, operate, or maintain the appliance in accordance with the installation instructions, operating instructions, and listing agent identification label furnished with the appliance; (2) failure to install the appliance in accordance with local building codes; (3) shipping or improper handling; (4) improper operation, abuse, misuse, continued operation with damaged, corroded or failed components, accident, or improperly/incorrectly performed repairs; (5) environmental conditions, inadequate ventilation, negative pressure, or drafting caused by tightly sealed constructions, insufficient make-up air supply, or handling devices such as exhaust fans or forced air furnaces or other such causes; (6) use of fuels other than those specified in the operating instructions; (7) installation or use of components not supplied with the appliance or any other components not expressly authorized and approved by HHT; (8) modification of the appliance not expressly authorized and approved by HHT in writing; and/or (9) interruptions or fluctuations of electrical power supply to the appliance.
- Non-HHT venting components, hearth components or other accessories used in conjunction with the appliance.
- Any part of a pre-existing fireplace system in which an insert or a decorative gas appliance is installed.
- HHT's obligation under this warranty does not extend to the appliance's capability to heat the desired space. Information is provided to assist the consumer and the dealer in selecting the proper appliance for the application. Consideration must be given to appliance location and configuration, environmental conditions, insulation and air tightness of the structure.

### **This warranty is void if:**

- The appliance has been over-fired or operated in atmospheres contaminated by chlorine, fluorine, or other damaging chemicals. Over-firing can be identified by, but not limited to, warped plates or tubes, rust colored cast iron, bubbling, cracking and discoloration of steel or enamel finishes.
- The appliance is subjected to prolonged periods of dampness or condensation.
- There is any damage to the appliance or other components due to water or weather damage which is the result of, but not limited to, improper chimney or venting installation.

### **LIMITATIONS OF LIABILITY:**

- The owner's exclusive remedy and HHT's sole obligation under this warranty, under any other warranty, express or implied, or in contract, tort or otherwise, shall be limited to replacement, repair, or refund, as specified above. In no event will HHT be liable for any incidental or consequential damages caused by defects in the appliance. Some states do not allow exclusions or limitation of incidental or consequential damages, so these limitations may not apply to you. This warranty gives you specific rights; you may also have other rights, which vary from state to state. EXCEPT TO THE EXTENT PROVIDED BY LAW, HHT MAKES NO EXPRESS WARRANTIES OTHER THAN THE WARRANTY SPECIFIED HEREIN. THE DURATION OF ANY IMPLIED WARRANTY IS LIMITED TO DURATION OF THE EXPRESSED WARRANTY SPECIFIED ABOVE.



## C. Loss of Power

### Minimizing Smoke During Loss of Power Using Battery Back-up

Harman® strongly recommends installing battery back-up to minimize entry of smoke into the room in the event of power loss.

Your pellet/biomass burning appliance relies on a combustion blower to remove exhaust. A power failure will cause the combustion blower to stop. This may lead to exhaust seeping into the room. Vertical rise in the venting may provide natural draft. It is, however, no guarantee against leakage.

**There are two Harman® approved battery back-up options for your appliance:**

**Uninterruptible Power Supply (UPS)** battery back-ups are available online or at computer and office equipment stores. Your Harman® appliance may be plugged directly into a Harman® approved UPS:

- The APC (American Power Conversion) model #BE750G and the TrippLite model INTERNET750U are tested and approved. Other brands or models may not be compatible.

When power is lost, a fully charged UPS will power a safe, combustion blower only shut-down. Your appliance will pulse the blower every few seconds to clear exhaust until the fire is out. **NOTE: The UPS provides safe shut-down only. It is not intended for continued operation.**

- The Surefire 512 connects to a 12 volt deep cycle battery that will run your appliance for up to eight (8) hours. It includes a trickle charge feature that keeps your battery charged when power is available. **NOTE:** If the power is out for longer than battery life, smoke leakage may still occur unless your stove has been safely shut down.

Your appliance will recognize when power is restored. What happens depends on ESP temperature and whether it is equipped with automatic ignition:

- In **“Automatic” Mode**, units equipped with automatic ignition will respond to the set point and ESP temperature and resume normal operation.
- In **“Idle” Mode**, or for units without automatic ignition:
  - If the ESP is cool, the appliance will remain shut down.
  - If the fire is out and the ESP is still warm, the feeder may restart. Since the fire is out, the ESP temperature will not rise. The unit will then shut-down, and may flash a six-blink status error. (See ESP error codes)
  - If the fire is still burning, it will resume normal operation.

Contact your dealer if you have questions about UPS compatibility with your appliance.



### WARNING

Use only Harman® approved battery back-up devices. Other products may not operate properly, can create unsafe conditions or damage your appliance.



### CAUTION

Always keep appliance doors and hopper lid closed and latched during operation and during power failures to minimize risk of smoke or burn-back.

## D. Emergency Manual Ignition

Harman® pellet stoves and inserts should be lit using the automatic ignition system. This is the safest and most reliable way for igniting the unit. In the event the automatic igniter is not functioning, the steps below may be followed to manually light the stove or insert in the “Constant Burn” mode. Manual lighting is for emergency purposes only, and the igniter should be repaired or replaced as soon as practical.



### WARNING

Only use firestarter commercially marketed for pellet stoves and inserts, including wax coated wood chips, pellet starter gel and pellet igniter blocks. Use of any other type of firestarter is prohibited.

To avoid serious injury or death read and follow manufacturer’s warning and instructions for use of firestarter. Use of firestarter is only permitted when performing a cold start.

Never attempt to manually light a stove or insert that has been operated recently and is not at room temperature. If automatic ignition was attempted, be sure to give the stove or insert at least 30 minutes or longer to cool to room temperature.

Be sure that the stove or insert is in the “Igniter - Disabled” mode of operation.

Once all the precautions have been taken, follow these steps:

1. On the touch control, select the Burn Mode icon then select “Constant Burn”.
2. Arrow back and select the Igniter icon then select “Manual” for the ignition method. Select the Home Icon to go back to the Main Menu.
3. Fill burn pot with pellets, only half way. (Do Not Over Fill).
4. Add firestarter to pellets following manufacturer’s instructions.
5. Light firestarter with a match, and close the door, touch the On/Off icon on the home screen. Operation will begin when the fire reaches the proper temperature.

## E. Troubleshooting

ISSUES	SOLUTIONS
Stove does not feed	<ul style="list-style-type: none"> <li>• No fuel in hopper.</li> <li>• Firebox draft may be too low for sensing switch in feeder circuit to operate. <b>Check for closed doors</b>, loose or missing gasket on doors or hopper lid.</li> <li>• Feed motor will not run until the ESP control senses a certain temperature. Maybe you did not put enough fuel or firestarter in the burn pot before manually lighting the fire (In Constant Burn, Manual Light Only.)</li> <li>• Restriction in the hopper or feeder. Remove all fuel and examine. Clear the obstruction.</li> <li>• Feed motor has failed.</li> </ul>
Partially burned pellets	<ul style="list-style-type: none"> <li>• Feed rate too high.</li> <li>• Poor air to fuel mixture. (Check burn pot clean-out cover and air intake).</li> <li>• Burn pot may need to be cleaned.</li> <li>• Combination of all the above.</li> </ul>
Smoke smell	Seal the vent pipe joints and connection to stove with silicone. The exhaust vent is the only part of the system that is under positive pressure.
Fire has gone out	<ul style="list-style-type: none"> <li>• No fuel in hopper.</li> <li>• Draft is too low, blocked flue.</li> <li>• Something is restricting fuel flow.</li> <li>• Hopper lid not closed properly.</li> <li>• Feed motor or combustion fan has failed.</li> </ul>
Smoke is visible coming out of vent	<ul style="list-style-type: none"> <li>• Air-fuel ratio is too rich.               <ul style="list-style-type: none"> <li>- Feed rate too high.</li> <li>- Draft too low caused by a gasket leak.</li> </ul> </li> </ul>
Low heat output	<ul style="list-style-type: none"> <li>• Feed rate too low.</li> <li>• Draft too low because of gasket leak.</li> <li>• Poor quality or damp pellets.</li> <li>• Combination of 1 and 2.</li> </ul>

## F. Glass Installation and Cleaning

**Step 1 - Installing Side Panels:** Locate the cut-outs in the top of the panel that marry to the hooks located underneath the cast top. Once in place simply place the bottom of the panel flush against unit. Figure 1.

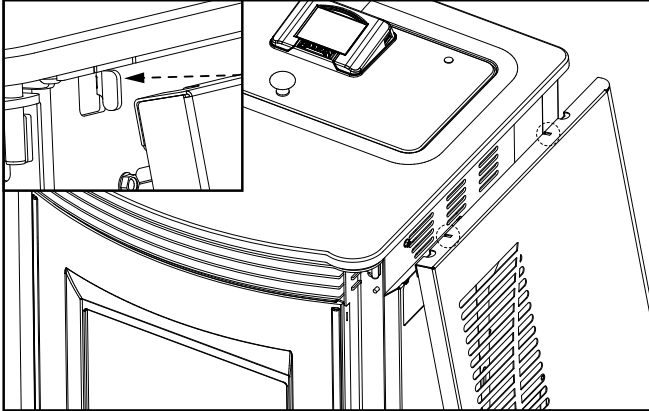


Figure 1

**Step 2:** Tighten the (4) 10-24 x 1/2" Thread cutting screw using a 5/16" nut driver, (2) Thread cutting screws per panel. Figure 2. **(Note: The door does not need to be removed to access screws.)**

**Helpful Hint;** When tightening the right panel front screw, open the door slowly until it contacts the side panel. This will push the side panel fully into the slot for tightening from the front.

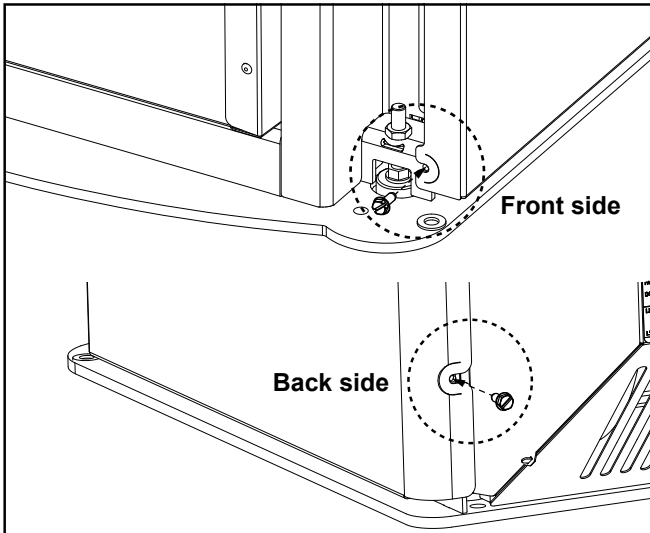


Figure 2

**Step 3 - Installing glass:** *If glass is not being installed move onto step 4.* Install right side column, do not tighten screws. Prior to installing glass make sure the end marked "Top" is up. Slide glass behind right hand column and push glass flush with door and center glass. Figure 3. Install the left column and tighten (3) 10-24 x 3/8" Button Head Screws at the top, center and bottom of the door, tighten right side column. Figure 4. **Note: Use 1/8" Allen Wrench supplied with stove.**

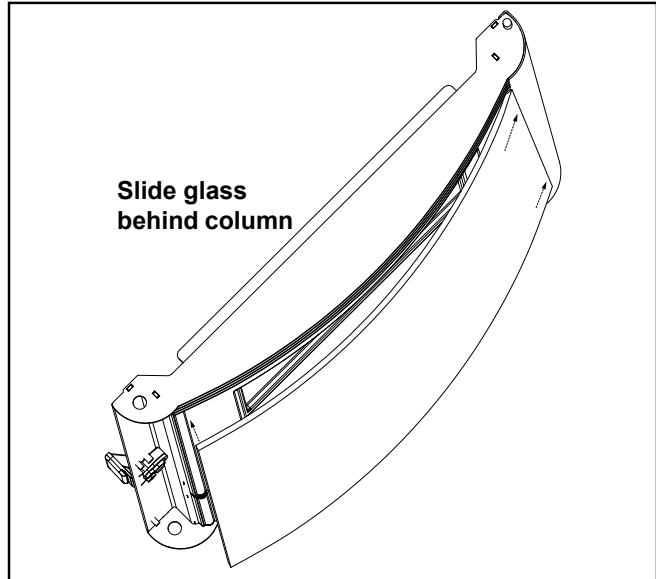


Figure 3

**Step 4 - Installing columns with no glass:** Door must be slightly open. Insert right column from the side. While holding column to the door swing door open and install (3) 10-24 x 3/8" Button Head Screws at the top, center and bottom of the door. Figure 4. Repeat step for other side. **Note: Use 1/8" Allen Wrench supplied with stove.**

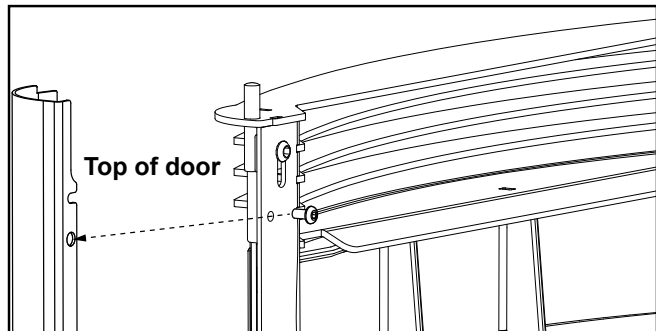


Figure 4



*Model: Allure 50  
Harman Home Heating  
352 Mountain House Road  
Halifax, PA 17032*

## **Section 5**

### **Label**



**MODEL / MODÈLE: "Allure50"**

Room Heater Pellet Fuel-Burning Type  
SUITABLE FOR MOBILE-HOME INSTALLATION

This pellet burning appliance has been tested and listed for use in Manufactured Homes in accordance with OAR 814-23-900 through 814-23-909

Report #/Rapport #0135P50375

Test to/testé à: ASTM E 2779-10, ASTM E 2515-11, ASTM E 1509-12, ULC-S627-00, EPA Method 28R

Test date: September 2015  
Room Heater, Pellet Fuel-Burning Type, Also For Use In Mobile Homes. (UM) 84-HUD

"PREVENT HOUSE FIRES" Install and use only in accordance with manufactures installation and operation instructions.

Contact local building or fire officials about restrictions and installation inspection in your area.

**WARNING: FOR MANUFACTURED HOMES:** Do not install appliance in a sleeping room. An outside combustion air inlet must be provided.

The structural integrity of the manufactured home floor, ceiling and walls must be maintained.

Refer to manufacturer's instructions and local codes for precautions required for passing chimney through a combustible wall or ceiling.

Inspect and clean exhaust venting system frequently in accordance with manufacturer's instructions.

Use a 3" or 4" diameter type "L" or "PL" venting system.

Do not connect this unit to a chimney flue servicing another appliance.

Do not obstruct the space beneath the heater.

**FOR USE WITH PELLETIZED WOOD FUEL ONLY.**

EPA Certified Emissions: 1.49 g/hr

Input Rating Max: 6.6 lb. fuel/hr

Electrical Rating: 240 VAC, 50 Hz, Start 1.75 AMPS, Run 1.25 AMPS

U.S. Electrical Rating: 115 VAC, 60 Hz, Start 3.5 AMPS, Run 2.5 AMPS

Fuel Type: Wood Pellet ONLY

Route power cord away from unit.

**OPERATE ONLY WITH DOORS CLOSED**

**DANGER:** Risk of electrical shock. Disconnect power supply before servicing.

Replace glass only with 5mm ceramic available from your dealer.

For further instruction refer to owner's manual.

Keep viewing and ash removal doors tightly closed during operation.

**MINIMUM CLEARANCES TO COMBUSTIBLES**

Back Wall to Appliance 2"  
Side Wall to Appliance 6"

**Corner Installation**  
Walls to Appliance 6.25"

Use a non-combustible floor protector extending under and to the sides, front and back of the unit as shown in floor protection diagram. Measure front distance from the surface of the glass door.

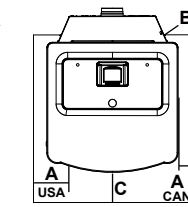
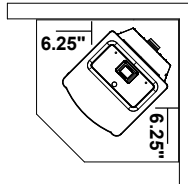
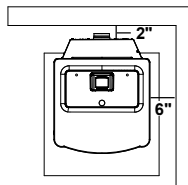
**Recommended: Non-combustible floor protection extended beneath the flue pipe when installed with horizontal venting.**

**Floor Protection\***

	USA	CANADA
Sides (A)	6"	152 mm
Back (B)	1"	25 mm
Front* (C)	6"	450 mm

\*Measured From Glass in the USA ONLY

**Alcove Installation**  
Min. Alcove Height 51" (1295mm)  
Max. Alcove Depth 24" (610mm)



**THIS AREA MUST BE BLACK**



352 Mountain House Road, Halifax, PA 17032 (É.-U.)

3-90-088

**Modèle: ALLURE50**  
Appareil de chauffage à granulés de bois  
CONÇU POUR MAISONS MOBILES

Serial No. **008**  
N° de série:

BARCODE LABEL

Test pour / tested à la norme ASTM E 2779-10, ASTM E 2515-11, ASTM E 1509-12, ULC-S627-00, EPA Method 28R  
Châuffe-chambre, Pellet à combustibles Type, également pour les maisons mobiles. (UM) 84-HUD

**"Empêcher MAISON incendies"** Installer et utiliser uniquement en conformité avec les instructions du fabricant d'installation et d'exploitation.

Contactez le service des incendies à propos des restrictions et l'inspection d'installation dans votre région.

**AVERTISSEMENT: POUR maisons préfabriquées:** Ne pas installer l'appareil dans une chambre à coucher. Une entrée d'air de combustion à l'extérieur doit être fournie. L'intégrité structurale de la maison étage, plafond et murs fabriqués doit être maintenue.

Reportez-vous aux instructions du fabricant et les codes locaux pour les précautions nécessaires pour faire passer la cheminée à travers un mur ou un plafond combustible.

Inspectez et nettoyez système d'évacuation souvent en conformité avec les instructions du fabricant.

Utilisez un "ou 4" Type de diamètre «L» 3 ou le système de ventilation "PL".

Ne pas connecter cet appareil à un conduit de cheminée desservant un autre appareil.

**Ne pas obstruer l'espace sous le chauffe-eau.**

**À UTILISER AVEC LA GRANULE DE BOIS SEULEMENT.**

Émissions certifiées EPA: 1,49 g / h

Entrée Max Note: £ 6,6 carburant / h

Note électrique: 240 VAC, 50 Hz, Lancer 1,75 AMPS, Exécuter 1,25 AMPS

US Note électrique: 115 VAC, 60 Hz, 3,5 AMPS Démarrer, Exécuter 2,5 AMPS

Type de carburant: Bois Pellet SEULEMENT

Route cordon électrique de l'appareil.

Fonctionner uniquement avec les portes fermées

**DANGER:** Risque d'électrocution. Coupez l'alimentation électrique avant l'entretien.

Remplacer le verre avec 5 mm miroir verre céramique de la même qualité disponible auprès de votre revendeur.

En tenant la porte d'entrée et le couvercle de la trémie hermétiquement fermé pendant le fonctionnement de l'appareil

**DISTANCES DE SECURITE PAR RAPPORT AUX MATERIAUX COMBUSTIBLES**

Pari arrière à l'appareil	51 mm
paroi latérale de l'appareil	152 mm

Installation en angle	159 mm
Entre murs et appareil	159 mm

Installation en alcôve	1295 mm
Hauter minimale de l'alcôve	1295 mm
Profondeur maximale de l'alcôve	610 mm

**PROTECTION DU SOL\***

Côtés (A)	200 mm
Arrière (B)	25 mm
Avant (C)	450 mm

Utiliser une protection de sol non combustible sous l'appareil qui s'étend sur les côtés, l'avant et l'arrière du poêle (voir schéma). Pour la distance à l'avant, mesurer à partir de la surface de la porte en verre.

Il est recommandé que la protection s'étende jusque sous le conduit en cas d'installation d'un conduit horizontal ou sous le té en cas conduit vertical.

Do not remove this label/Ne pas enlever cette étiquette. Made in the USA/Fabriqué aux É.-U.

US ENVIRONMENTAL PROTECTION AGENCY

Certified to comply with 2015 particulate emission standards. Not approved for sale after May 15, 2020.

Certifié conforme aux normes 2015 d'émission de particules. Non approuvé pour la vente après le 15 mai 2020.

Date of Manufacture / Date de fabrication:

2015 2016 2017 JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC

Manufactured by / Fabriqué par: Hearth and Home Technologies 352 Mountain House Road, Halifax PA 17032

Rev A

LABEL TICKET

ECO:	CLASS:
PART # / REV: 3-90-088_RevA	ADHESIVE: 468
ORIGINATOR: SpidleT	MATERIAL: METAL
DATE: 01/16	INK: BLACK
LABEL SIZE: 13 in. x 5.75 in.	OVERCOAT:
LOCATION:	Hole Size = .312
 The Hearth Experts™	<b>This unit will need the addendum label that refers to the "Wood heater needs periodic inspection" Information</b>
352 Mountain House Road Halifax, PA 17032	

## **Section 6**

### **Test Data by Run**

**NOTE: The original data sheets show the model name as “Allure 43” rather than “Allure 50.” The name was changed following completion of testing and analysis.**

## Pellet Heater Conditioning Data - ASTM E2779 / ASTM E2515

Manufacturer: Harman  
 Model: Allure 43  
 Tracking No.: 2123  
 Project No.: 0135PS037E  
 Test Date: 9/1/15 (Final 17hr)  
 Technician: A. Kravitz  
 Operation Category: Medium

Elapsed Time (hr)	Flue Gas Temp (degrees F)
0	288.2
1	289.5
2	288.3
3	289.3
4	291.6
5	292.1
6	290.2
7	291.3
8	292.1
9	291.3
10	292.4
11	293.2
12	294.3
13	296.0
14	295.3
15	296.8
16	295.3
17	294.6
18	293.8
19	296.1
20	297.2
21	295.9
22	297.4
23	296.8
24	295.3
25	294.9

Elapsed Time (hr)	Flue Gas Temp (degrees F)
26	296.2
27	297.2
28	298.7
29	299.8
30	300.3
31	300.7
32	299.4
33	299.2
34	291.0
35	301.0
36	309.0
37	307.0
38	298.0
39	294.0
40	300.0
41	303.0
42	303.0
43	308.0
44	306.0
45	313.0
46	312.0
47	313.0
48	318.0
49	316.0
50	319.0



*Model: Allure 50  
Harman Home Heating  
352 Mountain House Road  
Halifax, PA 17032*

# **Run 1**

## Pellet Heater Test Results - ASTM E2779 / ASTM E2515

Manufacturer: Harman  
 Model: Allure 43  
 Project No.: 0135PS037E  
 Tracking No.: 2123  
 Run: 1  
 Test Date: 09/02/15

Burn Rate (Composite)	<b>1.40 kg/hr dry</b>
Average Tunnel Temperature	102 degrees F
Average Gas Velocity in Dilution Tunnel - vs	13.39 feet/second
Average Gas Flow Rate in Dilution Tunnel - Qsd	8723.8 dscf/hour
Average Delta p	0.054 inches H2O
Average Delta H	1.01 inches H2O
Total Time of Test	364 minutes

<b>Burn Rate (High)</b>	<b>2.88 kg/hr dry</b>
<b>Burn Rate (Med)</b>	<b>1.32 kg/hr dry</b> 45.7% of High
<b>Burn Rate (Low)</b>	<b>0.94 kg/hr dry</b> 32.4% of High

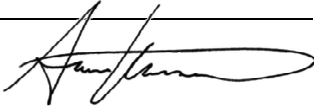
	AMBIENT	SAMPLE TRAIN 1	SAMPLE TRAIN 2	1 <sup>st</sup> HR FILTER (TRAIN 1)
Total Sample Volume - Vm	69.113 cubic feet	52.295 cubic feet	53.787 cubic feet	8.769 cubic feet
Average Gas Meter Temperature	79 degrees F	90 degrees F	89 degrees F	84 degrees F
Total Sample Volume (Standard Conditions) - Vmstd	68.419 dscf	50.504 dscf	52.051 dscf	8.562 dscf
Total Particulates - m <sub>n</sub>	0.2 mg	16.1 mg	17.5 mg	7.1 mg
Particulate Concentration (dry-standard) - C <sub>i</sub> /C <sub>s</sub>	0.000003 grams/dscf	0.00032 grams/dscf	0.00034 grams/dscf	0.00083 grams/dscf
Total Particulate Emissions - E <sub>T</sub>	0.15 grams	16.72 grams	17.64 grams	7.23 grams
Particulate Emission Rate	0.03 grams/hour	2.76 grams/hour	2.91 grams/hour	7.23 grams/hour
Emissions Factor		1.98 g/kg	2.08 g/kg	2.50 g/kg
Difference from Average Total Particulate Emissions		0.46 grams	0.46 grams	
<b>Dual Train Comparison Results Are Acceptable</b>				

INTEGRATED AVERAGE RESULT	
<b>Integrated Test Run</b>	
Total Particulate Emissions - E <sub>T</sub>	17.18 grams
Particulate Emission Rate	<b>2.83 grams/hour</b>
Emissions Factor	2.03 grams/kg
<b>First Hour Emissions</b>	
Total Particulate Emissions - E <sub>T</sub>	7.23 grams
Particulate Emission Rate	7.23 grams/hour
Emissions Factor	2.50 grams/kg

# OMNI-Test Laboratories, Inc.

**Manufacturer:** Harman  
**Model:** Allure 43  
**Date:** 09/02/15  
**Run:** 1  
**Control #:** 2123  
**Test Duration:** 364  
**Output Category:** N/A

**Technicians:** A. Kravitz

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**Test Results in Accordance with CSA B415.1-09**

	HHV Basis	LHV Basis
<b>Overall Efficiency</b>	71.4%	76.5%
<b>Combustion Efficiency</b>	94.3%	94.3%
<b>Heat Transfer Efficiency</b>	76%	81.1%

<b>Output Rate (kJ/h)</b>	19,428	18,430	<b>(Btu/h)</b>
<b>Burn Rate (kg/h)</b>	1.40	3.08	<b>(lb/h)</b>
<b>Input (kJ/h)</b>	27,199	25,801	<b>(Btu/h)</b>

<b>Test Load Weight (dry kg)</b>	8.47	18.66	<b>dry lb</b>
<b>MC wet (%)</b>	4.80723465		
<b>MC dry (%)</b>	5.05		
<b>Particulate (g)</b>	0		
<b>CO (g)</b>	605		
<b>Test Duration (h)</b>	6.07		

Emissions	Particulate	CO
<b>g/MJ Output</b>	0.00	5.13
<b>g/kg Dry Fuel</b>	0.00	71.46
<b>g/h</b>	0.00	99.71
<b>lb/MM Btu Output</b>	0.00	11.93

<b>Air/Fuel Ratio (A/F)</b>	19.20
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VERSION:                      2.3                      3/23/2010

# OMNI-Test Laboratories, Inc.

**Manufacturer:** Harman  
**Model:** Allure 43  
**Date:** 09/02/15  
**Run:** 1  
**Control #:** 2123  
**Test Duration:** 62  
**Output Category:** N/A

**Technicians:** A. Kravitz  
 \_\_\_\_\_  
 \_\_\_\_\_



**Test Results in Accordance with CSA B415.1-09**

	H Max is	LHV Basis
Overall Efficiency	90.47%	64.7%
Combustion Efficiency	92.2%	92.2%
Heat Transfer Efficiency	66%	70.2%

Output Rate (kJ/h)	33,977	32,231	(Btu/h)
Burn Rate (kg/h)	2.88	6.36	(lb/h)
Input (kJ/h)	56,216	53,327	(Btu/h)

Test Load Weight (dry kg)	2.98	6.57	dry lb
MC wet (%)	4.80723465		
MC dry (%)	5.05		
Particulate (g)	0		
CO (g)	496		
Test Duration (h)	1.03		

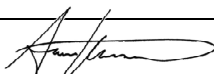
Emissions	Particulate	CO
g/MJ Output	0.00	14.13
g/kg Dry Fuel	0.00	166.50
g/h	0.00	480.20
lb/MM Btu Output	0.00	32.85

Air/Fuel Ratio (A/F)	11.31
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VERSION:                      2.3                      3/23/2010

# OMNI-Test Laboratories, Inc.

**Manufacturer:** Harman  
**Model:** Allure 43  
**Date:** 09/02/15  
**Run:** 1  
**Control #:** 2123  
**Test Duration:** 122  
**Output Category:** N/A

**Technicians:** A. Kravitz  
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 \_\_\_\_\_  


**Test Results in Accordance with CSA B415.1-09**

	H <sub>Med</sub> is	LHV Basis
<b>Overall Efficiency</b>	75.9%	81.2%
<b>Combustion Efficiency</b>	97.6%	97.6%
<b>Heat Transfer Efficiency</b>	78%	83.2%

<b>Output Rate (kJ/h)</b>	19,482	18,481	<b>(Btu/h)</b>
<b>Burn Rate (kg/h)</b>	1.32	2.90	<b>(lb/h)</b>
<b>Input (kJ/h)</b>	25,670	24,351	<b>(Btu/h)</b>

<b>Test Load Weight (dry kg)</b>	2.68	5.90	<b>dry lb</b>
<b>MC wet (%)</b>	4.80723465		
<b>MC dry (%)</b>	5.05		
<b>Particulate (g)</b>	0		
<b>CO (g)</b>	114		
<b>Test Duration (h)</b>	2.03		

Emissions	Particulate	CO
<b>g/MJ Output</b>	0.00	2.89
<b>g/kg Dry Fuel</b>	0.00	42.72
<b>g/h</b>	0.00	56.27
<b>lb/MM Btu Output</b>	0.00	6.71

<b>Air/Fuel Ratio (A/F)</b>	19.43
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VERSION:                      2.3                      3/23/2010

# OMNI-Test Laboratories, Inc.

**Manufacturer:** Harman  
**Model:** Allure 43  
**Date:** 09/02/15  
**Run:** 1  
**Control #:** 2123  
**Test Duration:** 180  
**Output Category:** N/A

**Technicians:** A. Kravitz

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**Test Results in Accordance with CSA B415.1-09**

	H Min	s	LHV Basis
<b>Overall Efficiency</b>	73.6%		78.8%
<b>Combustion Efficiency</b>	99.0%		99.0%
<b>Heat Transfer Efficiency</b>	74%		79.6%

<b>Output Rate (kJ/h)</b>	13,420	12,730	<b>(Btu/h)</b>
<b>Burn Rate (kg/h)</b>	0.94	2.06	<b>(lb/h)</b>
<b>Input (kJ/h)</b>	18,241	17,303	<b>(Btu/h)</b>

<b>Test Load Weight (dry kg)</b>	2.81	6.19	<b>dry lb</b>
<b>MC wet (%)</b>	4.80723465		
<b>MC dry (%)</b>	5.05		
<b>Particulate (g)</b>	0		
<b>CO (g)</b>	84		
<b>Test Duration (h)</b>	3.00		

Emissions	Particulate	CO
<b>g/MJ Output</b>	0.00	2.08
<b>g/kg Dry Fuel</b>	0.00	29.78
<b>g/h</b>	0.00	27.87
<b>lb/MM Btu Output</b>	0.00	4.83

<b>Air/Fuel Ratio (A/F)</b>	24.95
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VERSION:

2.3

3/23/2010

### Pellet Heater Test Data - ASTM E2779 / ASTM E2515

Run: 1

Manufacturer: Harman High Burn End Time: 62  
 Model: Allure 43 Medium Burn End Time: 184  
 Tracking No.: 2123 Total Sampling Time: 364 min  
 Project No.: 0135PS037E Recording Interval: 1 min  
 Test Date: 02-Sep-15  
 Beginning Clock Time: 10:12 Background Sample Volume: 69.113 cubic feet

Meter Box Y Factor: 1.001 (1) 1.003 (2) 1.009 (Amb)

Barometric Pressure: Begin Middle End Average  
29.99 29.98 29.98 29.98 "Hg

OMNI Equipment Numbers: 23, 131, 185, 132, 209, 291, 335, 336, 410, 420, 559

PM Control Modules:  
 Dilution Tunnel MW(dry): 29.00 lb/lb-mole  
 Dilution Tunnel MW(wet): 28.78 lb/lb-mole  
 Dilution Tunnel H2O: 2.00 percent  
 Dilution Tunnel H2O: -0.490 "H2O  
 Tunnel Area: 0.19635 ft2  
 Pitot Tube Cp: 0.99

Avg. Tunnel Velocity: 13.39 ft/sec.  
 Initial Tunnel Flow: 140.0 scfm  
 Average Tunnel Flow: 145.4 scfm  
 Post-Test Leak Check (1): 0.001 cfm @ -1 in. Hg  
 Post-Test Leak Check (2): 0 cfm @ -1 in. Hg  
 Fuel Moisture: 5.1 Dry Basis %

Velocity Traverse Data									
	Pt.1	Pt.2	Pt.3	Pt.4	Pt.5	Pt.6	Pt.7	Pt.8	Center
Initial dP	0.020	0.046	0.052	0.030	0.024	0.051	0.048	0.028	0.054
Temp:	113	113	113	113	113	113	113	113	113
V <sub>strav</sub>		13.47		ft/sec		V <sub>scent</sub>		16.03	
						F <sub>p</sub>		0.840	

Elapsed Time (min)	Particulate Sampling Data												Fuel Weight (lb)				Temperature Data (°F)				Stack Gas Data		
	Gas Meter 1 (ft³)	Gas Meter 2 (ft³)	Sample Rate 1 (cfm)	Sample Rate 2 (cfm)	Orifice dH 1 ("H <sub>2</sub> O)	Meter Temp 1 (°F)	Meter Vacuum 1 ("Hg)	Orifice dH 2 ("H <sub>2</sub> O)	Meter Temp 2 (°F)	Meter Vacuum 2 ("Hg)	Dilution Tunnel (°F)	Dilution Tunnel Center dP	Pro. Rate 1	Pro. Rate 2	Scale Reading	Weight Change	Stack	Filter 1	Filter 2	Ambient	Draft ("H <sub>2</sub> O)	CO <sub>2</sub> (%)	CO (%)
0	0.000	0.000			0.03	80	1.69	0.30	80	0.8	113	0.054			38.8		399	75	75	78	-0.047	8.8	0.8
1	0.139	0.145	0.14	0.15	1.11	80	1.91	0.98	80	1.1	115	0.054	100	101	38.7	-0.1	399	75	76	78	-0.047	8.7	0.7
2	0.288	0.298	0.15	0.15	1.11	80	1.91	0.99	80	1.1	115	0.054	107	107	38.6	-0.1	400	75	77	79	-0.048	9	0.9
3	0.437	0.452	0.15	0.15	1.10	80	1.92	0.98	80	1.1	115	0.053	108	109	38.4	-0.2	401	75	77	79	-0.048	9.5	1.1
4	0.586	0.605	0.15	0.15	1.10	80	1.92	0.98	80	1.1	115	0.054	107	107	38.4	0	400	75	78	79	-0.048	8.7	0.6
5	0.733	0.759	0.15	0.15	1.10	80	1.91	0.98	80	1.1	116	0.054	106	108	38.2	-0.2	400	75	78	79	-0.048	8.8	0.6
6	0.881	0.913	0.15	0.15	1.10	80	1.92	0.98	80	1.1	116	0.054	107	108	38.1	-0.1	401	76	78	79	-0.047	9.2	0.7
7	1.030	1.065	0.15	0.15	1.09	80	1.92	0.97	80	1.1	116	0.055	106	105	38.0	-0.1	400	76	78	79	-0.048	8.7	0.6
8	1.178	1.218	0.15	0.15	1.10	80	1.91	0.97	80	1.1	115	0.056	105	105	37.9	-0.1	400	76	79	79	-0.048	9.1	0.8
9	1.325	1.372	0.15	0.15	1.09	80	1.91	0.97	80	1.2	116	0.052	108	110	37.8	-0.1	401	76	79	79	-0.048	9.2	0.8
10	1.473	1.524	0.15	0.15	1.09	80	1.91	0.97	80	1.2	116	0.053	108	107	37.7	-0.1	401	76	79	79	-0.047	9.1	0.7
11	1.621	1.678	0.15	0.15	1.09	81	1.91	0.97	81	1.1	116	0.056	104	106	37.6	-0.1	401	76	79	79	-0.048	9.1	0.8
12	1.769	1.830	0.15	0.15	1.09	81	1.91	0.97	81	1.1	116	0.053	107	107	37.5	-0.1	402	76	79	79	-0.048	8.8	0.7
13	1.916	1.983	0.15	0.15	1.08	81	1.92	0.96	81	1.2	116	0.054	106	107	37.4	-0.1	402	76	80	79	-0.048	9.5	0.8
14	2.063	2.135	0.15	0.15	1.08	81	1.91	0.96	81	1.2	116	0.056	104	104	37.2	-0.2	402	76	80	79	-0.047	9.3	0.9
15	2.210	2.287	0.15	0.15	1.09	81	1.91	0.96	81	1.2	116	0.052	108	108	37.1	-0.1	402	76	80	79	-0.048	8.6	0.7
16	2.358	2.439	0.15	0.15	1.08	81	1.92	0.95	81	1.2	116	0.053	107	107	37.0	-0.1	403	76	80	79	-0.049	9.5	1.3
17	2.505	2.592	0.15	0.15	1.08	81	1.92	0.95	81	1.2	116	0.055	105	106	36.9	-0.1	403	76	80	79	-0.048	9.4	1.2
18	2.652	2.743	0.15	0.15	1.08	82	1.92	0.95	82	1.2	116	0.054	105	105	36.8	-0.1	402	76	80	79	-0.048	8.8	0.9
19	2.798	2.895	0.15	0.15	1.08	82	1.92	0.95	82	1.2	116	0.053	106	107	36.6	-0.2	402	76	81	79	-0.048	9.3	1
20	2.945	3.048	0.15	0.15	1.08	82	1.92	0.95	82	1.2	116	0.054	105	107	36.6	0	401	76	81	79	-0.047	8.9	0.8
21	3.093	3.199	0.15	0.15	1.07	82	1.92	0.95	82	1.2	116	0.052	108	107	36.5	-0.1	401	76	81	79	-0.048	8.8	0.8
22	3.240	3.350	0.15	0.15	1.08	82	1.93	0.94	82	1.2	116	0.054	105	105	36.3	-0.2	401	76	81	79	-0.047	9.3	1
23	3.387	3.502	0.15	0.15	1.08	83	1.93	0.94	82	1.2	116	0.054	105	106	36.2	-0.1	401	76	81	79	-0.047	9.4	0.9
24	3.533	3.653	0.15	0.15	1.07	83	1.92	0.94	83	1.2	116	0.054	105	105	36.1	-0.1	401	76	81	79	-0.048	9.2	1.1
25	3.679	3.804	0.15	0.15	1.07	83	1.94	0.94	83	1.2	116	0.054	105	105	36.0	-0.1	401	76	81	79	-0.047	9	1
26	3.826	3.956	0.15	0.15	1.07	83	1.94	0.94	83	1.2	116	0.053	106	107	35.9	-0.1	401	76	81	79	-0.048	9	0.7
27	3.973	4.107	0.15	0.15	1.06	83	1.93	0.94	83	1.2	116	0.055	104	104	35.8	-0.1	401	76	81	79	-0.047	9.1	1.1
28	4.120	4.257	0.15	0.15	1.07	83	1.94	0.94	83	1.2	116	0.053	106	105	35.7	-0.1	401	76	81	80	-0.048	9.5	1.2
29	4.266	4.409	0.15	0.15	1.07	84	1.94	0.93	84	1.2	116	0.054	104	106	35.6	-0.1	400	76	82	79	-0.046	8.8	0.9
30	4.412	4.560	0.15	0.15	1.06	84	1.94	0.93	84	1.2	116	0.054	104	105	35.4	-0.2	400	77	82	79	-0.047	8.9	1.3
31	4.558	4.710	0.15	0.15	1.06	84	1.95	0.93	84	1.2	116	0.054	104	104	35.3	-0.1	400	77	82	80	-0.047	9.2	1
32	4.705	4.861	0.15	0.15	1.06	84	1.95	0.93	84	1.2	116	0.053	106	106	35.2	-0.1	400	76	82	80	-0.048	8.8	0.8
33	4.851	5.012	0.15	0.15	1.05	84	1.95	0.93	84	1.2	116	0.054	104	105	35.1	-0.1	401	77	82	79	-0.047	9.5	1.2
34	4.997	5.162	0.15	0.15	1.06	84	1.96	0.93	84	1.2	116	0.055	103	103	35.0	-0.1	401	77	82	80	-0.048	9.4	1.1

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OMNI Equipment Numbers: 23, 131, 185, 132, 209, 291, 335, 336, 410, 420, 559

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Dilution Tunnel MW(dry): 29.00 lb/lb-mole  
 Dilution Tunnel MW(wet): 28.78 lb/lb-mole  
 Dilution Tunnel H2O: 2.00 percent  
 Dilution Tunnel Status: -0.490 "H2O  
 Tunnel Area: 0.19635 ft2  
 Pitot Tube Cp: 0.99

Avg. Tunnel Velocity: 13.39 ft/sec.  
 Initial Tunnel Flow: 140.0 scfm  
 Average Tunnel Flow: 145.4 scfm  
 Post-Test Leak Check (1): 0.001 cfm @ -1 in. Hg  
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 Fuel Moisture: 5.1 Dry Basis %

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	Pt.1	Pt.2	Pt.3	Pt.4	Pt.5	Pt.6	Pt.7	Pt.8	Center
Initial dP	0.020	0.046	0.052	0.030	0.024	0.051	0.048	0.028	0.054
Temp:	113	113	113	113	113	113	113	113	113
V <sub>strav</sub>		13.47		ft/sec		V <sub>scent</sub>		16.03	
						F <sub>p</sub>		0.840	

Elapsed Time (min)	Particulate Sampling Data												Fuel Weight (lb)		Temperature Data (°F)				Stack Gas Data				
	Gas Meter 1 (ft³)	Gas Meter 2 (ft³)	Sample Rate 1 (cfm)	Sample Rate 2 (cfm)	Orifice dH 1 ("H <sub>2</sub> O)	Meter Temp 1 (°F)	Meter Vacuum 1 ("Hg)	Orifice dH 2 ("H <sub>2</sub> O)	Meter Temp 2 (°F)	Meter Vacuum 2 ("Hg)	Dilution Tunnel (°F)	Dilution Tunnel Center dP	Pro. Rate 1	Pro. Rate 2	Scale Reading	Weight Change	Stack	Filter 1	Filter 2	Ambient	Draft ("H <sub>2</sub> O)	CO <sub>2</sub> (%)	CO (%)
35	5.144	5.312	0.15	0.15	1.06	85	1.95	0.93	85	1.2	116	0.055	104	103	34.9	-0.1	401	77	82	80	-0.048	9.3	1
36	5.289	5.463	0.15	0.15	1.06	85	1.96	0.92	85	1.2	116	0.055	102	104	34.8	-0.1	401	77	82	80	-0.047	8.9	0.6
37	5.435	5.614	0.15	0.15	1.05	85	1.96	0.92	85	1.2	116	0.055	103	104	34.6	-0.2	400	77	82	80	-0.047	9.1	1.1
38	5.581	5.763	0.15	0.15	1.05	85	1.97	0.92	85	1.2	116	0.054	104	103	34.5	-0.1	399	77	82	80	-0.048	9	1
39	5.726	5.913	0.15	0.15	1.05	85	1.97	0.92	85	1.3	116	0.055	102	103	34.4	-0.1	399	77	82	79	-0.047	9.1	0.9
40	5.873	6.063	0.15	0.15	1.04	85	1.97	0.91	85	1.3	116	0.053	106	105	34.3	-0.1	399	77	82	79	-0.048	9.1	0.9
41	6.018	6.213	0.15	0.15	1.05	85	1.97	0.92	86	1.3	116	0.053	104	105	34.2	-0.1	400	77	82	79	-0.048	9.2	1.1
42	6.164	6.362	0.15	0.15	1.04	86	1.98	0.92	86	1.3	116	0.053	105	104	34.1	-0.1	401	77	82	79	-0.048	9.1	1
43	6.308	6.511	0.14	0.15	1.05	86	1.99	0.92	86	1.3	116	0.056	101	101	34.0	-0.1	400	77	82	80	-0.048	9.2	1
44	6.454	6.661	0.15	0.15	1.05	86	1.98	0.91	86	1.3	116	0.054	104	104	33.9	-0.1	400	77	82	80	-0.048	8.9	0.8
45	6.599	6.811	0.15	0.15	1.05	86	1.99	0.91	86	1.3	116	0.054	103	104	33.7	-0.2	401	77	82	80	-0.048	9.3	1
46	6.744	6.960	0.15	0.15	1.04	86	1.99	0.91	86	1.3	116	0.054	103	103	33.6	-0.1	401	77	82	80	-0.047	9.1	1.2
47	6.890	7.109	0.15	0.15	1.04	86	1.99	0.91	86	1.3	116	0.055	103	102	33.5	-0.1	399	77	82	80	-0.047	8.4	0.7
48	7.035	7.258	0.15	0.15	1.03	86	2	0.90	86	1.3	116	0.055	102	102	33.5	0	398	77	82	80	-0.047	8.7	0.9
49	7.180	7.407	0.15	0.15	1.04	86	2	0.90	87	1.3	116	0.054	103	103	33.3	-0.2	398	77	82	80	-0.047	9.3	1
50	7.325	7.556	0.15	0.15	1.03	87	2.01	0.90	87	1.3	116	0.053	104	104	33.2	-0.1	398	77	82	80	-0.047	9	1
51	7.470	7.704	0.15	0.15	1.04	87	2.01	0.90	87	1.3	116	0.054	103	102	33.1	-0.1	397	77	82	80	-0.047	8.8	0.8
52	7.614	7.853	0.14	0.15	1.03	87	2.02	0.90	87	1.3	116	0.055	101	102	33.0	-0.1	399	77	82	80	-0.048	9	0.9
53	7.758	8.001	0.14	0.15	1.03	87	2.01	0.89	87	1.3	116	0.053	103	103	32.9	-0.1	399	77	82	80	-0.047	9.2	1.1
54	7.903	8.150	0.15	0.15	1.03	87	2.02	0.89	87	1.3	116	0.053	104	104	32.8	-0.1	399	77	83	80	-0.047	8.9	1
55	8.047	8.298	0.14	0.15	1.03	87	2.02	0.89	87	1.3	116	0.054	102	102	32.6	-0.2	400	77	82	80	-0.048	9.2	1.2
56	8.192	8.446	0.15	0.15	1.02	87	2.02	0.89	87	1.3	116	0.056	101	100	32.5	-0.1	399	77	82	80	-0.048	8.7	1
57	8.336	8.594	0.14	0.15	1.02	87	2.02	0.89	87	1.3	116	0.053	103	103	32.4	-0.1	398	77	82	79	-0.047	8.7	0.7
58	8.480	8.742	0.14	0.15	1.02	87	2.04	0.89	87	1.3	116	0.054	102	102	32.3	-0.1	398	77	83	79	-0.047	8.9	0.9
59	8.625	8.890	0.15	0.15	1.02	88	2.04	0.89	87	1.3	116	0.054	103	102	32.2	-0.1	398	77	82	80	-0.047	8.7	0.9
60	8.769	9.038	0.14	0.15	1.06	88	1.95	0.88	88	1.3	116	0.055	101	101	32.1	-0.1	398	77	82	80	-0.047	9	1
61	8.916	9.185	0.15	0.15	1.06	88	1.96	0.88	88	1.3	116	0.055	103	100	32.0	-0.1	397	78	84	80	-0.047	8.7	0.9
62	9.062	9.333	0.15	0.15	1.06	88	1.96	0.88	88	1.3	115	0.053	104	103	31.9	-0.1	395	79	84	79	-0.048	8.5	0.9
63	9.209	9.480	0.15	0.15	1.06	88	1.95	0.88	88	1.3	113	0.054	104	101	31.8	-0.1	386	79	83	80	-0.048	7.5	0.4
64	9.356	9.627	0.15	0.15	1.06	88	1.96	0.88	88	1.3	111	0.055	103	100	31.8	0	378	79	83	80	-0.046	7.5	0.5
65	9.503	9.774	0.15	0.15	1.05	88	1.96	0.87	88	1.3	110	0.054	104	101	31.7	-0.1	371	79	83	79	-0.046	7.6	0.4
66	9.650	9.922	0.15	0.15	1.06	88	1.96	0.88	88	1.3	109	0.057	101	99	31.6	-0.1	363	79	83	80	-0.045	6.1	0.1
67	9.797	10.069	0.15	0.15	1.06	88	1.95	0.87	88	1.3	108	0.054	104	101	31.6	0	356	80	83	79	-0.044	5.3	0.1
68	9.943	10.217	0.15	0.15	1.06	88	1.96	0.88	88	1.3	107	0.057	100	99	31.6	0	349	80	83	79	-0.043	4.6	0.1
69	10.090	10.364	0.15	0.15	1.05	88	1.95	0.88	88	1.3	106	0.054	103	100	31.6	0	342	80	83	79	-0.042	4.2	0.1



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70	10.237	10.511	0.15	0.15	1.05	88	1.96	0.88	88	1.3	105	0.055	102	99	31.6	0	334	80	83	79	-0.041	3.6	0.1
71	10.384	10.659	0.15	0.15	1.05	89	1.96	0.88	89	1.3	104	0.055	102	100	31.5	-0.1	326	80	83	80	-0.040	3.4	0.1
72	10.531	10.806	0.15	0.15	1.05	89	1.96	0.88	89	1.3	104	0.053	104	101	31.5	0	319	80	83	80	-0.040	3.1	0.1
73	10.677	10.954	0.15	0.15	1.06	89	1.95	0.87	89	1.3	103	0.056	100	99	31.4	-0.1	313	80	83	79	-0.038	3.3	0.1
74	10.824	11.102	0.15	0.15	1.06	89	1.95	0.88	89	1.3	102	0.054	103	101	31.4	0	306	80	82	79	-0.037	3.1	0.1
75	10.972	11.249	0.15	0.15	1.06	89	1.95	0.88	89	1.3	101	0.054	103	100	31.4	0	299	80	82	79	-0.037	2.9	0.1
76	11.119	11.396	0.15	0.15	1.06	89	1.95	0.87	89	1.3	100	0.054	103	100	31.4	0	292	80	82	80	-0.035	2.6	0.1
77	11.266	11.544	0.15	0.15	1.06	89	1.96	0.88	89	1.3	100	0.054	103	100	31.4	0	286	80	82	78	-0.035	2.7	0.1
78	11.413	11.691	0.15	0.15	1.06	89	1.95	0.88	89	1.3	99	0.055	102	99	31.3	-0.1	282	80	82	79	-0.034	3	0.1
79	11.560	11.839	0.15	0.15	1.06	89	1.96	0.88	89	1.3	99	0.054	103	100	31.3	0	278	80	82	79	-0.034	3.3	0.1
80	11.707	11.987	0.15	0.15	1.05	89	1.95	0.87	89	1.3	98	0.056	101	98	31.3	0	275	80	82	79	-0.033	3.5	0.1
81	11.855	12.134	0.15	0.15	1.05	89	1.95	0.88	89	1.3	98	0.056	101	98	31.2	-0.1	273	80	82	79	-0.033	3.5	0.1
82	12.002	12.282	0.15	0.15	1.05	89	1.96	0.88	89	1.3	98	0.054	102	100	31.2	0	271	80	82	79	-0.033	3.8	0.1
83	12.148	12.429	0.15	0.15	1.06	89	1.96	0.88	89	1.3	98	0.054	102	100	31.2	0	270	80	82	79	-0.033	4.2	0.1
84	12.295	12.576	0.15	0.15	1.06	89	1.96	0.88	89	1.3	97	0.054	102	99	31.1	-0.1	269	80	82	79	-0.033	4	0.1
85	12.442	12.724	0.15	0.15	1.05	89	1.96	0.88	89	1.3	98	0.054	102	100	31.1	0	270	80	82	79	-0.034	4.5	0.1
86	12.590	12.871	0.15	0.15	1.04	89	1.98	0.87	89	1.3	98	0.054	103	100	31.0	-0.1	272	80	82	79	-0.034	5.4	0.1
87	12.736	13.018	0.15	0.15	1.05	89	1.98	0.86	89	1.4	98	0.055	101	99	31.0	0	274	80	82	78	-0.034	5.5	0.1
88	12.882	13.165	0.15	0.15	1.05	89	1.99	0.87	89	1.4	98	0.056	100	98	30.9	-0.1	277	81	81	79	-0.035	5.4	0.2
89	13.028	13.312	0.15	0.15	1.04	89	2	0.86	89	1.4	98	0.054	102	100	30.8	-0.1	280	81	81	79	-0.035	5.8	0.2
90	13.174	13.458	0.15	0.15	1.04	90	2	0.86	89	1.4	98	0.054	102	99	30.8	0	282	81	81	79	-0.036	6	0.2
91	13.320	13.604	0.15	0.15	1.03	90	2	0.86	89	1.4	98	0.053	103	100	30.7	-0.1	285	81	81	79	-0.036	5.8	0.2
92	13.466	13.749	0.15	0.15	1.03	90	2.02	0.86	89	1.4	98	0.054	102	98	30.7	0	286	81	81	78	-0.036	5.8	0.2
93	13.612	13.895	0.15	0.15	1.03	90	2.02	0.85	89	1.4	98	0.054	102	99	30.6	-0.1	286	81	81	78	-0.036	5.8	0.2
94	13.757	14.041	0.15	0.15	1.03	90	2.03	0.85	89	1.4	98	0.054	101	99	30.6	0	287	81	81	78	-0.036	5.8	0.2
95	13.902	14.186	0.15	0.15	1.03	90	2.03	0.85	89	1.4	98	0.055	100	97	30.5	-0.1	287	81	81	78	-0.036	5.4	0.2
96	14.046	14.331	0.14	0.15	1.02	90	2.05	0.84	90	1.4	98	0.054	100	98	30.4	-0.1	288	81	81	78	-0.036	5.7	0.1
97	14.190	14.476	0.14	0.15	1.02	90	2.05	0.84	89	1.4	98	0.055	99	97	30.4	0	288	81	81	78	-0.037	5.5	0.1
98	14.335	14.621	0.15	0.15	1.02	90	2.06	0.84	90	1.4	98	0.054	101	98	30.3	-0.1	288	81	81	78	-0.037	5.4	0.1
99	14.479	14.765	0.14	0.14	1.01	90	2.06	0.84	90	1.4	98	0.055	99	96	30.3	0	287	81	81	78	-0.036	5.2	0.1
100	14.623	14.910	0.14	0.15	1.01	90	2.06	0.83	90	1.4	98	0.056	98	96	30.2	-0.1	287	81	81	78	-0.037	5.6	0.1
101	14.767	15.054	0.14	0.14	1.00	90	2.07	0.84	90	1.4	98	0.054	100	97	30.2	0	287	81	81	78	-0.036	5.4	0.1
102	14.911	15.198	0.14	0.14	1.01	90	2.07	0.83	90	1.4	98	0.054	100	97	30.1	-0.1	287	81	81	78	-0.036	5.8	0.2
103	15.054	15.342	0.14	0.14	1.00	90	2.08	0.83	90	1.4	98	0.052	101	99	30.1	0	286	81	81	78	-0.036	5.1	0.1
104	15.197	15.486	0.14	0.14	1.00	90	2.09	0.83	90	1.5	98	0.055	99	96	30.1	0	286	81	81	78	-0.036	5.3	0.1

### Pellet Heater Test Data - ASTM E2779 / ASTM E2515

Run: 1

Manufacturer: Harman High Burn End Time: 62  
 Model: Allure 43 Medium Burn End Time: 184  
 Tracking No.: 2123 Total Sampling Time: 364 min  
 Project No.: 0135PS037E Recording Interval: 1 min  
 Test Date: 02-Sep-15  
 Beginning Clock Time: 10:12 Background Sample Volume: 69.113 cubic feet

Meter Box Y Factor: 1.001 (1) 1.003 (2) 1.009 (Amb)

Barometric Pressure: Begin Middle End Average  
29.99 29.98 29.98 29.98 "Hg

OMNI Equipment Numbers: 23, 131, 185, 132, 209, 291, 335, 336, 410, 420, 559

PM Control Modules:  
 Dilution Tunnel MW(dry): 29.00 lb/lb-mole  
 Dilution Tunnel MW(wet): 28.78 lb/lb-mole  
 Dilution Tunnel H2O: 2.00 percent  
 Dilution Tunnel Static: -0.490 "H2O  
 Tunnel Area: 0.19635 ft2  
 Pitot Tube Cp: 0.99

Avg. Tunnel Velocity: 13.39 ft/sec.  
 Initial Tunnel Flow: 140.0 scfm  
 Average Tunnel Flow: 145.4 scfm  
 Post-Test Leak Check (1): 0.001 cfm @ -1 in. Hg  
 Post-Test Leak Check (2): 0 cfm @ -1 in. Hg  
 Fuel Moisture: 5.1 Dry Basis %

Velocity Traverse Data									
	Pt.1	Pt.2	Pt.3	Pt.4	Pt.5	Pt.6	Pt.7	Pt.8	Center
Initial dP	0.020	0.046	0.052	0.030	0.024	0.051	0.048	0.028	0.054
Temp:	113	113	113	113	113	113	113	113	113
V <sub>strav</sub>		13.47		ft/sec		V <sub>scent</sub>		16.03	
						F <sub>p</sub>		0.840	

Elapsed Time (min)	Particulate Sampling Data												Fuel Weight (lb)				Temperature Data (°F)				Stack Gas Data		
	Gas Meter 1 (ft³)	Gas Meter 2 (ft³)	Sample Rate 1 (cfm)	Sample Rate 2 (cfm)	Orifice dH 1 ("H₂O)	Meter Temp 1 (°F)	Meter Vacuum 1 ("Hg)	Orifice dH 2 ("H₂O)	Meter Temp 2 (°F)	Meter Vacuum 2 ("Hg)	Dilution Tunnel (°F)	Dilution Tunnel Center dP	Pro. Rate 1	Pro. Rate 2	Scale Reading	Weight Change	Stack	Filter 1	Filter 2	Ambient	Draft ("H₂O)	CO₂ (%)	CO (%)
105	15.341	15.629	0.14	0.14	0.99	90	2.09	0.83	90	1.5	98	0.053	101	98	30.0	-0.1	286	81	81	78	-0.036	5.1	0.1
106	15.484	15.773	0.14	0.14	0.99	90	2.1	0.82	90	1.5	98	0.054	99	97	29.9	-0.1	286	81	81	78	-0.036	5.1	0.1
107	15.627	15.916	0.14	0.14	0.99	90	2.11	0.82	90	1.5	98	0.054	99	97	29.9	0	286	81	81	78	-0.036	5.2	0.1
108	15.769	16.059	0.14	0.14	0.98	90	2.11	0.82	90	1.5	98	0.054	99	97	29.8	-0.1	285	81	81	78	-0.036	5.5	0.2
109	15.912	16.202	0.14	0.14	0.98	90	2.12	0.82	90	1.5	98	0.054	99	97	29.8	0	285	81	81	79	-0.035	4.8	0.1
110	16.054	16.344	0.14	0.14	0.98	90	2.11	0.82	90	1.5	98	0.056	97	94	29.8	0	283	81	81	79	-0.035	4.8	0.1
111	16.196	16.487	0.14	0.14	0.98	90	2.12	0.82	90	1.5	98	0.055	98	96	29.7	-0.1	283	81	81	77	-0.036	4.8	0.1
112	16.338	16.629	0.14	0.14	0.97	90	2.14	0.81	90	1.5	98	0.056	97	94	29.6	-0.1	284	81	81	78	-0.036	5.5	0.1
113	16.479	16.771	0.14	0.14	0.97	90	2.15	0.81	90	1.5	98	0.056	96	94	29.6	0	285	81	81	78	-0.036	5.5	0.2
114	16.620	16.913	0.14	0.14	0.97	90	2.15	0.80	90	1.5	99	0.054	98	96	29.5	-0.1	286	81	81	79	-0.037	5.9	0.2
115	16.761	17.055	0.14	0.14	0.97	90	2.16	0.80	90	1.5	98	0.056	96	94	29.5	0	286	81	81	79	-0.037	5.8	0.2
116	16.901	17.196	0.14	0.14	0.96	90	2.17	0.79	90	1.5	98	0.054	97	95	29.4	-0.1	286	81	81	78	-0.036	5.5	0.2
117	17.042	17.337	0.14	0.14	0.96	90	2.19	0.79	90	1.5	98	0.057	95	93	29.4	0	286	81	81	78	-0.036	5.6	0.2
118	17.182	17.477	0.14	0.14	0.96	90	2.19	0.79	90	1.5	98	0.055	97	94	29.3	-0.1	286	81	81	79	-0.036	5.8	0.3
119	17.322	17.617	0.14	0.14	0.96	90	2.2	0.79	90	1.5	98	0.053	98	96	29.3	0	285	81	81	78	-0.035	5.3	0.2
120	17.463	17.757	0.14	0.14	0.95	90	2.2	0.79	90	1.5	98	0.057	95	92	29.2	-0.1	285	81	81	79	-0.036	5.2	0.1
121	17.603	17.897	0.14	0.14	0.95	90	2.2	0.79	90	1.6	98	0.055	97	94	29.2	0	284	81	81	78	-0.036	5.2	0.1
122	17.742	18.038	0.14	0.14	0.95	90	2.21	0.78	90	1.5	98	0.056	95	94	29.1	-0.1	285	81	81	78	-0.036	5.4	0.2
123	17.881	18.178	0.14	0.14	0.94	90	2.21	0.78	90	1.6	99	0.055	96	94	29.1	0	285	81	81	78	-0.036	5.5	0.2
124	18.020	18.317	0.14	0.14	0.94	90	2.23	0.77	90	1.6	99	0.054	97	94	29.0	-0.1	286	81	81	79	-0.036	5.6	0.3
125	18.158	18.456	0.14	0.14	0.94	90	2.23	0.77	90	1.6	99	0.055	95	93	28.9	-0.1	286	81	81	79	-0.037	5.6	0.2
126	18.297	18.595	0.14	0.14	0.93	90	2.24	0.77	90	1.6	99	0.055	96	93	28.9	0	286	81	81	79	-0.036	5.2	0.1
127	18.436	18.734	0.14	0.14	0.93	90	2.24	0.77	90	1.6	99	0.054	97	94	28.8	-0.1	287	81	81	78	-0.036	5.7	0.3
128	18.574	18.873	0.14	0.14	0.93	90	2.25	0.77	90	1.6	99	0.053	97	95	28.8	0	288	81	81	79	-0.036	6	0.3
129	18.711	19.010	0.14	0.14	0.92	90	2.26	0.77	90	1.6	99	0.054	95	93	28.7	-0.1	288	81	81	78	-0.036	5.8	0.3
130	18.849	19.148	0.14	0.14	0.92	90	2.26	0.76	90	1.6	99	0.054	96	93	28.6	-0.1	288	81	81	78	-0.036	5.4	0.2
131	18.986	19.286	0.14	0.14	0.92	90	2.26	0.76	90	1.6	99	0.055	95	93	28.6	0	288	81	81	78	-0.037	5.5	0.3
132	19.124	19.425	0.14	0.14	0.92	90	2.28	0.76	90	1.6	99	0.056	94	92	28.5	-0.1	288	81	81	78	-0.037	5.4	0.2
133	19.261	19.562	0.14	0.14	0.92	90	2.28	0.75	90	1.6	99	0.055	95	92	28.5	0	288	81	81	79	-0.037	5.6	0.2
134	19.397	19.699	0.14	0.14	0.91	90	2.29	0.75	90	1.6	99	0.054	95	93	28.4	-0.1	288	81	81	79	-0.036	5.7	0.2
135	19.534	19.837	0.14	0.14	0.91	90	2.3	0.75	90	1.6	99	0.054	95	93	28.4	0	288	81	81	79	-0.036	5.3	0.1
136	19.671	19.973	0.14	0.14	0.91	90	2.3	0.75	90	1.6	99	0.054	95	92	28.3	-0.1	287	81	81	79	-0.036	5.1	0.1
137	19.807	20.110	0.14	0.14	0.90	90	2.3	0.75	90	1.6	99	0.052	97	94	28.3	0	286	81	81	79	-0.036	5.3	0.1
138	19.943	20.246	0.14	0.14	0.90	90	2.31	0.75	90	1.6	99	0.055	94	91	28.3	0	286	81	81	79	-0.037	5.3	0.2
139	20.079	20.383	0.14	0.14	0.91	90	2.31	0.75	90	1.6	99	0.056	93	91	28.2	-0.1	286	81	81	78	-0.037	5.5	0.2

### Pellet Heater Test Data - ASTM E2779 / ASTM E2515

Run: 1

Manufacturer: Harman High Burn End Time: 62  
 Model: Allure 43 Medium Burn End Time: 184  
 Tracking No.: 2123 Total Sampling Time: 364 min  
 Project No.: 0135PS037E Recording Interval: 1 min  
 Test Date: 02-Sep-15  
 Beginning Clock Time: 10:12 Background Sample Volume: 69.113 cubic feet

Meter Box Y Factor: 1.001 (1) 1.003 (2) 1.009 (Amb)

Barometric Pressure: Begin Middle End Average  
29.99 29.98 29.98 29.98 "Hg

OMNI Equipment Numbers: 23, 131, 185, 132, 209, 291, 335, 336, 410, 420, 559

PM Control Modules:  
 Dilution Tunnel MW(dry): 29.00 lb/lb-mole  
 Dilution Tunnel MW(wet): 28.78 lb/lb-mole  
 Dilution Tunnel H2O: 2.00 percent  
 Dilution Tunnel Static: -0.490 "H2O  
 Tunnel Area: 0.19635 ft2  
 Pitot Tube Cp: 0.99

Avg. Tunnel Velocity: 13.39 ft/sec.  
 Initial Tunnel Flow: 140.0 scfm  
 Average Tunnel Flow: 145.4 scfm  
 Post-Test Leak Check (1): 0.001 cfm @ -1 in. Hg  
 Post-Test Leak Check (2): 0 cfm @ -1 in. Hg  
 Fuel Moisture: 5.1 Dry Basis %

Velocity Traverse Data										
	Pt.1	Pt.2	Pt.3	Pt.4	Pt.5	Pt.6	Pt.7	Pt.8	Center	
Initial dP	0.020	0.046	0.052	0.030	0.024	0.051	0.048	0.028	0.054	
Temp:	113	113	113	113	113	113	113	113	113	
V <sub>strav</sub>		13.47			ft/sec		V <sub>scent</sub>		16.03	
							F <sub>p</sub>		0.840	

Elapsed Time (min)	Particulate Sampling Data												Fuel Weight (lb)				Temperature Data (°F)				Stack Gas Data		
	Gas Meter 1 (ft³)	Gas Meter 2 (ft³)	Sample Rate 1 (cfm)	Sample Rate 2 (cfm)	Orifice dH 1 ("H₂O)	Meter Temp 1 (°F)	Meter Vacuum 1 ("Hg)	Orifice dH 2 ("H₂O)	Meter Temp 2 (°F)	Meter Vacuum 2 ("Hg)	Dilution Tunnel (°F)	Dilution Tunnel Center dP	Pro. Rate 1	Pro. Rate 2	Scale Reading	Weight Change	Stack	Filter 1	Filter 2	Ambient	Draft ("H₂O)	CO₂ (%)	CO (%)
140	20.216	20.519	0.14	0.14	0.90	90	2.32	0.74	90	1.6	99	0.054	95	92	28.1	-0.1	287	81	81	79	-0.036	5.3	0.1
141	20.352	20.655	0.14	0.14	0.89	90	2.32	0.74	90	1.6	99	0.054	95	92	28.1	0	286	81	81	79	-0.036	5	0.1
142	20.487	20.792	0.13	0.14	0.89	90	2.32	0.74	90	1.7	99	0.056	92	91	28.1	0	285	81	81	79	-0.036	5.1	0.1
143	20.622	20.928	0.14	0.14	0.90	90	2.33	0.74	90	1.7	99	0.054	94	92	28.0	-0.1	285	81	81	79	-0.035	5.1	0.1
144	20.758	21.063	0.14	0.13	0.89	90	2.33	0.74	90	1.7	99	0.056	93	90	27.9	-0.1	285	81	81	79	-0.036	5.1	0.1
145	20.893	21.199	0.14	0.14	0.89	90	2.34	0.73	90	1.7	99	0.055	93	91	27.9	0	286	81	81	78	-0.036	5.4	0.1
146	21.027	21.334	0.13	0.13	0.89	90	2.35	0.73	90	1.7	99	0.054	93	91	27.8	-0.1	287	81	81	79	-0.037	5.7	0.2
147	21.163	21.469	0.14	0.14	0.88	90	2.36	0.73	90	1.7	99	0.055	94	91	27.8	0	288	81	81	78	-0.036	5.5	0.2
148	21.297	21.605	0.13	0.14	0.88	90	2.36	0.73	90	1.7	99	0.053	94	93	27.7	-0.1	287	81	81	78	-0.036	5.2	0.2
149	21.431	21.739	0.13	0.13	0.88	90	2.36	0.73	90	1.7	99	0.054	93	91	27.7	0	287	81	81	79	-0.036	5.4	0.2
150	21.566	21.874	0.13	0.13	0.88	90	2.37	0.72	90	1.7	99	0.054	94	91	27.6	-0.1	288	81	81	78	-0.037	5.7	0.3
151	21.699	22.007	0.13	0.13	0.87	90	2.38	0.72	90	1.7	99	0.054	93	90	27.5	-0.1	289	81	81	79	-0.036	5.8	0.3
152	21.832	22.141	0.13	0.13	0.87	90	2.39	0.72	90	1.7	99	0.055	92	90	27.5	0	289	81	81	79	-0.036	5.6	0.2
153	21.967	22.276	0.13	0.14	0.87	90	2.4	0.72	90	1.7	99	0.054	94	91	27.4	-0.1	289	81	81	79	-0.036	5.6	0.3
154	22.099	22.409	0.13	0.13	0.86	90	2.4	0.71	90	1.7	99	0.052	94	92	27.4	0	289	81	81	79	-0.037	5.4	0.2
155	22.233	22.543	0.13	0.13	0.87	90	2.41	0.71	90	1.7	99	0.052	95	92	27.3	-0.1	289	81	81	79	-0.037	5.6	0.2
156	22.365	22.678	0.13	0.14	0.86	90	2.42	0.71	90	1.7	99	0.055	91	91	27.3	0	289	81	81	78	-0.037	5.9	0.4
157	22.498	22.810	0.13	0.13	0.86	90	2.41	0.71	90	1.7	99	0.052	94	91	27.2	-0.1	289	81	81	78	-0.036	5.9	0.3
158	22.631	22.943	0.13	0.13	0.85	91	2.43	0.71	90	1.7	99	0.054	92	90	27.1	-0.1	289	81	81	79	-0.037	5.4	0.3
159	22.762	23.079	0.13	0.14	0.86	91	2.43	0.71	90	1.7	99	0.055	90	91	27.1	0	290	81	81	78	-0.037	6	0.3
160	22.896	23.213	0.13	0.13	0.85	91	2.43	0.70	90	1.7	99	0.055	92	90	27.0	-0.1	290	81	81	78	-0.037	5.7	0.3
161	23.027	23.346	0.13	0.13	0.85	91	2.44	0.70	90	1.8	99	0.054	91	90	27.0	0	289	81	81	79	-0.036	5.4	0.2
162	23.159	23.482	0.13	0.14	0.85	91	2.44	0.69	90	1.8	99	0.056	90	90	26.9	-0.1	288	81	81	79	-0.037	5.4	0.2
163	23.290	23.616	0.13	0.13	0.84	91	2.46	0.70	90	1.8	99	0.053	92	92	26.9	0	288	81	81	79	-0.036	5.7	0.3
164	23.421	23.750	0.13	0.13	0.85	91	2.45	0.69	90	1.8	99	0.055	90	90	26.8	-0.1	287	81	81	79	-0.036	5.2	0.2
165	23.553	23.887	0.13	0.14	0.84	91	2.46	0.69	90	1.8	99	0.056	90	91	26.8	0	287	81	81	79	-0.036	5.3	0.2
166	23.684	24.025	0.13	0.14	0.84	91	2.47	0.69	90	1.8	99	0.055	90	93	26.7	-0.1	288	81	81	79	-0.037	5.6	0.3
167	23.816	24.161	0.13	0.14	0.83	91	2.48	0.69	90	1.8	99	0.053	93	93	26.6	-0.1	289	81	81	79	-0.037	5.7	0.3
168	23.946	24.292	0.13	0.13	0.83	91	2.48	0.68	90	1.8	99	0.052	92	90	26.6	0	289	81	81	79	-0.037	5.6	0.3
169	24.081	24.433	0.13	0.14	0.83	91	2.49	0.69	90	1.8	99	0.057	91	93	26.5	-0.1	290	81	81	79	-0.037	5.9	0.4
170	24.224	24.567	0.14	0.13	1.09	91	2.97	0.95	90	2.3	99	0.054	99	91	26.5	0	290	81	81	79	-0.038	5.8	0.4
171	24.373	24.704	0.15	0.14	1.09	91	2.98	0.98	90	2.3	99	0.057	101	90	26.4	-0.1	290	81	81	78	-0.037	5.8	0.3
172	24.522	24.859	0.15	0.16	1.08	91	2.99	0.98	90	2.3	99	0.054	104	105	26.3	-0.1	289	81	81	78	-0.037	5.4	0.2
173	24.672	25.015	0.15	0.16	1.08	91	2.99	0.97	90	2.3	99	0.053	105	107	26.3	0	288	81	81	78	-0.036	5.2	0.2
174	24.821	25.170	0.15	0.16	1.08	91	3	0.97	90	2.3	99	0.054	104	105	26.3	0	288	81	81	79	-0.037	5.5	0.3

### Pellet Heater Test Data - ASTM E2779 / ASTM E2515

Run: 1

Manufacturer: Harman High Burn End Time: 62  
 Model: Allure 43 Medium Burn End Time: 184  
 Tracking No.: 2123 Total Sampling Time: 364 min  
 Project No.: 0135PS037E Recording Interval: 1 min  
 Test Date: 02-Sep-15  
 Beginning Clock Time: 10:12 Background Sample Volume: 69.113 cubic feet

Meter Box Y Factor: 1.001 (1) 1.003 (2) 1.009 (Amb)

Barometric Pressure: Begin Middle End Average  
29.99 29.98 29.98 29.98 "Hg

OMNI Equipment Numbers: 23, 131, 185, 132, 209, 291, 335, 336, 410, 420, 559

PM Control Modules:  
 Dilution Tunnel MW(dry): 29.00 lb/lb-mole  
 Dilution Tunnel MW(wet): 28.78 lb/lb-mole  
 Dilution Tunnel H2O: 2.00 percent  
 Dilution Tunnel H2O: -0.490 "H2O  
 Tunnel Area: 0.19635 ft2  
 Pitot Tube Cp: 0.99

Avg. Tunnel Velocity: 13.39 ft/sec.  
 Initial Tunnel Flow: 140.0 scfm  
 Average Tunnel Flow: 145.4 scfm  
 Post-Test Leak Check (1): 0.001 cfm @ -1 in. Hg  
 Post-Test Leak Check (2): 0 cfm @ -1 in. Hg  
 Fuel Moisture: 5.1 Dry Basis %

Velocity Traverse Data									
	Pt.1	Pt.2	Pt.3	Pt.4	Pt.5	Pt.6	Pt.7	Pt.8	Center
Initial dP	0.020	0.046	0.052	0.030	0.024	0.051	0.048	0.028	0.054
Temp:	113	113	113	113	113	113	113	113	113
V <sub>strav</sub>		13.47		ft/sec		V <sub>scent</sub>		16.03	
						F <sub>p</sub>		0.840	

Elapsed Time (min)	Particulate Sampling Data												Fuel Weight (lb)				Temperature Data (°F)				Stack Gas Data		
	Gas Meter 1 (ft³)	Gas Meter 2 (ft³)	Sample Rate 1 (cfm)	Sample Rate 2 (cfm)	Orifice dH 1 ("H <sub>2</sub> O)	Meter Temp 1 (°F)	Meter Vacuum 1 ("Hg)	Orifice dH 2 ("H <sub>2</sub> O)	Meter Temp 2 (°F)	Meter Vacuum 2 ("Hg)	Dilution Tunnel (°F)	Dilution Tunnel Center dP	Pro. Rate 1	Pro. Rate 2	Scale Reading	Weight Change	Stack	Filter 1	Filter 2	Ambient	Draft ("H <sub>2</sub> O)	CO <sub>2</sub> (%)	CO (%)
175	24.969	25.326	0.15	0.16	1.07	91	3.01	0.97	90	2.4	99	0.054	103	106	26.2	-0.1	288	81	81	79	-0.037	5.9	0.4
176	25.118	25.480	0.15	0.15	1.07	91	3.02	0.97	90	2.4	99	0.053	105	105	26.1	-0.1	288	81	81	79	-0.036	5.6	0.3
177	25.267	25.635	0.15	0.16	1.07	91	3.02	0.97	90	2.4	99	0.056	102	103	26.1	0	288	81	81	79	-0.037	5.7	0.3
178	25.414	25.790	0.15	0.15	1.07	91	3.03	0.97	91	2.4	99	0.053	103	106	26.0	-0.1	288	81	81	79	-0.037	5.5	0.2
179	25.562	25.944	0.15	0.15	1.07	91	3.04	0.96	91	2.4	99	0.056	101	102	26.0	0	289	81	81	79	-0.037	5.9	0.3
180	25.710	26.098	0.15	0.15	1.06	91	3.05	0.96	90	2.4	99	0.055	102	103	25.9	-0.1	289	81	81	79	-0.036	5.7	0.3
181	25.858	26.252	0.15	0.15	1.05	91	3.05	0.96	90	2.4	99	0.055	102	103	25.8	-0.1	289	81	81	79	-0.036	5.4	0.3
182	26.006	26.407	0.15	0.16	1.06	91	3.06	0.95	90	2.4	100	0.057	100	102	25.8	0	289	81	81	79	-0.037	5.6	0.2
183	26.152	26.560	0.15	0.15	1.06	91	3.07	0.95	90	2.4	100	0.056	100	102	52.5	26.7	289	81	81	78	-0.037	5.3	0.2
184	26.299	26.715	0.15	0.16	1.05	91	3.07	0.95	90	2.4	99	0.056	100	103	25.7	-26.8	287	81	81	78	-0.036	5.2	0.3
185	26.447	26.868	0.15	0.15	1.05	91	3.08	0.95	90	2.4	99	0.054	103	104	25.6	-0.1	286	81	81	79	-0.037	6.2	0.5
186	26.594	27.021	0.15	0.15	1.04	91	3.1	0.94	91	2.4	99	0.055	101	102	25.6	0	285	81	81	78	-0.037	5.8	0.4
187	26.741	27.175	0.15	0.15	1.04	91	3.09	0.94	91	2.4	99	0.054	102	104	25.5	-0.1	285	81	81	78	-0.037	5.7	0.5
188	26.886	27.327	0.15	0.15	1.05	91	3.11	0.94	91	2.4	99	0.052	103	105	25.5	0	287	81	81	79	-0.038	5.8	0.4
189	27.032	27.480	0.15	0.15	1.05	91	3.11	0.93	91	2.5	99	0.055	101	102	25.4	-0.1	287	81	81	79	-0.037	6.1	0.8
190	27.178	27.632	0.15	0.15	1.04	91	3.11	0.94	91	2.5	99	0.054	101	103	25.3	-0.1	289	81	81	79	-0.038	5.8	0.4
191	27.325	27.785	0.15	0.15	1.04	91	3.11	0.94	91	2.5	98	0.054	102	103	25.3	0	290	81	81	78	-0.038	5.3	0.1
192	27.472	27.938	0.15	0.15	1.03	91	3.11	0.94	91	2.5	98	0.056	100	101	25.3	0	291	81	81	78	-0.038	4.6	0
193	27.618	28.090	0.15	0.15	1.04	91	3.11	0.94	91	2.5	98	0.054	101	103	25.2	-0.1	291	81	81	79	-0.039	3.9	0
194	27.764	28.243	0.15	0.15	1.04	91	3.11	0.94	91	2.5	98	0.053	102	104	25.2	0	291	81	81	79	-0.038	3.8	0
195	27.909	28.397	0.15	0.15	1.04	91	3.11	0.94	91	2.5	99	0.054	101	104	25.2	0	290	81	81	79	-0.039	3.8	0
196	28.055	28.548	0.15	0.15	1.04	91	3.12	0.94	91	2.5	99	0.054	101	102	25.1	-0.1	290	81	81	79	-0.038	3.8	0
197	28.202	28.701	0.15	0.15	1.03	91	3.11	0.93	91	2.5	99	0.054	102	103	25.1	0	290	81	81	79	-0.038	3.6	0
198	28.348	28.854	0.15	0.15	1.03	91	3.11	0.94	91	2.5	99	0.053	102	104	25.1	0	290	81	81	79	-0.038	3.6	0
199	28.495	29.006	0.15	0.15	1.04	91	3.11	0.94	91	2.5	99	0.054	102	103	25.1	0	290	81	81	79	-0.038	3.4	0
200	28.641	29.159	0.15	0.15	1.04	91	3.11	0.94	91	2.5	99	0.055	101	102	25.0	-0.1	288	81	81	79	-0.037	2.9	0
201	28.786	29.311	0.15	0.15	1.04	91	3.11	0.94	91	2.5	99	0.055	100	102	25.0	0	287	81	81	79	-0.037	3.1	0
202	28.932	29.464	0.15	0.15	1.04	91	3.12	0.94	91	2.5	99	0.054	101	103	25.0	0	285	81	81	79	-0.037	2.7	0.1
203	29.079	29.617	0.15	0.15	1.04	91	3.11	0.93	91	2.5	99	0.054	102	103	25.0	0	284	81	81	79	-0.036	2.7	0.1
204	29.225	29.769	0.15	0.15	1.03	91	3.12	0.93	91	2.5	98	0.055	100	102	24.9	-0.1	282	81	81	79	-0.037	2.5	0.1
205	29.371	29.922	0.15	0.15	1.03	91	3.11	0.93	91	2.5	98	0.055	100	102	24.9	0	280	81	81	79	-0.036	2.7	0.1
206	29.518	30.075	0.15	0.15	1.03	91	3.11	0.94	91	2.5	98	0.054	102	103	24.9	0	279	81	81	79	-0.036	3	0
207	29.663	30.227	0.15	0.15	1.04	91	3.11	0.93	91	2.5	98	0.055	100	102	24.9	0	279	81	81	79	-0.035	3.1	0
208	29.809	30.380	0.15	0.15	1.04	91	3.12	0.93	91	2.5	98	0.055	100	102	24.8	-0.1	278	81	81	79	-0.035	3.6	0
209	29.955	30.532	0.15	0.15	1.03	91	3.12	0.93	91	2.5	98	0.054	101	103	24.8	0	277	81	81	79	-0.035	3.4	0

### Pellet Heater Test Data - ASTM E2779 / ASTM E2515

Run: 1

Manufacturer: Harman  
 Model: Allure 43  
 Tracking No.: 2123  
 Project No.: 0135PS037E  
 Test Date: 02-Sep-15  
 Beginning Clock Time: 10:12

High Burn End Time: 62  
 Medium Burn End Time: 184  
 Total Sampling Time: 364 min  
 Recording Interval: 1 min

Background Sample Volume: 69.113 cubic feet

Meter Box Y Factor: 1.001 (1) 1.003 (2) 1.009 (Amb)

Barometric Pressure: Begin Middle End Average  
29.99 29.98 29.98 29.98 "Hg

OMNI Equipment Numbers: 23, 131, 185, 132, 209, 291, 335, 336, 410, 420, 559

PM Control Modules:  
 Dilution Tunnel MW(dry): 29.00 lb/lb-mole  
 Dilution Tunnel MW(wet): 28.78 lb/lb-mole  
 Dilution Tunnel H2O: 2.00 percent  
 Dilution Tunnel Status: -0.490 "H2O  
 Tunnel Area: 0.19635 ft2  
 Pitot Tube Cp: 0.99

Avg. Tunnel Velocity: 13.39 ft/sec.  
 Initial Tunnel Flow: 140.0 scfm  
 Average Tunnel Flow: 145.4 scfm  
 Post-Test Leak Check (1): 0.001 cfm @ -1 in. Hg  
 Post-Test Leak Check (2): 0 cfm @ -1 in. Hg  
 Fuel Moisture: 5.1 Dry Basis %

Velocity Traverse Data									
	Pt.1	Pt.2	Pt.3	Pt.4	Pt.5	Pt.6	Pt.7	Pt.8	Center
Initial dP	0.020	0.046	0.052	0.030	0.024	0.051	0.048	0.028	0.054
Temp:	113	113	113	113	113	113	113	113	113
V <sub>strav</sub>		13.47		ft/sec		V <sub>scent</sub>		16.03	
						F <sub>p</sub>		0.840	

Elapsed Time (min)	Particulate Sampling Data												Fuel Weight (lb)		Temperature Data (°F)				Stack Gas Data				
	Gas Meter 1 (ft³)	Gas Meter 2 (ft³)	Sample Rate 1 (cfm)	Sample Rate 2 (cfm)	Orifice dH 1 ("H₂O)	Meter Temp 1 (°F)	Meter Vacuum 1 ("Hg)	Orifice dH 2 ("H₂O)	Meter Temp 2 (°F)	Meter Vacuum 2 ("Hg)	Dilution Tunnel (°F)	Dilution Tunnel Center dP	Pro. Rate 1	Pro. Rate 2	Scale Reading	Weight Change	Stack	Filter 1	Filter 2	Ambient	Draft ("H₂O)	CO₂ (%)	CO (%)
210	30.101	30.684	0.15	0.15	1.03	91	3.12	0.94	91	2.5	98	0.055	100	102	24.8	0	276	81	81	79	-0.036	3.8	0.1
211	30.247	30.837	0.15	0.15	1.03	91	3.12	0.93	91	2.5	98	0.055	100	102	24.7	-0.1	276	81	81	79	-0.036	3.9	0.1
212	30.393	30.989	0.15	0.15	1.03	91	3.13	0.93	91	2.5	98	0.054	101	103	24.7	0	277	81	82	79	-0.036	4.5	0.1
213	30.539	31.141	0.15	0.15	1.03	91	3.14	0.93	91	2.5	98	0.055	100	102	24.6	-0.1	277	81	81	79	-0.036	4.5	0.2
214	30.684	31.293	0.15	0.15	1.03	91	3.13	0.93	91	2.5	98	0.056	99	101	24.6	0	278	81	81	79	-0.036	4.7	0.2
215	30.829	31.445	0.15	0.15	1.03	91	3.14	0.93	91	2.5	98	0.055	100	102	24.6	0	279	81	81	79	-0.036	4.7	0.3
216	30.975	31.597	0.15	0.15	1.03	91	3.15	0.93	91	2.5	98	0.053	102	104	24.5	-0.1	280	81	81	79	-0.037	4.6	0.2
217	31.121	31.749	0.15	0.15	1.02	91	3.14	0.93	91	2.5	98	0.056	100	101	24.5	0	281	81	81	79	-0.037	4.6	0.1
218	31.266	31.901	0.15	0.15	1.03	91	3.15	0.93	91	2.5	99	0.055	100	102	24.4	-0.1	282	81	82	79	-0.036	4.4	0.1
219	31.412	32.053	0.15	0.15	1.02	91	3.15	0.92	91	2.5	99	0.055	101	102	24.4	0	282	81	81	78	-0.037	4.3	0.1
220	31.558	32.205	0.15	0.15	1.02	91	3.15	0.93	91	2.5	99	0.055	101	102	24.3	-0.1	283	81	81	78	-0.037	4.4	0.1
221	31.703	32.356	0.15	0.15	1.03	91	3.15	0.93	91	2.5	99	0.055	100	101	24.3	0	283	81	81	79	-0.036	4.2	0.1
222	31.847	32.508	0.14	0.15	1.03	91	3.15	0.92	91	2.5	98	0.056	98	101	24.3	0	283	81	82	79	-0.037	4.1	0
223	31.993	32.660	0.15	0.15	1.03	91	3.16	0.92	91	2.5	99	0.055	101	102	24.2	-0.1	283	81	82	79	-0.037	4	0
224	32.138	32.811	0.15	0.15	1.03	91	3.15	0.93	91	2.5	99	0.056	99	100	24.2	0	284	81	82	79	-0.037	4.2	0.1
225	32.284	32.963	0.15	0.15	1.02	91	3.16	0.93	91	2.5	99	0.054	101	103	24.2	0	283	81	82	79	-0.037	3.4	0
226	32.429	33.115	0.15	0.15	1.02	91	3.16	0.92	91	2.5	99	0.054	101	103	24.1	-0.1	283	81	82	79	-0.037	3.3	0
227	32.575	33.267	0.15	0.15	1.02	91	3.16	0.93	91	2.5	99	0.055	101	102	24.1	0	283	81	82	79	-0.037	3	0
228	32.720	33.418	0.14	0.15	1.02	91	3.15	0.92	91	2.5	99	0.054	101	102	24.1	0	283	81	82	79	-0.037	3.3	0
229	32.866	33.570	0.15	0.15	1.03	91	3.15	0.92	91	2.5	99	0.053	102	104	24.1	0	283	81	82	79	-0.037	3.6	0
230	33.010	33.722	0.14	0.15	1.03	91	3.15	0.93	91	2.5	99	0.054	100	103	24.0	-0.1	283	81	82	79	-0.036	3.2	0
231	33.155	33.873	0.15	0.15	1.02	91	3.16	0.92	91	2.5	99	0.056	99	100	24.0	0	282	81	82	78	-0.037	2.7	0
232	33.300	34.025	0.14	0.15	1.02	91	3.15	0.92	91	2.5	99	0.054	101	103	24.0	0	281	81	82	78	-0.036	3.3	0
233	33.446	34.177	0.15	0.15	1.02	91	3.16	0.92	91	2.5	99	0.053	102	104	23.9	-0.1	280	81	82	78	-0.036	3.6	0
234	33.591	34.328	0.15	0.15	1.02	91	3.16	0.92	91	2.5	98	0.055	100	101	23.9	0	279	81	82	79	-0.036	3.2	0
235	33.737	34.480	0.15	0.15	1.02	91	3.16	0.92	91	2.5	98	0.055	100	102	23.9	0	278	81	82	79	-0.035	3.6	0
236	33.882	34.632	0.14	0.15	1.02	91	3.17	0.92	91	2.5	98	0.053	102	104	23.9	0	277	81	82	79	-0.036	3.8	0
237	34.027	34.782	0.15	0.15	1.02	91	3.16	0.92	91	2.5	98	0.054	101	101	23.8	-0.1	277	81	82	79	-0.036	4	0.1
238	34.172	34.934	0.14	0.15	1.02	91	3.16	0.92	91	2.5	98	0.056	99	101	23.8	0	278	81	82	79	-0.036	4.3	0.1
239	34.316	35.086	0.14	0.15	1.02	91	3.16	0.92	91	2.5	98	0.056	98	101	23.7	-0.1	278	81	82	79	-0.036	4.2	0.1
240	34.461	35.237	0.14	0.15	1.02	91	3.17	0.92	91	2.5	98	0.055	100	101	23.7	0	279	81	82	79	-0.036	4.2	0.1
241	34.606	35.388	0.15	0.15	1.02	91	3.17	0.92	91	2.5	99	0.057	98	99	23.7	0	279	81	82	79	-0.036	4.6	0.2
242	34.751	35.540	0.14	0.15	1.02	91	3.17	0.92	91	2.5	99	0.057	98	100	23.6	-0.1	280	81	82	79	-0.036	4.3	0.1
243	34.896	35.690	0.15	0.15	1.02	91	3.17	0.92	91	2.5	99	0.054	101	101	23.6	0	280	81	82	79	-0.037	4.3	0.1
244	35.041	35.842	0.14	0.15	1.01	91	3.18	0.92	91	2.5	99	0.055	100	102	23.5	-0.1	281	81	82	79	-0.037	4.6	0.1

### Pellet Heater Test Data - ASTM E2779 / ASTM E2515

Run: 1

Manufacturer: Harman High Burn End Time: 62  
 Model: Allure 43 Medium Burn End Time: 184  
 Tracking No.: 2123 Total Sampling Time: 364 min  
 Project No.: 0135PS037E Recording Interval: 1 min  
 Test Date: 02-Sep-15  
 Beginning Clock Time: 10:12 Background Sample Volume: 69.113 cubic feet

Meter Box Y Factor: 1.001 (1) 1.003 (2) 1.009 (Amb)

Barometric Pressure: Begin Middle End Average  
29.99 29.98 29.98 29.98 "Hg

OMNI Equipment Numbers: 23, 131, 185, 132, 209, 291, 335, 336, 410, 420, 559

PM Control Modules:

Dilution Tunnel MW (dry): 29.00 lb/lb-mole  
 Dilution Tunnel MW (wet): 28.78 lb/lb-mole  
 Dilution Tunnel H2O: 2.00 percent  
 Dilution Tunnel Status: -0.490 "H2O  
 Tunnel Area: 0.19635 ft2  
 Pitot Tube Cp: 0.99

Avg. Tunnel Velocity: 13.39 ft/sec.  
 Initial Tunnel Flow: 140.0 scfm  
 Average Tunnel Flow: 145.4 scfm  
 Post-Test Leak Check (1): 0.001 cfm @ -1 in. Hg  
 Post-Test Leak Check (2): 0 cfm @ -1 in. Hg  
 Fuel Moisture: 5.1 Dry Basis %

Velocity Traverse Data									
	Pt.1	Pt.2	Pt.3	Pt.4	Pt.5	Pt.6	Pt.7	Pt.8	Center
Initial dP	0.020	0.046	0.052	0.030	0.024	0.051	0.048	0.028	0.054
Temp:	113	113	113	113	113	113	113	113	113
V <sub>strav</sub>		13.47		ft/sec		V <sub>scent</sub>		16.03	
						F <sub>p</sub>		0.840	

Elapsed Time (min)	Particulate Sampling Data												Fuel Weight (lb)				Temperature Data (°F)				Stack Gas Data		
	Gas Meter 1 (ft³)	Gas Meter 2 (ft³)	Sample Rate 1 (cfm)	Sample Rate 2 (cfm)	Orifice dH 1 ("H <sub>2</sub> O)	Meter Temp 1 (°F)	Meter Vacuum 1 ("Hg)	Orifice dH 2 ("H <sub>2</sub> O)	Meter Temp 2 (°F)	Meter Vacuum 2 ("Hg)	Dilution Tunnel (°F)	Dilution Tunnel Center dP	Pro. Rate 1	Pro. Rate 2	Scale Reading	Weight Change	Stack	Filter 1	Filter 2	Ambient	Draft ("H <sub>2</sub> O)	CO <sub>2</sub> (%)	CO (%)
245	35.186	35.993	0.15	0.15	1.01	91	3.18	0.91	91	2.5	99	0.055	100	101	23.5	0	281	81	82	79	-0.037	4.4	0.1
246	35.331	36.144	0.15	0.15	1.02	91	3.18	0.92	91	2.5	99	0.055	100	101	23.5	0	282	81	82	79	-0.037	4.8	0.2
247	35.475	36.294	0.14	0.15	1.01	91	3.18	0.92	91	2.5	99	0.054	100	101	23.4	-0.1	283	81	82	78	-0.037	4.7	0.2
248	35.620	36.445	0.14	0.15	1.02	91	3.18	0.91	91	2.5	99	0.054	101	102	23.4	0	284	81	82	79	-0.037	4.5	0.1
249	35.764	36.597	0.14	0.15	1.02	91	3.18	0.91	91	2.5	98	0.056	98	101	23.3	-0.1	284	81	82	79	-0.037	4.3	0
250	35.908	36.747	0.14	0.15	1.02	91	3.19	0.92	91	2.5	99	0.054	100	101	23.3	0	285	81	82	79	-0.038	3.8	0
251	36.053	36.898	0.14	0.15	1.02	91	3.19	0.91	91	2.5	99	0.055	100	101	23.3	0	285	81	82	79	-0.037	4	0
252	36.197	37.049	0.14	0.15	1.02	91	3.18	0.91	91	2.5	99	0.054	100	102	23.2	-0.1	285	81	82	79	-0.037	3.6	0
253	36.342	37.200	0.14	0.15	1.01	91	3.18	0.92	91	2.5	99	0.054	101	102	23.2	0	284	81	82	79	-0.037	3.4	0
254	36.486	37.350	0.14	0.15	1.01	91	3.18	0.92	91	2.5	99	0.054	100	101	23.2	0	284	81	82	79	-0.037	2.9	0
255	36.631	37.502	0.15	0.15	1.01	91	3.19	0.91	91	2.5	99	0.055	100	102	23.2	0	283	81	82	79	-0.037	2.6	0.1
256	36.776	37.653	0.15	0.15	1.01	91	3.18	0.91	91	2.5	99	0.057	98	99	23.1	-0.1	282	81	82	79	-0.037	2.9	0
257	36.920	37.803	0.14	0.15	1.01	91	3.19	0.92	91	2.5	99	0.057	97	99	23.1	0	281	81	82	79	-0.037	3.1	0
258	37.065	37.954	0.14	0.15	1.01	91	3.18	0.91	91	2.5	98	0.055	100	101	23.1	0	280	81	82	79	-0.037	4	0.1
259	37.209	38.105	0.14	0.15	1.01	91	3.18	0.91	91	2.5	98	0.056	98	100	23.0	-0.1	280	81	82	79	-0.036	3.7	0
260	37.353	38.255	0.14	0.15	1.02	91	3.18	0.91	91	2.5	98	0.056	98	99	23.0	0	279	81	82	79	-0.036	3.6	0
261	37.497	38.406	0.14	0.15	1.01	91	3.19	0.91	91	2.5	98	0.054	100	102	22.9	-0.1	279	81	82	79	-0.036	3.9	0
262	37.642	38.557	0.15	0.15	1.01	91	3.19	0.91	91	2.5	98	0.056	99	100	22.9	0	279	81	82	79	-0.036	4.1	0.1
263	37.786	38.708	0.14	0.15	1.01	91	3.2	0.91	91	2.5	98	0.055	99	101	22.9	0	279	81	82	79	-0.036	4.5	0.1
264	37.930	38.858	0.14	0.15	1.01	91	3.19	0.91	91	2.5	98	0.056	98	99	22.8	-0.1	279	81	82	79	-0.037	4.2	0.1
265	38.074	39.008	0.14	0.15	1.01	91	3.2	0.91	91	2.5	98	0.054	100	101	22.8	0	280	81	82	79	-0.037	4.8	0.3
266	38.218	39.159	0.14	0.15	1.00	91	3.21	0.91	91	2.6	98	0.056	98	100	22.8	0	281	81	82	80	-0.037	4.7	0.2
267	38.362	39.309	0.14	0.15	1.00	91	3.2	0.91	91	2.6	98	0.054	100	101	22.7	-0.1	281	81	82	79	-0.037	4.7	0.2
268	38.507	39.459	0.14	0.15	1.00	91	3.21	0.91	91	2.6	98	0.056	99	99	22.7	0	282	81	82	80	-0.037	4.6	0.1
269	38.651	39.609	0.14	0.15	1.00	91	3.2	0.91	91	2.6	98	0.054	100	101	22.6	-0.1	283	81	82	79	-0.037	4.8	0.3
270	38.795	39.760	0.14	0.15	1.00	91	3.21	0.91	91	2.6	99	0.055	99	101	22.6	0	283	81	82	79	-0.037	4.6	0.2
271	38.939	39.910	0.14	0.15	1.01	91	3.2	0.91	91	2.6	99	0.055	99	100	22.5	-0.1	284	81	82	79	-0.037	4.2	0.1
272	39.083	40.060	0.14	0.15	1.01	91	3.21	0.91	91	2.6	99	0.056	98	100	22.5	0	285	81	82	79	-0.038	4.2	0
273	39.227	40.211	0.14	0.15	1.01	91	3.21	0.90	91	2.6	99	0.054	100	102	22.5	0	286	81	82	79	-0.037	4.1	0.1
274	39.370	40.362	0.14	0.15	1.01	91	3.21	0.90	91	2.6	99	0.054	99	102	22.4	-0.1	286	81	82	79	-0.038	3.3	0
275	39.514	40.511	0.14	0.15	1.01	91	3.21	0.91	91	2.6	99	0.055	99	100	22.4	0	286	81	82	79	-0.037	3.3	0
276	39.658	40.661	0.14	0.15	1.00	91	3.21	0.90	91	2.6	99	0.054	100	101	22.4	0	284	81	82	79	-0.037	2.7	0.1
277	39.802	40.812	0.14	0.15	1.01	91	3.21	0.90	91	2.6	99	0.056	98	100	22.4	0	283	81	82	79	-0.037	2.8	0
278	39.946	40.963	0.14	0.15	1.01	91	3.21	0.90	91	2.6	99	0.057	97	99	22.3	-0.1	282	81	82	79	-0.036	2.9	0
279	40.089	41.112	0.14	0.15	1.01	91	3.21	0.90	91	2.6	99	0.053	100	102	22.3	0	280	81	82	80	-0.036	2.6	0

### Pellet Heater Test Data - ASTM E2779 / ASTM E2515

Run: 1

Manufacturer: Harman High Burn End Time: 62  
 Model: Allure 43 Medium Burn End Time: 184  
 Tracking No.: 2123 Total Sampling Time: 364 min  
 Project No.: 0135PS037E Recording Interval: 1 min  
 Test Date: 02-Sep-15  
 Beginning Clock Time: 10:12 Background Sample Volume: 69.113 cubic feet

Meter Box Y Factor: 1.001 (1) 1.003 (2) 1.009 (Amb)

Barometric Pressure: Begin Middle End Average  
29.99 29.98 29.98 29.98 "Hg

OMNI Equipment Numbers: 23, 131, 185, 132, 209, 291, 335, 336, 410, 420, 559

PM Control Modules:  
 Dilution Tunnel MW(dry): 29.00 lb/lb-mole  
 Dilution Tunnel MW(wet): 28.78 lb/lb-mole  
 Dilution Tunnel H2O: 2.00 percent  
 Dilution Tunnel Status: -0.490 "H2O  
 Tunnel Area: 0.19635 ft2  
 Pitot Tube Cp: 0.99

Avg. Tunnel Velocity: 13.39 ft/sec.  
 Initial Tunnel Flow: 140.0 scfm  
 Average Tunnel Flow: 145.4 scfm  
 Post-Test Leak Check (1): 0.001 cfm @ -1 in. Hg  
 Post-Test Leak Check (2): 0 cfm @ -1 in. Hg  
 Fuel Moisture: 5.1 Dry Basis %

Velocity Traverse Data									
	Pt.1	Pt.2	Pt.3	Pt.4	Pt.5	Pt.6	Pt.7	Pt.8	Center
Initial dP	0.020	0.046	0.052	0.030	0.024	0.051	0.048	0.028	0.054
Temp:	113	113	113	113	113	113	113	113	113
V <sub>strav</sub>		13.47		ft/sec		V <sub>scent</sub>		16.03	
						F <sub>p</sub>		0.840	

Elapsed Time (min)	Particulate Sampling Data												Fuel Weight (lb)				Temperature Data (°F)				Stack Gas Data		
	Gas Meter 1 (ft³)	Gas Meter 2 (ft³)	Sample Rate 1 (cfm)	Sample Rate 2 (cfm)	Orifice dH 1 ("H₂O)	Meter Temp 1 (°F)	Meter Vacuum 1 ("Hg)	Orifice dH 2 ("H₂O)	Meter Temp 2 (°F)	Meter Vacuum 2 ("Hg)	Dilution Tunnel (°F)	Dilution Tunnel Center dP	Pro. Rate 1	Pro. Rate 2	Scale Reading	Weight Change	Stack	Filter 1	Filter 2	Ambient	Draft ("H₂O)	CO₂ (%)	CO (%)
280	40.234	41.263	0.15	0.15	1.00	91	3.21	0.90	91	2.6	99	0.055	100	101	22.3	0	278	81	82	79	-0.035	2.9	0
281	40.378	41.413	0.14	0.15	1.00	91	3.21	0.90	91	2.6	99	0.055	99	100	22.3	0	277	81	82	79	-0.035	3	0
282	40.521	41.563	0.14	0.15	1.00	91	3.21	0.91	91	2.6	98	0.054	99	101	22.2	-0.1	276	81	82	80	-0.035	3.8	0
283	40.665	41.713	0.14	0.15	1.00	91	3.22	0.91	91	2.6	99	0.057	97	99	22.2	0	276	81	82	79	-0.036	4.2	0.2
284	40.809	41.863	0.14	0.15	1.00	91	3.22	0.90	91	2.6	98	0.055	99	100	22.1	-0.1	276	81	82	80	-0.036	4.2	0.1
285	40.953	42.014	0.14	0.15	1.00	91	3.22	0.90	91	2.6	98	0.057	97	99	22.1	0	276	81	82	79	-0.035	4.2	0.1
286	41.097	42.164	0.14	0.15	1.00	91	3.22	0.91	91	2.6	98	0.055	99	100	22.1	0	276	81	82	79	-0.036	4.2	0.1
287	41.240	42.313	0.14	0.15	1.00	91	3.22	0.91	91	2.6	98	0.056	98	99	22.0	-0.1	276	81	82	79	-0.036	4.4	0.2
288	41.384	42.464	0.14	0.15	1.00	91	3.22	0.90	91	2.6	98	0.056	98	100	22.0	0	277	81	82	80	-0.035	4.3	0.2
289	41.528	42.614	0.14	0.15	1.00	91	3.22	0.90	91	2.6	98	0.056	98	99	21.9	-0.1	278	81	82	80	-0.036	4.5	0.2
290	41.671	42.764	0.14	0.15	1.00	91	3.22	0.90	91	2.6	98	0.054	99	101	21.9	0	279	81	82	79	-0.036	4.6	0.2
291	41.815	42.913	0.14	0.15	1.00	91	3.23	0.90	91	2.6	98	0.056	98	99	21.9	0	279	81	82	79	-0.037	4.6	0.2
292	41.958	43.063	0.14	0.15	1.00	91	3.23	0.90	91	2.6	98	0.057	97	99	21.8	-0.1	280	81	82	79	-0.037	4.7	0.2
293	42.101	43.214	0.14	0.15	1.00	91	3.23	0.90	91	2.6	99	0.055	98	101	21.8	0	281	81	82	80	-0.037	4.6	0.2
294	42.245	43.363	0.14	0.15	1.00	91	3.22	0.90	91	2.6	99	0.053	101	102	21.7	-0.1	282	81	82	79	-0.037	4.8	0.2
295	42.388	43.513	0.14	0.15	1.00	91	3.23	0.90	91	2.6	99	0.054	99	101	21.7	0	282	81	82	79	-0.037	4.7	0.2
296	42.532	43.663	0.14	0.15	1.00	91	3.23	0.90	91	2.6	99	0.052	102	103	21.6	-0.1	283	81	82	79	-0.038	4.8	0.3
297	42.675	43.813	0.14	0.15	1.00	91	3.24	0.90	91	2.6	99	0.053	100	102	21.6	0	285	81	82	79	-0.037	4.7	0.1
298	42.818	43.962	0.14	0.15	1.00	91	3.24	0.90	91	2.6	99	0.055	98	100	21.5	-0.1	286	81	82	79	-0.037	4.7	0.1
299	42.961	44.111	0.14	0.15	1.00	91	3.23	0.89	91	2.6	99	0.053	100	102	21.5	0	287	81	82	79	-0.037	4.2	0
300	43.104	44.261	0.14	0.15	0.99	91	3.24	0.90	91	2.6	99	0.055	98	100	21.5	0	287	82	82	79	-0.037	4	0.1
301	43.248	44.411	0.14	0.15	1.00	91	3.23	0.90	91	2.6	99	0.055	99	100	21.5	0	286	82	82	79	-0.037	3.5	0
302	43.391	44.561	0.14	0.15	0.99	91	3.24	0.90	91	2.6	99	0.053	100	102	21.5	0	286	82	82	80	-0.037	3.8	0
303	43.534	44.710	0.14	0.15	0.99	92	3.24	0.90	91	2.6	99	0.056	97	99	21.4	-0.1	285	82	82	80	-0.037	3.7	0
304	43.678	44.859	0.14	0.15	0.99	92	3.24	0.89	91	2.6	99	0.055	99	100	21.4	0	284	82	82	79	-0.037	3.3	0
305	43.821	45.009	0.14	0.15	0.99	91	3.24	0.89	91	2.6	99	0.054	99	101	21.3	-0.1	283	82	82	80	-0.037	3	0
306	43.964	45.159	0.14	0.15	0.99	92	3.24	0.89	91	2.6	99	0.054	99	101	21.3	0	282	82	82	80	-0.036	3.1	0
307	44.107	45.307	0.14	0.15	0.99	92	3.23	0.90	91	2.6	99	0.055	98	99	21.3	0	282	82	82	80	-0.036	2.7	0
308	44.250	45.457	0.14	0.15	0.99	92	3.24	0.89	91	2.6	99	0.053	100	102	21.3	0	280	82	82	80	-0.036	3	0
309	44.394	45.607	0.14	0.15	0.99	92	3.24	0.89	91	2.6	99	0.054	100	101	21.2	-0.1	280	82	82	80	-0.036	2.9	0
310	44.537	45.756	0.14	0.15	0.98	92	3.24	0.89	91	2.6	99	0.054	99	101	21.2	0	279	82	82	79	-0.036	3.6	0
311	44.680	45.905	0.14	0.15	0.99	92	3.25	0.89	91	2.6	99	0.054	99	101	21.2	0	278	82	82	79	-0.037	3.9	0.1
312	44.823	46.054	0.14	0.15	0.99	92	3.24	0.90	91	2.6	99	0.053	100	102	21.1	-0.1	278	82	82	80	-0.036	4.1	0.1
313	44.966	46.204	0.14	0.15	0.99	92	3.25	0.90	91	2.6	99	0.053	100	102	21.1	0	278	82	82	80	-0.037	3.7	0.1
314	45.109	46.353	0.14	0.15	0.99	92	3.25	0.89	91	2.6	98	0.054	99	101	21.1	0	277	82	82	80	-0.036	3.8	0.1



### Pellet Heater Test Data - ASTM E2779 / ASTM E2515

Run: 1

Manufacturer: Harman High Burn End Time: 62  
 Model: Allure 43 Medium Burn End Time: 184  
 Tracking No.: 2123 Total Sampling Time: 364 min  
 Project No.: 0135PS037E Recording Interval: 1 min  
 Test Date: 02-Sep-15  
 Beginning Clock Time: 10:12 Background Sample Volume: 69.113 cubic feet

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Barometric Pressure: Begin Middle End Average  
29.99 29.98 29.98 29.98 "Hg

OMNI Equipment Numbers: 23, 131, 185, 132, 209, 291, 335, 336, 410, 420, 559

PM Control Modules:  
 Dilution Tunnel MW(dry): 29.00 lb/lb-mole  
 Dilution Tunnel MW(wet): 28.78 lb/lb-mole  
 Dilution Tunnel H2O: 2.00 percent  
 Dilution Tunnel Status: -0.490 "H2O  
 Tunnel Area: 0.19635 ft2  
 Pitot Tube Cp: 0.99

Avg. Tunnel Velocity: 13.39 ft/sec.  
 Initial Tunnel Flow: 140.0 scfm  
 Average Tunnel Flow: 145.4 scfm  
 Post-Test Leak Check (1): 0.001 cfm @ -1 in. Hg  
 Post-Test Leak Check (2): 0 cfm @ -1 in. Hg  
 Fuel Moisture: 5.1 Dry Basis %

Velocity Traverse Data									
	Pt.1	Pt.2	Pt.3	Pt.4	Pt.5	Pt.6	Pt.7	Pt.8	Center
Initial dP	0.020	0.046	0.052	0.030	0.024	0.051	0.048	0.028	0.054
Temp:	113	113	113	113	113	113	113	113	113
V <sub>strav</sub>		13.47		ft/sec		V <sub>scent</sub>		16.03	
						F <sub>p</sub>		0.840	

Elapsed Time (min)	Particulate Sampling Data												Fuel Weight (lb)				Temperature Data (°F)				Stack Gas Data		
	Gas Meter 1 (ft³)	Gas Meter 2 (ft³)	Sample Rate 1 (cfm)	Sample Rate 2 (cfm)	Orifice dH 1 ("H₂O)	Meter Temp 1 (°F)	Meter Vacuum 1 ("Hg)	Orifice dH 2 ("H₂O)	Meter Temp 2 (°F)	Meter Vacuum 2 ("Hg)	Dilution Tunnel (°F)	Dilution Tunnel Center dP	Pro. Rate 1	Pro. Rate 2	Scale Reading	Weight Change	Stack	Filter 1	Filter 2	Ambient	Draft ("H₂O)	CO₂ (%)	CO (%)
315	45.252	46.503	0.14	0.15	0.99	92	3.24	0.89	91	2.6	98	0.054	99	101	21.0	-0.1	277	82	82	79	-0.036	3.9	0.1
316	45.395	46.652	0.14	0.15	0.99	92	3.25	0.89	91	2.6	99	0.055	98	100	21.0	0	278	82	82	80	-0.037	4.7	0.2
317	45.538	46.801	0.14	0.15	0.99	92	3.25	0.89	91	2.6	99	0.054	99	101	20.9	-0.1	278	82	82	80	-0.036	4.5	0.1
318	45.681	46.950	0.14	0.15	0.99	92	3.25	0.89	91	2.6	99	0.054	99	101	20.9	0	279	82	82	80	-0.037	4.3	0.1
319	45.824	47.100	0.14	0.15	0.98	92	3.25	0.89	91	2.6	99	0.054	99	101	20.9	0	279	82	82	80	-0.037	4.4	0.2
320	45.966	47.248	0.14	0.15	0.99	92	3.25	0.89	91	2.6	99	0.054	99	100	20.8	-0.1	280	82	82	80	-0.037	4.5	0.2
321	46.109	47.397	0.14	0.15	0.99	92	3.25	0.90	91	2.6	99	0.054	99	101	20.8	0	281	82	82	80	-0.037	4.5	0.1
322	46.252	47.547	0.14	0.15	0.99	92	3.26	0.89	91	2.6	99	0.053	100	102	20.8	0	281	82	82	80	-0.037	4.2	0.2
323	46.395	47.696	0.14	0.15	0.99	92	3.25	0.89	91	2.6	99	0.054	99	101	20.7	-0.1	281	82	82	79	-0.037	4.4	0.1
324	46.538	47.845	0.14	0.15	0.99	92	3.26	0.89	91	2.6	99	0.054	99	101	20.7	0	282	82	82	79	-0.036	4.5	0.2
325	46.680	47.994	0.14	0.15	0.99	92	3.26	0.89	91	2.6	99	0.054	99	101	20.6	-0.1	282	82	82	80	-0.037	4.5	0.3
326	46.823	48.143	0.14	0.15	0.99	92	3.25	0.89	91	2.6	99	0.056	97	99	20.6	0	282	82	82	80	-0.037	4.5	0.2
327	46.966	48.292	0.14	0.15	0.99	92	3.26	0.89	91	2.6	99	0.054	99	101	20.5	-0.1	283	82	82	80	-0.037	4.5	0.2
328	47.108	48.441	0.14	0.15	0.99	92	3.26	0.89	91	2.6	99	0.052	100	103	20.5	0	283	82	82	80	-0.037	4.5	0.1
329	47.251	48.590	0.14	0.15	0.99	92	3.26	0.89	91	2.6	99	0.054	99	101	20.5	0	283	82	82	80	-0.037	4.2	0
330	47.393	48.738	0.14	0.15	0.99	92	3.27	0.89	91	2.6	99	0.053	99	101	20.4	-0.1	284	82	82	80	-0.038	4.4	0.1
331	47.536	48.887	0.14	0.15	0.99	92	3.26	0.89	91	2.6	99	0.054	99	101	20.4	0	284	82	82	80	-0.037	4.1	0
332	47.678	49.036	0.14	0.15	0.99	92	3.26	0.88	91	2.6	99	0.054	99	101	20.4	0	285	82	82	80	-0.038	3.8	0
333	47.820	49.185	0.14	0.15	0.98	92	3.27	0.89	91	2.6	99	0.052	100	103	20.3	-0.1	285	82	82	80	-0.037	3.5	0
334	47.963	49.334	0.14	0.15	0.99	92	3.27	0.89	91	2.6	99	0.054	99	101	20.3	0	284	82	82	80	-0.037	3.6	0
335	48.105	49.482	0.14	0.15	0.99	92	3.26	0.89	92	2.6	99	0.054	99	100	20.3	0	285	82	82	80	-0.037	3.5	0
336	48.248	49.631	0.14	0.15	0.99	92	3.27	0.89	91	2.6	99	0.055	98	100	20.2	-0.1	284	82	82	80	-0.038	3.6	0
337	48.390	49.780	0.14	0.15	0.99	92	3.27	0.88	91	2.6	99	0.055	98	100	20.2	0	283	82	82	79	-0.037	2.5	0
338	48.533	49.929	0.14	0.15	0.99	92	3.27	0.88	92	2.6	99	0.054	99	100	20.2	0	281	82	82	80	-0.037	3.2	0
339	48.677	50.077	0.14	0.15	1.02	92	3.34	0.89	91	2.6	99	0.052	102	102	20.2	0	280	82	82	79	-0.036	3.5	0
340	48.822	50.226	0.15	0.15	1.02	92	3.35	0.88	91	2.6	99	0.054	101	101	20.1	-0.1	279	82	82	80	-0.036	4	0.1
341	48.967	50.374	0.14	0.15	1.02	92	3.34	0.88	92	2.6	99	0.055	100	99	20.1	0	278	82	82	79	-0.036	3.6	0
342	49.112	50.523	0.15	0.15	1.01	92	3.35	0.88	92	2.6	98	0.056	99	99	20.1	0	278	82	82	80	-0.036	4.1	0.2
343	49.257	50.672	0.14	0.15	1.01	92	3.35	0.88	91	2.6	98	0.054	101	101	20.0	-0.1	278	82	82	80	-0.036	4.5	0.2
344	49.403	50.820	0.15	0.15	1.01	92	3.35	0.89	92	2.6	99	0.054	101	100	20.0	0	279	82	82	80	-0.036	4.3	0.2
345	49.547	50.969	0.14	0.15	1.02	92	3.35	0.89	92	2.6	99	0.054	100	100	19.9	-0.1	280	82	82	80	-0.037	4.6	0.2
346	49.693	51.117	0.15	0.15	1.02	92	3.35	0.88	92	2.6	99	0.053	102	101	19.9	0	280	82	82	80	-0.037	4.4	0.2
347	49.837	51.266	0.14	0.15	1.01	92	3.35	0.88	92	2.6	99	0.054	100	100	19.8	-0.1	280	82	82	80	-0.036	4.4	0.3
348	49.981	51.415	0.14	0.15	1.02	92	3.36	0.88	92	2.6	99	0.051	103	103	19.8	0	281	82	82	80	-0.036	4.6	0.2
349	50.126	51.563	0.14	0.15	1.02	92	3.36	0.88	92	2.6	99	0.053	102	101	19.8	0	282	82	82	79	-0.037	4.5	0.1







**ASTM E2779 Pellet Heater Run Sheets**

Client: Harman Project Number: 0135PS037E Run Number: 1  
 Model: Allure 43 Tracking Number: 2123 Date: 9/2/15  
 Test Crew: A. Kravitz  
 OMNI Equipment ID numbers: 23, 131, 185, 132, 209, 291, 335, 336, 410, 420, 559

**Pellet Heater Supplemental Data**

Start Time: 10:12 Booth #: E1  
 Stop Time: 16:11

**Stack Gas Leak Check:**

Initial: ∅ Final: ∅

**Sample Train Leak Check:**

A: 0.001 @ -1 "Hg  
 B: ∅ @ -1 "Hg  
 A<sub>2</sub>: 0.002 @ -1

Calibrations: Span Gas CO<sub>2</sub>: 16.89 CO: 4.29

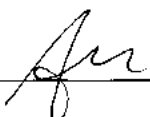
	Pre Test		Post Test	
	Zero	Span	Zero	Span
Time	<u>09:27</u>	<u>09:28</u>	<u>16:37</u>	<u>16:36</u>
CO <sub>2</sub>	<u>0.06</u>	<u>16.89</u>	<u>6.15</u>	<u>16.85</u>
CO	<u>0.000</u>	<u>4.294</u>	<u>0.015</u>	<u>4.252</u>

Air Velocity (ft/min): Initial: 250 Final: 250  
 Scale Audit (lbs): Initial: 10.0 Final: 10.0  
 Pitot Tube Leak Test: Initial: ∅ Final: ∅  
 Stack Diameter (in): 3  
 Induced Draft: ∅  
 % Smoke Capture: 100  
 Flue Pipe Cleaned Prior to First Test in Series:  
 Date: 9/1/15 Initials: A

	Initial	Middle	Ending
P <sub>b</sub> (in/Hg)	<u>29.99</u> <u>42.92</u>	<u>29.98</u>	<u>29.98</u>
Ambient (°F)	<u>80.5</u>	<u>81.3</u>	<u>82.2</u>

Tunnel Traverse		
Microtector Reading	dP (in H <sub>2</sub> O)	T(°F)
<u>N/A</u>	<u>0.020</u>	<u>113</u>
	<u>0.046</u>	
	<u>0.052</u>	
	<u>0.030</u>	
	<u>0.027</u>	
	<u>0.051</u>	
	<u>0.048</u>	
	<u>0.028</u>	
Center:		
	<u>0.054</u>	<u>113</u>
Static:		
	<u>-6.44</u>	<u>113</u>

Background Filter Volume: 60.113 ft<sup>3</sup>

Technician Signature: 

Date: 9/2/15

*Model: Allure 50  
Harman Home Heating  
352 Mountain House Road  
Halifax, PA 17032*

# **Run 2**

## Pellet Heater Test Results - ASTM E2779 / ASTM E2515

Manufacturer: Harman  
 Model: Allure 43  
 Project No.: 0135PS037E  
 Tracking No.: 2123  
 Run: 2  
 Test Date: 09/10/15

Burn Rate (Composite)	<b>1.26 kg/hr dry</b>
Average Tunnel Temperature	102 degrees F
Average Gas Velocity in Dilution Tunnel - vs	13.69 feet/second
Average Gas Flow Rate in Dilution Tunnel - Qsd	8950.3 dscf/hour
Average Delta p	0.053 inches H2O
Average Delta H	1.06 inches H2O
Total Time of Test	363 minutes

<b>Burn Rate (High)</b>	<b>2.84 kg/hr dry</b>
<b>Burn Rate (Med)</b>	<b>1.26 kg/hr dry</b> 44.5% of High
<b>Burn Rate (Low)</b>	<b>0.72 kg/hr dry</b> 25.3% of High

	AMBIENT	SAMPLE TRAIN 1	SAMPLE TRAIN 2	1 <sup>st</sup> HR FILTER (TRAIN 1)
Total Sample Volume - Vm	74.988 cubic feet	53.623 cubic feet	55.194 cubic feet	8.861 cubic feet
Average Gas Meter Temperature	79 degrees F	90 degrees F	89 degrees F	82 degrees F
Total Sample Volume (Standard Conditions) - Vmstd	74.441 dscf	51.954 dscf	53.602 dscf	8.706 dscf
Total Particulates - m <sub>n</sub>	0.2 mg	8.7 mg	9 mg	3.6 mg
Particulate Concentration (dry-standard) - C <sub>i</sub> /C <sub>s</sub>	0.000003 grams/dscf	0.00017 grams/dscf	0.00017 grams/dscf	0.00041 grams/dscf
Total Particulate Emissions - E <sub>T</sub>	0.15 grams	8.92 grams	8.95 grams	3.70 grams
Particulate Emission Rate	0.02 grams/hour	1.47 grams/hour	1.48 grams/hour	3.70 grams/hour
Emissions Factor		1.17 g/kg	1.17 g/kg	1.30 g/kg
Difference from Average Total Particulate Emissions		0.01 grams	0.01 grams	
<b>Dual Train Comparison Results Are Acceptable</b>				

FINAL AVERAGE RESULTS	
<b>Integrated Test Run</b>	
Total Particulate Emissions - E <sub>T</sub>	8.93 grams
Particulate Emission Rate	<b>1.48 grams/hour</b>
Emissions Factor	1.17 grams/kg
<b>First Hour Emissions</b>	
Total Particulate Emissions - E <sub>T</sub>	3.70 grams
Particulate Emission Rate	3.70 grams/hour
Emissions Factor	1.30 grams/kg

# OMNI-Test Laboratories, Inc.

**Manufacturer:** Harman  
**Model:** Allure 43  
**Date:** 09/10/15  
**Run:** 2  
**Control #:** 2123  
**Test Duration:** 363  
**Output Category:** N/A

**Technicians:** A. Kravitz

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**Test Results in Accordance with CSA B415.1-09**

	HHV Basis	LHV Basis
<b>Overall Efficiency</b>	74.6%	79.9%
<b>Combustion Efficiency</b>	99.2%	99.2%
<b>Heat Transfer Efficiency</b>	75%	80.5%

<b>Output Rate (kJ/h)</b>	18,376	17,432	<b>(Btu/h)</b>
<b>Burn Rate (kg/h)</b>	1.26	2.78	<b>(lb/h)</b>
<b>Input (kJ/h)</b>	24,630	23,364	<b>(Btu/h)</b>

<b>Test Load Weight (dry kg)</b>	7.64	16.85	<b>dry lb</b>
<b>MC wet (%)</b>	4.80723465		
<b>MC dry (%)</b>	5.05		
<b>Particulate (g)</b>	0		
<b>CO (g)</b>	183		
<b>Test Duration (h)</b>	6.05		

Emissions	Particulate	CO
<b>g/MJ Output</b>	0.00	1.65
<b>g/kg Dry Fuel</b>	0.00	23.97
<b>g/h</b>	0.00	30.29
<b>lb/MM Btu Output</b>	0.00	3.83

<b>Air/Fuel Ratio (A/F)</b>	20.33
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VERSION:                      2.3                      3/23/2010

# OMNI-Test Laboratories, Inc.

**Manufacturer:** Harman  
**Model:** Allure 43  
**Date:** 09/10/15  
**Run:** 2  
**Control #:** 2123  
**Test Duration:** 62  
**Output Category:** N/A

**Technicians:** A. Kravitz

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**Test Results in Accordance with CSA B415.1-09**

	Hi Max	LHV Basis
<b>Overall Efficiency</b>	74.47%	79.7%
<b>Combustion Efficiency</b>	95.7%	95.7%
<b>Heat Transfer Efficiency</b>	78%	83.2%

<b>Output Rate (kJ/h)</b>	41,224	39,105	<b>(Btu/h)</b>
<b>Burn Rate (kg/h)</b>	2.84	6.26	<b>(lb/h)</b>
<b>Input (kJ/h)</b>	55,401	52,554	<b>(Btu/h)</b>

<b>Test Load Weight (dry kg)</b>	2.94	6.47	<b>dry lb</b>
<b>MC wet (%)</b>	4.80723465		
<b>MC dry (%)</b>	5.05		
<b>Particulate (g)</b>	0		
<b>CO (g)</b>	212		
<b>Test Duration (h)</b>	1.03		

Emissions	Particulate	CO
<b>g/MJ Output</b>	0.00	4.98
<b>g/kg Dry Fuel</b>	0.00	72.28
<b>g/h</b>	0.00	205.43
<b>lb/MM Btu Output</b>	0.00	11.58

<b>Air/Fuel Ratio (A/F)</b>	10.45
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VERSION:

2.3

3/23/2010

# OMNI-Test Laboratories, Inc.

**Manufacturer:** Harman  
**Model:** Allure 43  
**Date:** 09/10/15  
**Run:** 2  
**Control #:** 2123  
**Test Duration:** 121  
**Output Category:** N/A

**Technicians:** A. Kravitz

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**Test Results in Accordance with CSA B415.1-09**

	Hi Med s	LHV Basis
<b>Overall Efficiency</b>	100.0%	81.1%
<b>Combustion Efficiency</b>	99.5%	99.5%
<b>Heat Transfer Efficiency</b>	76%	81.6%

<b>Output Rate (kJ/h)</b>	18,670	17,711	<b>(Btu/h)</b>
<b>Burn Rate (kg/h)</b>	1.26	2.78	<b>(lb/h)</b>
<b>Input (kJ/h)</b>	24,630	23,364	<b>(Btu/h)</b>

<b>Test Load Weight (dry kg)</b>	2.55	5.62	<b>dry lb</b>
<b>MC wet (%)</b>	4.80723465		
<b>MC dry (%)</b>	5.05		
<b>Particulate (g)</b>	0		
<b>CO (g)</b>	3		
<b>Test Duration (h)</b>	2.02		

Emissions	Particulate	CO
<b>g/MJ Output</b>	0.00	0.07
<b>g/kg Dry Fuel</b>	0.00	1.03
<b>g/h</b>	0.00	1.31
<b>lb/MM Btu Output</b>	0.00	0.16

<b>Air/Fuel Ratio (A/F)</b>	19.40
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VERSION:                      2.3                      3/23/2010



# OMNI-Test Laboratories, Inc.

**Manufacturer:** Harman  
**Model:** Allure 43  
**Date:** 09/10/15  
**Run:** 2  
**Control #:** 2123  
**Test Duration:** 180  
**Output Category:** N/A

**Technicians:** A. Kravitz

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### Test Results in Accordance with CSA B415.1-09

	Hi	Min	LHV Basis
<b>Overall Efficiency</b>	91.0%	91.0%	72.4%
<b>Combustion Efficiency</b>	99.5%	99.5%	99.5%
<b>Heat Transfer Efficiency</b>	68%	68%	72.8%

<b>Output Rate (kJ/h)</b>	9,488	9,001	<b>(Btu/h)</b>
<b>Burn Rate (kg/h)</b>	0.72	1.59	<b>(lb/h)</b>
<b>Input (kJ/h)</b>	14,031	13,310	<b>(Btu/h)</b>

<b>Test Load Weight (dry kg)</b>	2.16	4.76	<b>dry lb</b>
<b>MC wet (%)</b>	4.80723465		
<b>MC dry (%)</b>	5.05		
<b>Particulate (g)</b>	0		
<b>CO (g)</b>	0		
<b>Test Duration (h)</b>	3.00		

Emissions	Particulate	CO
<b>g/MJ Output</b>	0.00	0.00
<b>g/kg Dry Fuel</b>	0.00	0.00
<b>g/h</b>	0.00	0.00
<b>lb/MM Btu Output</b>	0.00	0.00

<b>Air/Fuel Ratio (A/F)</b>	31.44
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VERSION:

2.3

3/23/2010

### Pellet Heater Test Data - ASTM E2779 / ASTM E2515

Run: 2

Manufacturer: Harman  
 Model: Allure 43  
 Tracking No.: 2123  
 Project No.: 0135PS037E  
 Test Date: 10-Sep-15  
 Beginning Clock Time: 09:22

High Burn End Time: 62  
 Medium Burn End Time: 183  
 Total Sampling Time: 363 min  
 Recording Interval: 1 min

Background Sample Volume: 74.988 cubic feet

Meter Box Y Factor: 1.001 (1) 1.003 (2) 1.009 (Amb)

Barometric Pressure: Begin Middle End Average  
30.10 30.08 30.07 30.08 "Hg

OMNI Equipment Numbers: 23, 131, 185, 132, 209, 291, 335, 336, 410, 420, 559

PM Control Modules: 335/336  
 Dilution Tunnel MW(dry): 29.00 lb/lb-mole  
 Dilution Tunnel MW(wet): 28.78 lb/lb-mole  
 Dilution Tunnel H2O: 2.00 percent  
 Dilution Tunnel Status: -0.530 "H2O  
 Tunnel Area: 0.19635 ft2  
 Pitot Tube Cp: 0.99

Avg. Tunnel Velocity: 13.69 ft/sec.  
 Initial Tunnel Flow: 144.8 scfm  
 Average Tunnel Flow: 149.2 scfm  
 Post-Test Leak Check (1): 0.001 cfm @ -1 in. Hg  
 Post-Test Leak Check (2): 0 cfm @ -1 in. Hg  
 Fuel Moisture: 5.05 Dry Basis %

Velocity Traverse Data									
	Pt.1	Pt.2	Pt.3	Pt.4	Pt.5	Pt.6	Pt.7	Pt.8	Center
Initial dP	0.026	0.051	0.052	0.030	0.028	0.049	0.052	0.031	0.053
Temp:	118	118	118	118	118	118	118	118	118
V <sub>strav</sub>		13.92		ft/sec		V <sub>scent</sub>		15.93	
						F <sub>p</sub>		0.874	

Elapsed Time (min)	Particulate Sampling Data												Fuel Weight (lb)				Temperature Data (°F)				Stack Gas Data		
	Gas Meter 1 (ft³)	Gas Meter 2 (ft³)	Sample Rate 1 (cfm)	Sample Rate 2 (cfm)	Orifice dH 1 ("H₂O)	Meter Temp 1 (°F)	Meter Vacuum 1 ("Hg)	Orifice dH 2 ("H₂O)	Meter Temp 2 (°F)	Meter Vacuum 2 ("Hg)	Dilution Tunnel (°F)	Dilution Tunnel Center dP	Pro. Rate 1	Pro. Rate 2	Scale Reading	Weight Change	Stack	Filter 1	Filter 2	Ambient	Draft ("H₂O)	CO₂ (%)	CO (%)
0	0.000	0.000			0.20	78	0.2	0.01	79	-0.3	118	0.053			41.1		425	74	74	77	-0.151	10	0.5
1	0.131	0.141	0.13	0.14	1.10	78	1.94	1.00	78	1.1	113	0.054	90	94	41.1	0	424	75	75	76	-0.126	10.6	0.7
2	0.279	0.296	0.15	0.16	1.11	79	1.94	0.60	78	0.8	113	0.053	103	105	40.9	-0.2	425	75	76	76	-0.110	10.1	0.5
3	0.426	0.446	0.15	0.15	1.11	79	1.94	0.96	79	1.1	113	0.055	100	99	40.8	-0.1	426	76	76	77	-0.096	10.5	0.7
4	0.574	0.598	0.15	0.15	1.11	79	1.94	0.96	79	1.1	113	0.051	105	105	40.7	-0.1	426	76	76	76	-0.089	10.3	0.4
5	0.723	0.751	0.15	0.15	1.11	79	1.94	0.96	79	1.1	113	0.052	105	104	40.6	-0.1	425	76	77	76	-0.082	10.2	0.3
6	0.871	0.903	0.15	0.15	1.11	79	1.93	0.96	79	1.1	113	0.051	105	105	40.5	-0.1	425	76	77	77	-0.073	9.6	0.2
7	1.019	1.055	0.15	0.15	1.11	79	1.94	0.96	79	1.1	113	0.053	103	103	40.4	-0.1	425	76	77	77	-0.062	10.2	0.4
8	1.167	1.208	0.15	0.15	1.10	79	1.93	0.96	79	1.1	113	0.054	102	102	40.2	-0.2	426	77	77	77	-0.058	10.4	0.4
9	1.315	1.359	0.15	0.15	1.10	79	1.93	0.96	79	1.1	113	0.052	104	103	40.2	0	425	77	78	77	-0.053	10	0.2
10	1.464	1.511	0.15	0.15	1.10	79	1.94	0.96	79	1.1	113	0.051	106	105	40.1	-0.1	423	77	78	76	-0.049	10	0.3
11	1.611	1.664	0.15	0.15	1.10	79	1.93	0.95	79	1.1	113	0.056	99	100	40.0	-0.1	422	77	78	77	-0.043	9.7	0.2
12	1.758	1.815	0.15	0.15	1.10	79	1.93	0.95	79	1.1	113	0.052	103	103	39.8	-0.2	423	77	78	77	-0.045	9.9	0.4
13	1.906	1.967	0.15	0.15	1.09	79	1.93	0.95	79	1.1	113	0.055	101	101	39.7	-0.1	425	77	78	77	-0.048	10.4	0.4
14	2.054	2.119	0.15	0.15	1.09	80	1.92	0.95	80	1.1	113	0.049	107	107	39.6	-0.1	426	77	79	76	-0.047	10.9	0.8
15	2.203	2.271	0.15	0.15	1.10	80	1.93	0.95	80	1.1	113	0.054	102	101	39.5	-0.1	424	78	79	77	-0.039	10.7	0.7
16	2.349	2.422	0.15	0.15	1.09	80	1.92	0.94	80	1.1	113	0.056	99	99	39.4	-0.1	424	78	79	77	-0.041	9.5	0.2
17	2.497	2.575	0.15	0.15	1.09	80	1.93	0.95	80	1.1	113	0.056	100	100	39.3	-0.1	425	78	79	76	-0.041	10.1	0.4
18	2.645	2.726	0.15	0.15	1.09	80	1.93	0.95	80	1.1	113	0.054	102	101	39.2	-0.1	426	78	79	77	-0.042	10.6	0.6
19	2.793	2.877	0.15	0.15	1.09	80	1.93	0.94	80	1.1	113	0.051	105	104	39.1	-0.1	425	78	79	76	-0.043	10.8	0.7
20	2.940	3.030	0.15	0.15	1.09	80	1.93	0.95	80	1.1	113	0.052	103	104	38.9	-0.2	425	78	79	77	-0.041	10.4	0.5
21	3.087	3.181	0.15	0.15	1.10	81	1.92	0.95	81	1.1	113	0.050	105	105	38.8	-0.1	425	78	79	76	-0.043	10.5	0.8
22	3.235	3.333	0.15	0.15	1.10	81	1.93	0.95	81	1.1	113	0.053	103	102	38.7	-0.1	425	78	79	76	-0.041	10.4	0.5
23	3.383	3.485	0.15	0.15	1.09	81	1.92	0.95	81	1.1	113	0.048	108	107	38.6	-0.1	424	78	80	77	-0.034	10.3	0.4
24	3.531	3.636	0.15	0.15	1.09	81	1.92	0.95	81	1.1	113	0.051	105	104	38.5	-0.1	423	79	80	76	-0.037	9.9	0.3
25	3.678	3.788	0.15	0.15	1.09	81	1.92	0.94	81	1.1	113	0.054	101	101	38.4	-0.1	422	79	80	77	-0.034	10.2	0.5
26	3.826	3.941	0.15	0.15	1.09	81	1.92	0.95	81	1.1	113	0.051	105	105	38.3	-0.1	422	79	80	77	-0.041	9.7	0.3
27	3.974	4.092	0.15	0.15	1.08	82	1.93	0.95	82	1.1	113	0.052	103	102	38.2	-0.1	422	79	80	77	-0.039	10.1	0.4
28	4.122	4.244	0.15	0.15	1.09	82	1.92	0.94	82	1.1	113	0.050	105	105	38.1	-0.1	423	79	80	78	-0.039	10.6	0.8
29	4.270	4.396	0.15	0.15	1.09	82	1.93	0.95	82	1.1	113	0.052	103	103	38.0	-0.1	422	79	80	78	-0.036	10.5	0.7
30	4.417	4.547	0.15	0.15	1.09	82	1.92	0.95	82	1.1	113	0.054	101	100	37.9	-0.1	422	79	80	77	-0.036	10	0.5
31	4.565	4.699	0.15	0.15	1.09	82	1.93	0.95	82	1.1	113	0.052	103	103	37.7	-0.2	423	79	80	77	-0.031	10.3	0.5
32	4.714	4.852	0.15	0.15	1.09	82	1.92	0.95	82	1.1	113	0.052	104	104	37.6	-0.1	423	79	80	78	-0.034	10.4	0.6
33	4.862	5.003	0.15	0.15	1.09	83	1.92	0.94	83	1.1	114	0.051	104	103	37.6	0	423	79	80	77	-0.032	10	0.5
34	5.009	5.155	0.15	0.15	1.09	83	1.93	0.94	83	1.1	114	0.053	102	102	37.4	-0.2	422	79	80	78	-0.032	10.1	0.4

### Pellet Heater Test Data - ASTM E2779 / ASTM E2515

Run: 2

Manufacturer: Harman High Burn End Time: 62  
 Model: Allure 43 Medium Burn End Time: 183  
 Tracking No.: 2123 Total Sampling Time: 363 min  
 Project No.: 0135PS037E Recording Interval: 1 min  
 Test Date: 10-Sep-15  
 Beginning Clock Time: 09:22 Background Sample Volume: 74.988 cubic feet

Meter Box Y Factor: 1.001 (1) 1.003 (2) 1.009 (Amb)

Barometric Pressure: Begin Middle End Average  
30.10 30.08 30.07 30.08 "Hg

OMNI Equipment Numbers: 23, 131, 185, 132, 209, 291, 335, 336, 410, 420, 559

PM Control Modules: 335/336  
 Dilution Tunnel MW(dry): 29.00 lb/lb-mole  
 Dilution Tunnel MW(wet): 28.78 lb/lb-mole  
 Dilution Tunnel H2O: 2.00 percent  
 Dilution Tunnel Status: -0.530 "H2O  
 Tunnel Area: 0.19635 ft2  
 Pitot Tube Cp: 0.99

Avg. Tunnel Velocity: 13.69 ft/sec.  
 Initial Tunnel Flow: 144.8 scfm  
 Average Tunnel Flow: 149.2 scfm  
 Post-Test Leak Check (1): 0.001 cfm @ -1 in. Hg  
 Post-Test Leak Check (2): 0 cfm @ -1 in. Hg  
 Fuel Moisture: 5.05 Dry Basis %

Velocity Traverse Data									
	Pt.1	Pt.2	Pt.3	Pt.4	Pt.5	Pt.6	Pt.7	Pt.8	Center
Initial dP	0.026	0.051	0.052	0.030	0.028	0.049	0.052	0.031	0.053
Temp:	118	118	118	118	118	118	118	118	118
V <sub>strav</sub>		13.92		ft/sec		V <sub>scent</sub>		15.93	
						F <sub>p</sub>		0.874	

Elapsed Time (min)	Particulate Sampling Data												Fuel Weight (lb)		Temperature Data (°F)				Stack Gas Data				
	Gas Meter 1 (ft³)	Gas Meter 2 (ft³)	Sample Rate 1 (cfm)	Sample Rate 2 (cfm)	Orifice dH 1 ("H <sub>2</sub> O)	Meter Temp 1 (°F)	Meter Vacuum 1 ("Hg)	Orifice dH 2 ("H <sub>2</sub> O)	Meter Temp 2 (°F)	Meter Vacuum 2 ("Hg)	Dilution Tunnel (°F)	Dilution Tunnel Center dP	Pro. Rate 1	Pro. Rate 2	Scale Reading	Weight Change	Stack	Filter 1	Filter 2	Ambient	Draft ("H <sub>2</sub> O)	CO <sub>2</sub> (%)	CO (%)
35	5.157	5.308	0.15	0.15	1.09	83	1.93	0.95	83	1.1	114	0.049	106	107	37.3	-0.1	422	79	80	78	-0.037	10	0.4
36	5.305	5.459	0.15	0.15	1.08	83	1.93	0.94	83	1.1	114	0.054	101	100	37.2	-0.1	422	79	80	77	-0.046	10	0.6
37	5.453	5.611	0.15	0.15	1.09	83	1.94	0.94	83	1.1	114	0.056	99	99	37.1	-0.1	423	80	81	78	-0.046	10.1	0.6
38	5.601	5.763	0.15	0.15	1.09	83	1.94	0.94	83	1.1	114	0.052	103	103	37.0	-0.1	425	80	81	78	-0.054	10.4	0.8
39	5.748	5.915	0.15	0.15	1.09	83	1.93	0.95	84	1.1	114	0.053	102	102	36.8	-0.2	425	80	81	78	-0.056	11	1.1
40	5.897	6.067	0.15	0.15	1.08	84	1.94	0.95	84	1.1	114	0.052	104	103	36.7	-0.1	424	80	81	78	-0.047	10.6	0.9
41	6.045	6.220	0.15	0.15	1.09	84	1.94	0.94	84	1.1	114	0.054	101	101	36.6	-0.1	425	80	81	78	-0.046	10.2	0.7
42	6.193	6.371	0.15	0.15	1.09	84	1.94	0.95	84	1.1	114	0.051	104	103	36.5	-0.1	426	80	81	78	-0.047	10.4	0.6
43	6.341	6.523	0.15	0.15	1.09	84	1.93	0.94	84	1.1	114	0.052	103	103	36.4	-0.1	425	80	81	78	-0.048	10.7	0.7
44	6.489	6.676	0.15	0.15	1.09	84	1.94	0.94	84	1.1	114	0.052	103	103	36.2	-0.2	424	80	81	77	-0.051	10.3	0.7
45	6.638	6.827	0.15	0.15	1.08	84	1.94	0.94	84	1.1	114	0.050	106	104	36.2	0	423	80	81	78	-0.046	10.2	0.7
46	6.786	6.979	0.15	0.15	1.09	85	1.94	0.94	85	1.1	115	0.051	104	104	36.0	-0.2	423	80	81	78	-0.041	10.1	0.6
47	6.934	7.132	0.15	0.15	1.09	85	1.93	0.94	85	1.1	115	0.052	103	103	35.8	-0.2	425	80	81	78	-0.042	10.4	0.8
48	7.082	7.284	0.15	0.15	1.08	85	1.94	0.94	85	1.1	114	0.054	101	101	35.8	0	424	80	81	78	-0.044	10.7	0.7
49	7.231	7.436	0.15	0.15	1.09	85	1.94	0.94	85	1.1	115	0.052	104	103	35.7	-0.1	424	80	81	79	-0.037	10.1	0.5
50	7.379	7.589	0.15	0.15	1.09	85	1.93	0.94	85	1.1	115	0.051	104	104	35.5	-0.2	423	80	81	78	-0.038	10.1	0.7
51	7.527	7.740	0.15	0.15	1.09	85	1.94	0.95	85	1.1	115	0.049	106	105	35.5	0	425	80	81	78	-0.041	10.2	0.8
52	7.675	7.892	0.15	0.15	1.09	85	1.93	0.94	85	1.1	115	0.052	103	103	35.4	-0.1	426	80	81	77	-0.041	10.6	1
53	7.824	8.045	0.15	0.15	1.08	85	1.94	0.94	85	1.1	115	0.050	106	105	35.3	-0.1	426	80	81	78	-0.046	10.7	1
54	7.972	8.196	0.15	0.15	1.08	85	1.93	0.95	85	1.1	115	0.050	105	104	35.1	-0.2	426	80	81	78	-0.042	10.4	0.6
55	8.120	8.349	0.15	0.15	1.09	86	1.94	0.94	86	1.1	115	0.052	103	103	35.0	-0.1	427	80	82	77	-0.039	10.2	0.4
56	8.268	8.501	0.15	0.15	1.09	86	1.94	0.94	86	1.1	116	0.051	104	104	34.9	-0.1	426	80	82	79	-0.032	10.5	0.4
57	8.417	8.653	0.15	0.15	1.08	86	1.94	0.95	86	1.1	116	0.051	105	104	34.8	-0.1	426	80	82	79	-0.037	10.3	0.5
58	8.565	8.805	0.15	0.15	1.09	86	1.94	0.94	86	1.1	115	0.052	103	102	34.7	-0.1	425	81	82	79	-0.038	10.2	0.5
59	8.713	8.958	0.15	0.15	1.09	86	1.94	0.95	86	1.1	116	0.047	108	109	34.6	-0.1	425	81	82	78	-0.044	9.9	0.4
60	8.861	9.109	0.15	0.15	1.07	86	1.97	0.94	86	1.1	116	0.051	104	103	34.5	-0.1	426	80	82	79	-0.033	10.1	0.6
61	9.009	9.262	0.15	0.15	1.07	86	1.98	0.94	86	1.2	116	0.050	105	105	35.4	0.9	425	77	82	79	-0.039	10.7	1.1
62	9.156	9.414	0.15	0.15	1.07	86	1.97	0.94	86	1.1	115	0.052	102	102	34.3	-1.1	421	77	82	78	-0.033	10.4	1.1
63	9.303	9.566	0.15	0.15	1.07	86	1.97	0.94	86	1.1	112	0.052	102	102	34.2	-0.1	408	77	82	79	-0.032	9.4	0.3
64	9.450	9.719	0.15	0.15	1.07	86	1.97	0.94	86	1.1	110	0.051	103	104	34.1	-0.1	398	78	82	79	-0.025	7.7	0.1
65	9.598	9.871	0.15	0.15	1.07	87	1.98	0.94	87	1.2	109	0.050	104	104	34.1	0	391	78	82	79	-0.026	6.7	0
66	9.746	10.023	0.15	0.15	1.06	87	1.97	0.94	87	1.1	109	0.054	100	100	34.1	0	382	78	82	78	-0.018	6.2	0
67	9.894	10.176	0.15	0.15	1.07	87	1.97	0.94	87	1.1	108	0.050	104	104	34.0	-0.1	374	78	82	79	-0.019	5.4	0
68	10.041	10.328	0.15	0.15	1.07	87	1.98	0.94	87	1.1	107	0.051	102	103	34.0	0	365	78	82	79	-0.020	4.6	0
69	10.188	10.480	0.15	0.15	1.07	87	1.97	0.94	87	1.1	106	0.050	103	103	34.0	0	356	79	81	79	-0.025	4	0

### Pellet Heater Test Data - ASTM E2779 / ASTM E2515

Run: 2

Manufacturer: Harman High Burn End Time: 62  
 Model: Allure 43 Medium Burn End Time: 183  
 Tracking No.: 2123 Total Sampling Time: 363 min  
 Project No.: 0135PS037E Recording Interval: 1 min  
 Test Date: 10-Sep-15  
 Beginning Clock Time: 09:22 Background Sample Volume: 74.988 cubic feet

Meter Box Y Factor: 1.001 (1) 1.003 (2) 1.009 (Amb)

Barometric Pressure: Begin Middle End Average  
30.10 30.08 30.07 30.08 "Hg

OMNI Equipment Numbers: 23, 131, 185, 132, 209, 291, 335, 336, 410, 420, 559

PM Control Modules: 335/336  
 Dilution Tunnel MW(dry): 29.00 lb/lb-mole  
 Dilution Tunnel MW(wet): 28.78 lb/lb-mole  
 Dilution Tunnel H2O: 2.00 percent  
 Dilution Tunnel Stat: -0.530 "H2O  
 Tunnel Area: 0.19635 ft2  
 Pitot Tube Cp: 0.99

Avg. Tunnel Velocity: 13.69 ft/sec.  
 Initial Tunnel Flow: 144.8 scfm  
 Average Tunnel Flow: 149.2 scfm  
 Post-Test Leak Check (1): 0.001 cfm @ -1 in. Hg  
 Post-Test Leak Check (2): 0 cfm @ -1 in. Hg  
 Fuel Moisture: 5.05 Dry Basis %

Velocity Traverse Data									
	Pt.1	Pt.2	Pt.3	Pt.4	Pt.5	Pt.6	Pt.7	Pt.8	Center
Initial dP	0.026	0.051	0.052	0.030	0.028	0.049	0.052	0.031	0.053
Temp:	118	118	118	118	118	118	118	118	118
V <sub>strav</sub>		13.92		ft/sec		V <sub>scent</sub>		15.93	
						F <sub>p</sub>		0.874	

Elapsed Time (min)	Particulate Sampling Data												Fuel Weight (lb)				Temperature Data (°F)				Stack Gas Data		
	Gas Meter 1 (ft³)	Gas Meter 2 (ft³)	Sample Rate 1 (cfm)	Sample Rate 2 (cfm)	Orifice dH 1 ("H₂O)	Meter Temp 1 (°F)	Meter Vacuum 1 ("Hg)	Orifice dH 2 ("H₂O)	Meter Temp 2 (°F)	Meter Vacuum 2 ("Hg)	Dilution Tunnel (°F)	Dilution Tunnel Center dP	Pro. Rate 1	Pro. Rate 2	Scale Reading	Weight Change	Stack	Filter 1	Filter 2	Ambient	Draft ("H₂O)	CO₂ (%)	CO (%)
70	10.336	10.633	0.15	0.15	1.07	87	1.98	0.94	87	1.1	106	0.050	104	104	33.9	-0.1	346	79	81	79	-0.021	3.7	0
71	10.485	10.785	0.15	0.15	1.07	87	1.98	0.94	87	1.1	105	0.052	102	101	33.9	0	338	79	81	78	-0.024	3.2	0
72	10.632	10.938	0.15	0.15	1.07	87	1.98	0.94	87	1.1	104	0.054	99	100	33.9	0	330	79	81	78	-0.014	2.9	0
73	10.779	11.091	0.15	0.15	1.07	87	1.97	0.94	87	1.1	103	0.055	98	99	33.9	0	324	79	81	78	-0.026	2.8	0
74	10.927	11.243	0.15	0.15	1.07	87	1.97	0.94	87	1.1	103	0.054	100	99	33.8	-0.1	318	79	81	78	-0.024	3	0
75	11.075	11.396	0.15	0.15	1.06	87	1.97	0.94	87	1.2	102	0.053	100	101	33.8	0	312	79	81	79	-0.015	3	0
76	11.223	11.548	0.15	0.15	1.07	87	1.97	0.94	87	1.1	102	0.051	102	102	33.8	0	306	79	81	79	-0.014	3	0
77	11.370	11.700	0.15	0.15	1.07	88	1.97	0.94	87	1.1	101	0.054	99	99	33.7	-0.1	301	80	81	79	-0.013	2.9	0
78	11.518	11.853	0.15	0.15	1.07	88	1.97	0.94	88	1.1	101	0.052	101	101	33.7	0	297	80	81	79	-0.001	2.8	0
79	11.666	12.005	0.15	0.15	1.07	88	1.98	0.95	88	1.2	100	0.052	101	101	33.7	0	295	80	81	79	0.002	3	0
80	11.814	12.158	0.15	0.15	1.07	88	1.98	0.94	88	1.1	100	0.054	99	99	33.7	0	293	80	81	79	0.016	3.2	0
81	11.961	12.311	0.15	0.15	1.07	88	1.98	0.94	88	1.2	100	0.052	100	101	33.6	-0.1	292	80	81	78	0.024	3.3	0
82	12.109	12.463	0.15	0.15	1.07	88	1.97	0.94	88	1.1	100	0.052	101	101	33.6	0	293	80	81	79	0.002	3.5	0
83	12.257	12.615	0.15	0.15	1.07	88	1.97	0.94	88	1.1	99	0.053	100	100	33.5	-0.1	294	80	81	78	-0.003	4	0
84	12.405	12.769	0.15	0.15	1.07	88	1.98	0.94	88	1.2	99	0.054	99	100	33.5	0	295	80	81	78	0.016	4.4	0
85	12.553	12.921	0.15	0.15	1.07	88	1.98	0.95	88	1.1	99	0.054	99	99	33.5	0	296	80	81	78	0.027	4.8	0
86	12.700	13.074	0.15	0.15	1.07	88	1.98	0.94	88	1.1	99	0.052	100	101	33.4	-0.1	297	80	81	79	0.020	5.1	0
87	12.848	13.226	0.15	0.15	1.07	88	1.97	0.94	88	1.1	99	0.053	100	100	33.4	0	299	80	80	78	0.007	5.1	0
88	12.996	13.379	0.15	0.15	1.06	88	1.98	0.95	88	1.1	99	0.052	101	101	33.3	-0.1	300	80	80	78	0.005	5.1	0
89	13.145	13.532	0.15	0.15	1.07	88	1.98	0.94	88	1.2	99	0.050	104	103	33.3	0	301	80	80	78	0.000	5.4	0
90	13.291	13.684	0.15	0.15	1.07	88	1.98	0.95	88	1.2	99	0.053	99	100	33.2	-0.1	303	80	80	78	0.000	5.4	0
91	13.439	13.837	0.15	0.15	1.07	88	1.98	0.94	88	1.1	99	0.050	103	103	33.1	-0.1	304	80	80	78	-0.010	5.3	0
92	13.588	13.990	0.15	0.15	1.07	88	1.99	0.94	88	1.2	99	0.050	104	103	33.1	0	304	80	80	78	-0.002	5.5	0
93	13.736	14.142	0.15	0.15	1.07	88	1.99	0.94	88	1.1	99	0.051	102	102	33.1	0	304	80	80	78	-0.008	5.2	0
94	13.883	14.295	0.15	0.15	1.07	88	1.98	0.94	88	1.1	99	0.052	100	101	33.0	-0.1	306	80	80	78	-0.002	5.1	0
95	14.031	14.448	0.15	0.15	1.07	88	1.98	0.94	88	1.1	99	0.052	101	101	32.9	-0.1	307	80	80	78	0.023	5.4	0
96	14.179	14.600	0.15	0.15	1.07	88	1.98	0.94	88	1.1	99	0.050	103	103	32.9	0	308	80	80	78	0.029	6	0
97	14.328	14.753	0.15	0.15	1.07	88	1.98	0.94	88	1.2	99	0.052	102	101	32.8	-0.1	308	80	80	78	0.022	5.7	0
98	14.476	14.906	0.15	0.15	1.07	88	1.98	0.94	88	1.1	99	0.051	102	102	32.8	0	310	80	80	78	0.036	5.3	0
99	14.623	15.059	0.15	0.15	1.07	89	1.99	0.94	88	1.1	99	0.054	98	99	32.8	0	309	80	80	77	0.025	5.9	0
100	14.771	15.212	0.15	0.15	1.07	88	1.98	0.94	88	1.2	99	0.051	102	102	32.7	-0.1	311	80	80	78	0.006	5.7	0
101	14.920	15.364	0.15	0.15	1.06	88	1.99	0.94	88	1.1	99	0.052	102	101	32.7	0	312	80	80	78	-0.003	5.5	0
102	15.068	15.517	0.15	0.15	1.07	89	1.98	0.94	89	1.1	99	0.053	100	100	32.6	-0.1	311	80	80	78	-0.011	5.7	0
103	15.215	15.670	0.15	0.15	1.07	89	1.99	0.94	88	1.2	99	0.053	99	100	32.6	0	311	80	80	78	-0.027	5.7	0
104	15.363	15.822	0.15	0.15	1.06	89	1.98	0.94	88	1.2	99	0.053	100	100	32.5	-0.1	310	80	80	78	-0.039	5.4	0

### Pellet Heater Test Data - ASTM E2779 / ASTM E2515

Run: 2

Manufacturer: Harman  
 Model: Allure 43  
 Tracking No.: 2123  
 Project No.: 0135PS037E  
 Test Date: 10-Sep-15  
 Beginning Clock Time: 09:22

High Burn End Time: 62  
 Medium Burn End Time: 183  
 Total Sampling Time: 363 min  
 Recording Interval: 1 min

Background Sample Volume: 74.988 cubic feet

Meter Box Y Factor: 1.001 (1) 1.003 (2) 1.009 (Amb)

Barometric Pressure: Begin Middle End Average  
30.10 30.08 30.07 30.08 "Hg

OMNI Equipment Numbers: 23, 131, 185, 132, 209, 291, 335, 336, 410, 420, 559

PM Control Modules: 335/336  
 Dilution Tunnel MW(dry): 29.00 lb/lb-mole  
 Dilution Tunnel MW(wet): 28.78 lb/lb-mole  
 Dilution Tunnel H2O: 2.00 percent  
 Dilution Tunnel Status: -0.530 "H2O  
 Tunnel Area: 0.19635 ft2  
 Pitot Tube Cp: 0.99

Avg. Tunnel Velocity: 13.69 ft/sec.  
 Initial Tunnel Flow: 144.8 scfm  
 Average Tunnel Flow: 149.2 scfm  
 Post-Test Leak Check (1): 0.001 cfm @ -1 in. Hg  
 Post-Test Leak Check (2): 0 cfm @ -1 in. Hg  
 Fuel Moisture: 5.05 Dry Basis %

Velocity Traverse Data									
	Pt.1	Pt.2	Pt.3	Pt.4	Pt.5	Pt.6	Pt.7	Pt.8	Center
Initial dP	0.026	0.051	0.052	0.030	0.028	0.049	0.052	0.031	0.053
Temp:	118	118	118	118	118	118	118	118	118
V <sub>strav</sub>		13.92		ft/sec		V <sub>scent</sub>		15.93	
						F <sub>p</sub>		0.874	

Elapsed Time (min)	Particulate Sampling Data												Fuel Weight (lb)		Temperature Data (°F)				Stack Gas Data				
	Gas Meter 1 (ft³)	Gas Meter 2 (ft³)	Sample Rate 1 (cfm)	Sample Rate 2 (cfm)	Orifice dH 1 ("H₂O)	Meter Temp 1 (°F)	Meter Vacuum 1 ("Hg)	Orifice dH 2 ("H₂O)	Meter Temp 2 (°F)	Meter Vacuum 2 ("Hg)	Dilution Tunnel (°F)	Dilution Tunnel Center dP	Pro. Rate 1	Pro. Rate 2	Scale Reading	Weight Change	Stack	Filter 1	Filter 2	Ambient	Draft ("H₂O)	CO₂ (%)	CO (%)
105	15.512	15.975	0.15	0.15	1.06	89	1.98	0.94	88	1.2	99	0.054	100	99	32.4	-0.1	311	80	80	78	-0.043	5.2	0
106	15.660	16.128	0.15	0.15	1.07	89	1.98	0.94	89	1.2	99	0.053	100	100	32.4	0	311	80	80	78	-0.048	5.1	0
107	15.807	16.280	0.15	0.15	1.07	89	1.98	0.94	89	1.1	99	0.050	102	102	32.3	-0.1	312	80	80	78	-0.046	5.3	0
108	15.955	16.434	0.15	0.15	1.07	89	1.99	0.94	89	1.1	100	0.055	98	99	32.3	0	312	80	80	78	-0.049	5.5	0
109	16.103	16.586	0.15	0.15	1.06	89	1.98	0.94	89	1.1	100	0.052	101	101	32.2	-0.1	312	80	80	78	-0.039	5.6	0
110	16.251	16.738	0.15	0.15	1.07	89	1.98	0.94	89	1.1	100	0.052	101	101	32.1	-0.1	312	80	80	78	-0.022	5.4	0
111	16.399	16.892	0.15	0.15	1.07	89	1.98	0.94	89	1.1	100	0.051	102	103	32.1	0	313	80	80	78	-0.018	5.4	0
112	16.546	17.044	0.15	0.15	1.07	89	1.99	0.95	89	1.1	100	0.050	102	103	32.1	0	313	80	80	78	-0.010	5.8	0
113	16.695	17.196	0.15	0.15	1.07	89	1.99	0.94	89	1.1	100	0.055	99	98	32.0	-0.1	313	80	80	78	-0.010	5.8	0
114	16.843	17.350	0.15	0.15	1.07	89	1.99	0.94	89	1.1	100	0.052	101	102	32.0	0	311	80	80	78	-0.014	5.6	0
115	16.991	17.502	0.15	0.15	1.07	89	1.98	0.95	89	1.2	100	0.053	100	100	32.0	0	310	80	80	78	-0.020	5.2	0
116	17.138	17.655	0.15	0.15	1.07	89	1.99	0.94	89	1.2	100	0.050	102	103	31.9	-0.1	311	80	80	78	-0.029	4.9	0
117	17.287	17.807	0.15	0.15	1.07	89	1.99	0.94	89	1.1	100	0.053	101	100	31.9	0	309	80	80	78	-0.030	5.2	0
118	17.435	17.960	0.15	0.15	1.06	89	1.98	0.94	89	1.2	100	0.051	102	102	31.8	-0.1	309	80	80	78	-0.030	5.1	0
119	17.583	18.113	0.15	0.15	1.07	89	1.99	0.94	89	1.2	100	0.055	98	98	31.7	-0.1	309	80	80	78	-0.021	5.1	0
120	17.730	18.265	0.15	0.15	1.07	89	1.98	0.94	89	1.2	100	0.053	99	100	31.7	0	309	80	80	78	-0.027	5.4	0
121	17.878	18.418	0.15	0.15	1.07	89	1.99	0.94	89	1.2	100	0.053	100	100	31.6	-0.1	308	80	80	79	-0.029	5.4	0
122	18.026	18.571	0.15	0.15	1.06	89	1.98	0.94	89	1.1	100	0.054	99	99	31.6	0	309	80	80	78	-0.019	5.3	0
123	18.175	18.723	0.15	0.15	1.07	89	1.98	0.94	89	1.2	100	0.051	102	102	31.6	0	310	80	80	78	-0.014	5.3	0
124	18.322	18.875	0.15	0.15	1.07	89	1.98	0.94	89	1.2	100	0.051	101	102	31.5	-0.1	310	80	80	78	-0.025	5.7	0
125	18.470	19.029	0.15	0.15	1.07	89	1.98	0.94	89	1.2	100	0.051	102	103	31.4	-0.1	309	80	80	78	-0.025	5.7	0
126	18.618	19.180	0.15	0.15	1.07	89	1.98	0.94	89	1.2	100	0.051	102	101	31.4	0	310	80	80	78	-0.031	5.8	0
127	18.766	19.333	0.15	0.15	1.06	89	1.98	0.93	89	1.2	100	0.052	101	101	31.3	-0.1	310	80	80	78	-0.023	5.7	0
128	18.914	19.486	0.15	0.15	1.06	89	1.98	0.94	89	1.2	100	0.053	100	100	31.3	0	309	80	80	78	-0.022	5.6	0
129	19.061	19.638	0.15	0.15	1.06	89	1.99	0.94	89	1.2	100	0.053	99	100	31.3	0	309	80	80	79	-0.035	5.3	0
130	19.209	19.791	0.15	0.15	1.06	89	1.99	0.94	89	1.2	100	0.053	100	100	31.2	-0.1	310	80	80	79	-0.036	5.1	0
131	19.357	19.943	0.15	0.15	1.06	89	1.99	0.94	89	1.2	100	0.053	100	100	31.1	-0.1	310	80	80	79	-0.045	5.2	0
132	19.506	20.096	0.15	0.15	1.07	89	1.99	0.94	89	1.2	100	0.052	102	101	31.1	0	311	80	80	79	-0.044	5.5	0
133	19.652	20.249	0.15	0.15	1.07	89	1.99	0.94	89	1.2	100	0.052	99	101	31.0	-0.1	311	80	80	79	-0.030	5.6	0
134	19.800	20.401	0.15	0.15	1.07	89	1.99	0.94	89	1.2	100	0.050	103	103	31.0	0	311	80	80	79	-0.022	5.8	0
135	19.948	20.553	0.15	0.15	1.06	89	1.99	0.94	89	1.2	100	0.051	102	102	30.9	-0.1	311	81	80	79	-0.032	5.8	0
136	20.097	20.707	0.15	0.15	1.07	89	1.99	0.94	89	1.2	100	0.055	99	99	30.9	0	312	81	80	79	-0.037	5.9	0
137	20.244	20.858	0.15	0.15	1.07	89	1.99	0.94	89	1.2	100	0.054	98	98	30.8	-0.1	311	81	81	79	-0.033	5.9	0
138	20.392	21.011	0.15	0.15	1.07	89	1.99	0.93	89	1.2	100	0.054	99	99	30.8	0	311	81	81	79	-0.031	5.7	0
139	20.540	21.164	0.15	0.15	1.07	89	1.99	0.94	89	1.2	100	0.054	99	99	30.7	-0.1	312	81	81	79	-0.028	5.7	0

### Pellet Heater Test Data - ASTM E2779 / ASTM E2515

Run: 2

Manufacturer: Harman High Burn End Time: 62  
 Model: Allure 43 Medium Burn End Time: 183  
 Tracking No.: 2123 Total Sampling Time: 363 min  
 Project No.: 0135PS037E Recording Interval: 1 min  
 Test Date: 10-Sep-15  
 Beginning Clock Time: 09:22 Background Sample Volume: 74.988 cubic feet

Meter Box Y Factor: 1.001 (1) 1.003 (2) 1.009 (Amb)

Barometric Pressure: Begin Middle End Average  
30.10 30.08 30.07 30.08 "Hg

OMNI Equipment Numbers: 23, 131, 185, 132, 209, 291, 335, 336, 410, 420, 559

PM Control Modules: 335/336  
 Dilution Tunnel MW(dry): 29.00 lb/lb-mole  
 Dilution Tunnel MW(wet): 28.78 lb/lb-mole  
 Dilution Tunnel H2O: 2.00 percent  
 Dilution Tunnel Static: -0.530 "H2O  
 Tunnel Area: 0.19635 ft2  
 Pitot Tube Cp: 0.99

Avg. Tunnel Velocity: 13.69 ft/sec.  
 Initial Tunnel Flow: 144.8 scfm  
 Average Tunnel Flow: 149.2 scfm  
 Post-Test Leak Check (1): 0.001 cfm @ -1 in. Hg  
 Post-Test Leak Check (2): 0 cfm @ -1 in. Hg  
 Fuel Moisture: 5.05 Dry Basis %

Velocity Traverse Data									
	Pt.1	Pt.2	Pt.3	Pt.4	Pt.5	Pt.6	Pt.7	Pt.8	Center
Initial dP	0.026	0.051	0.052	0.030	0.028	0.049	0.052	0.031	0.053
Temp:	118	118	118	118	118	118	118	118	118
V <sub>strav</sub>		13.92		ft/sec		V <sub>scent</sub>		15.93	
						F <sub>p</sub>		0.874	

Elapsed Time (min)	Particulate Sampling Data												Fuel Weight (lb)		Temperature Data (°F)				Stack Gas Data				
	Gas Meter 1 (ft³)	Gas Meter 2 (ft³)	Sample Rate 1 (cfm)	Sample Rate 2 (cfm)	Orifice dH 1 ("H₂O)	Meter Temp 1 (°F)	Meter Vacuum 1 ("Hg)	Orifice dH 2 ("H₂O)	Meter Temp 2 (°F)	Meter Vacuum 2 ("Hg)	Dilution Tunnel (°F)	Dilution Tunnel Center dP	Pro. Rate 1	Pro. Rate 2	Scale Reading	Weight Change	Stack	Filter 1	Filter 2	Ambient	Draft ("H₂O)	CO₂ (%)	CO (%)
140	20.688	21.316	0.15	0.15	1.06	89	1.99	0.94	89	1.2	100	0.051	102	102	30.6	-0.1	312	81	81	79	-0.022	5.7	0
141	20.836	21.469	0.15	0.15	1.07	89	1.99	0.94	89	1.2	100	0.053	100	100	30.6	0	312	81	81	79	-0.029	6	0
142	20.983	21.621	0.15	0.15	1.06	89	1.99	0.94	89	1.2	100	0.054	98	99	30.5	-0.1	312	81	81	79	-0.025	6.1	0
143	21.131	21.773	0.15	0.15	1.06	89	1.99	0.94	89	1.2	100	0.053	100	100	30.5	0	312	81	81	79	-0.028	5.8	0
144	21.279	21.926	0.15	0.15	1.06	90	1.99	0.94	89	1.2	100	0.052	101	101	30.4	-0.1	313	81	81	79	-0.020	6.3	0
145	21.428	22.078	0.15	0.15	1.07	90	1.99	0.94	89	1.2	100	0.053	100	100	30.4	0	314	81	81	79	-0.023	6.4	0
146	21.574	22.230	0.15	0.15	1.07	90	1.99	0.94	89	1.2	100	0.053	98	100	30.3	-0.1	313	81	81	79	-0.026	6.3	0
147	21.722	22.384	0.15	0.15	1.07	90	1.99	0.94	89	1.2	100	0.051	102	103	30.3	0	314	81	81	79	-0.036	6.1	0
148	21.870	22.535	0.15	0.15	1.06	90	1.99	0.94	89	1.2	101	0.055	98	97	30.2	-0.1	316	81	81	79	-0.026	6.4	0
149	22.019	22.688	0.15	0.15	1.06	90	1.99	0.94	89	1.2	101	0.050	103	103	30.1	-0.1	317	81	81	79	-0.019	6.5	0
150	22.166	22.841	0.15	0.15	1.07	90	1.99	0.94	89	1.2	101	0.048	104	105	30.1	0	317	81	81	79	-0.035	6.6	0
151	22.313	22.992	0.15	0.15	1.07	90	1.99	0.94	89	1.2	101	0.053	99	99	30.1	0	316	81	81	79	-0.026	6.3	0
152	22.462	23.145	0.15	0.15	1.06	90	2	0.94	89	1.2	101	0.053	100	100	30.0	-0.1	316	81	81	79	-0.033	6.1	0
153	22.610	23.298	0.15	0.15	1.06	90	1.99	0.94	89	1.2	101	0.054	99	99	29.9	-0.1	315	81	81	79	-0.038	5.9	0
154	22.758	23.449	0.15	0.15	1.06	90	2	0.94	89	1.2	101	0.054	99	98	29.9	0	315	81	81	79	-0.026	5.8	0
155	22.905	23.602	0.15	0.15	1.07	90	2	0.94	89	1.2	101	0.051	101	102	29.8	-0.1	315	81	81	79	-0.025	5.9	0
156	23.053	23.755	0.15	0.15	1.06	90	2	0.94	89	1.2	101	0.051	102	102	29.8	0	316	81	81	79	-0.030	6.1	0
157	23.201	23.907	0.15	0.15	1.06	90	2	0.94	90	1.2	101	0.051	102	101	29.8	0	315	81	81	80	-0.029	6.4	0
158	23.349	24.060	0.15	0.15	1.06	90	2	0.94	90	1.2	101	0.055	98	98	29.7	-0.1	315	81	81	79	-0.017	5.9	0
159	23.496	24.211	0.15	0.15	1.06	90	2	0.94	90	1.2	101	0.054	98	98	29.7	0	315	81	81	79	-0.030	6	0
160	23.644	24.364	0.15	0.15	1.06	90	1.99	0.93	90	1.2	101	0.051	102	102	29.6	-0.1	314	81	81	79	-0.023	6	0
161	23.792	24.517	0.15	0.15	1.06	90	2	0.94	90	1.2	101	0.050	103	103	29.5	-0.1	315	81	81	80	-0.031	5.8	0
162	23.941	24.669	0.15	0.15	1.06	90	2	0.94	90	1.2	101	0.049	104	103	29.5	0	316	81	81	79	-0.035	5.8	0
163	24.088	24.821	0.15	0.15	1.06	90	2	0.94	90	1.2	101	0.049	103	103	29.4	-0.1	315	81	81	79	-0.031	6.1	0
164	24.236	24.974	0.15	0.15	1.07	90	1.99	0.94	90	1.2	101	0.054	99	99	29.3	-0.1	316	81	81	80	-0.041	5.9	0
165	24.384	25.126	0.15	0.15	1.06	90	1.99	0.94	90	1.2	101	0.051	102	101	29.3	0	316	81	81	80	-0.032	5.8	0
166	24.532	25.278	0.15	0.15	1.06	90	1.99	0.93	90	1.2	101	0.052	101	100	29.2	-0.1	316	81	81	80	-0.037	5.8	0
167	24.680	25.431	0.15	0.15	1.06	90	1.99	0.94	90	1.2	101	0.052	101	101	29.2	0	316	81	81	80	-0.045	5.8	0
168	24.827	25.583	0.15	0.15	1.06	90	1.99	0.94	90	1.2	101	0.052	100	100	29.2	0	316	81	81	80	-0.044	5.7	0
169	24.975	25.735	0.15	0.15	1.06	90	2	0.93	90	1.2	101	0.052	101	100	29.1	-0.1	316	82	82	80	-0.034	5.7	0
170	25.123	25.888	0.15	0.15	1.06	90	1.99	0.94	90	1.2	101	0.051	102	102	29.0	-0.1	315	82	82	80	-0.023	6.1	0
171	25.271	26.039	0.15	0.15	1.06	90	2	0.94	90	1.2	101	0.051	102	101	29.0	0	315	82	82	80	-0.028	6.3	0
172	25.418	26.192	0.15	0.15	1.07	90	2	0.93	90	1.2	101	0.054	98	99	28.9	-0.1	314	82	82	80	-0.008	6.1	0
173	25.566	26.344	0.15	0.15	1.06	90	1.99	0.94	90	1.2	101	0.052	101	100	28.9	0	315	82	82	80	0.002	5.8	0
174	25.714	26.496	0.15	0.15	1.06	90	2	0.93	90	1.2	101	0.051	102	101	28.8	-0.1	315	82	82	80	-0.018	5.9	0

### Pellet Heater Test Data - ASTM E2779 / ASTM E2515

Run: 2

Manufacturer: Harman High Burn End Time: 62  
 Model: Allure 43 Medium Burn End Time: 183  
 Tracking No.: 2123 Total Sampling Time: 363 min  
 Project No.: 0135PS037E Recording Interval: 1 min  
 Test Date: 10-Sep-15  
 Beginning Clock Time: 09:22 Background Sample Volume: 74.988 cubic feet

Meter Box Y Factor: 1.001 (1) 1.003 (2) 1.009 (Amb)

Barometric Pressure: Begin Middle End Average  
30.10 30.08 30.07 30.08 "Hg

OMNI Equipment Numbers: 23, 131, 185, 132, 209, 291, 335, 336, 410, 420, 559

PM Control Modules: 335/336  
 Dilution Tunnel MW(dry): 29.00 lb/lb-mole  
 Dilution Tunnel MW(wet): 28.78 lb/lb-mole  
 Dilution Tunnel H2O: 2.00 percent  
 Dilution Tunnel Static: -0.530 "H2O  
 Tunnel Area: 0.19635 ft2  
 Pitot Tube Cp: 0.99

Avg. Tunnel Velocity: 13.69 ft/sec.  
 Initial Tunnel Flow: 144.8 scfm  
 Average Tunnel Flow: 149.2 scfm  
 Post-Test Leak Check (1): 0.001 cfm @ -1 in. Hg  
 Post-Test Leak Check (2): 0 cfm @ -1 in. Hg  
 Fuel Moisture: 5.05 Dry Basis %

Velocity Traverse Data									
	Pt.1	Pt.2	Pt.3	Pt.4	Pt.5	Pt.6	Pt.7	Pt.8	Center
Initial dP	0.026	0.051	0.052	0.030	0.028	0.049	0.052	0.031	0.053
Temp:	118	118	118	118	118	118	118	118	118
V <sub>strav</sub>		13.92		ft/sec		V <sub>scent</sub>		15.93	
						F <sub>p</sub>		0.874	

Elapsed Time (min)	Particulate Sampling Data												Fuel Weight (lb)				Temperature Data (°F)				Stack Gas Data		
	Gas Meter 1 (ft³)	Gas Meter 2 (ft³)	Sample Rate 1 (cfm)	Sample Rate 2 (cfm)	Orifice dH 1 ("H <sub>2</sub> O)	Meter Temp 1 (°F)	Meter Vacuum 1 ("Hg)	Orifice dH 2 ("H <sub>2</sub> O)	Meter Temp 2 (°F)	Meter Vacuum 2 ("Hg)	Dilution Tunnel (°F)	Dilution Tunnel Center dP	Pro. Rate 1	Pro. Rate 2	Scale Reading	Weight Change	Stack	Filter 1	Filter 2	Ambient	Draft ("H <sub>2</sub> O)	CO <sub>2</sub> (%)	CO (%)
175	25.862	26.648	0.15	0.15	1.06	90	1.99	0.93	90	1.2	101	0.054	99	99	28.8	0	314	82	82	80	-0.029	6.1	0
176	26.010	26.800	0.15	0.15	1.06	90	2	0.93	90	1.2	101	0.054	99	99	28.8	0	314	82	82	80	-0.040	6.1	0
177	26.157	26.952	0.15	0.15	1.06	91	2	0.94	90	1.2	101	0.054	98	99	28.7	-0.1	315	82	82	80	-0.042	6.1	0
178	26.305	27.105	0.15	0.15	1.06	91	1.99	0.93	90	1.2	101	0.052	101	101	28.6	-0.1	315	82	82	80	-0.037	6.3	0
179	26.453	27.256	0.15	0.15	1.05	91	1.99	0.94	90	1.2	101	0.055	98	97	28.5	-0.1	315	82	82	80	-0.038	6.2	0
180	26.601	27.409	0.15	0.15	1.06	91	2	0.93	90	1.2	101	0.051	102	102	28.5	0	316	82	82	80	-0.037	6	0
181	26.748	27.561	0.15	0.15	1.06	91	1.99	0.93	90	1.2	101	0.052	100	100	28.5	0	315	82	82	80	-0.044	6.1	0
182	26.896	27.713	0.15	0.15	1.06	91	2	0.94	90	1.2	101	0.052	101	100	28.4	-0.1	314	82	82	80	-0.041	6	0
183	27.044	27.865	0.15	0.15	1.06	91	1.99	0.93	90	1.2	101	0.054	99	99	28.4	0	316	82	82	80	-0.041	5.8	0
184	27.192	28.018	0.15	0.15	1.05	91	1.99	0.93	90	1.2	100	0.054	99	99	28.3	-0.1	312	82	82	80	-0.028	6	0
185	27.340	28.169	0.15	0.15	1.06	91	1.99	0.93	90	1.2	100	0.052	100	100	28.2	-0.1	311	82	82	80	-0.041	6.1	0
186	27.486	28.322	0.15	0.15	1.06	91	1.99	0.93	90	1.2	100	0.051	100	102	28.2	0	311	82	82	80	-0.039	5.7	0
187	27.634	28.474	0.15	0.15	1.06	91	1.99	0.93	90	1.2	100	0.052	100	100	28.2	0	311	82	82	80	-0.016	5.2	0
188	27.783	28.626	0.15	0.15	1.05	91	1.99	0.93	90	1.2	100	0.051	102	101	28.2	0	310	82	82	80	-0.019	4.8	0
189	27.931	28.778	0.15	0.15	1.06	91	2	0.93	90	1.2	100	0.052	100	100	28.1	-0.1	309	82	82	80	-0.021	4.2	0
190	28.078	28.931	0.15	0.15	1.06	91	1.99	0.93	91	1.2	100	0.054	98	99	28.1	0	309	82	82	79	-0.004	3.7	0
191	28.225	29.082	0.15	0.15	1.06	91	2	0.94	91	1.2	100	0.053	99	99	28.1	0	308	82	82	80	0.003	3.5	0
192	28.373	29.235	0.15	0.15	1.06	91	1.99	0.93	91	1.2	100	0.055	98	98	28.0	-0.1	306	82	82	79	0.002	3.4	0
193	28.522	29.388	0.15	0.15	1.06	91	1.99	0.93	91	1.2	100	0.049	104	104	28.0	0	303	82	82	80	-0.014	3.1	0
194	28.669	29.539	0.15	0.15	1.06	91	1.99	0.93	91	1.2	100	0.050	102	101	28.0	0	302	82	82	80	-0.026	2.8	0
195	28.817	29.691	0.15	0.15	1.06	91	1.99	0.93	91	1.2	99	0.054	98	98	28.0	0	301	82	82	80	-0.024	2.6	0
196	28.965	29.844	0.15	0.15	1.06	91	2	0.93	91	1.2	99	0.052	100	101	28.0	0	300	82	82	80	-0.009	2.6	0
197	29.113	29.995	0.15	0.15	1.05	91	1.99	0.93	91	1.2	99	0.052	100	99	28.0	0	298	82	82	80	-0.019	2.8	0
198	29.261	30.148	0.15	0.15	1.06	91	1.99	0.93	91	1.2	99	0.054	98	99	27.9	-0.1	297	82	82	80	-0.017	2.8	0
199	29.407	30.300	0.15	0.15	1.06	91	2	0.93	91	1.2	99	0.052	99	100	27.9	0	295	82	82	80	-0.023	2.8	0
200	29.555	30.451	0.15	0.15	1.06	91	1.99	0.93	91	1.2	99	0.052	100	99	27.8	-0.1	294	82	82	80	-0.028	2.7	0
201	29.703	30.604	0.15	0.15	1.06	91	2	0.93	91	1.2	99	0.054	98	99	27.8	0	294	82	82	79	-0.022	2.6	0
202	29.852	30.756	0.15	0.15	1.06	91	1.99	0.93	91	1.2	99	0.055	98	97	27.8	0	293	82	82	79	-0.019	2.7	0
203	29.999	30.908	0.15	0.15	1.06	91	1.99	0.93	91	1.2	99	0.052	100	100	27.8	0	292	82	82	80	-0.011	2.9	0
204	30.147	31.061	0.15	0.15	1.06	91	1.99	0.93	91	1.2	99	0.053	99	100	27.7	-0.1	290	82	82	80	-0.004	2.8	0
205	30.295	31.212	0.15	0.15	1.06	91	2	0.93	91	1.2	98	0.052	100	99	27.8	0.1	288	82	82	80	-0.023	2.7	0
206	30.443	31.364	0.15	0.15	1.06	91	1.99	0.93	91	1.2	98	0.052	100	100	27.7	-0.1	287	82	82	80	-0.037	2.5	0
207	30.591	31.517	0.15	0.15	1.06	91	1.99	0.93	91	1.2	98	0.053	99	100	27.7	0	287	82	82	80	-0.026	2.6	0
208	30.738	31.669	0.15	0.15	1.06	91	2	0.93	91	1.2	98	0.054	98	98	27.7	0	287	82	82	80	-0.024	2.7	0
209	30.886	31.821	0.15	0.15	1.06	91	1.99	0.93	91	1.2	98	0.050	102	102	27.7	0	285	82	82	80	-0.037	2.8	0

### Pellet Heater Test Data - ASTM E2779 / ASTM E2515

Run: 2

Manufacturer: Harman High Burn End Time: 62  
 Model: Allure 43 Medium Burn End Time: 183  
 Tracking No.: 2123 Total Sampling Time: 363 min  
 Project No.: 0135PS037E Recording Interval: 1 min  
 Test Date: 10-Sep-15  
 Beginning Clock Time: 09:22 Background Sample Volume: 74.988 cubic feet

Meter Box Y Factor: 1.001 (1) 1.003 (2) 1.009 (Amb)

Barometric Pressure: Begin Middle End Average  
30.10 30.08 30.07 30.08 "Hg

OMNI Equipment Numbers: 23, 131, 185, 132, 209, 291, 335, 336, 410, 420, 559

PM Control Modules: 335/336  
 Dilution Tunnel MW(dry): 29.00 lb/lb-mole  
 Dilution Tunnel MW(wet): 28.78 lb/lb-mole  
 Dilution Tunnel H2O: 2.00 percent  
 Dilution Tunnel Status: -0.530 "H2O  
 Tunnel Area: 0.19635 ft2  
 Pitot Tube Cp: 0.99

Avg. Tunnel Velocity: 13.69 ft/sec.  
 Initial Tunnel Flow: 144.8 scfm  
 Average Tunnel Flow: 149.2 scfm  
 Post-Test Leak Check (1): 0.001 cfm @ -1 in. Hg  
 Post-Test Leak Check (2): 0 cfm @ -1 in. Hg  
 Fuel Moisture: 5.05 Dry Basis %

Velocity Traverse Data									
	Pt.1	Pt.2	Pt.3	Pt.4	Pt.5	Pt.6	Pt.7	Pt.8	Center
Initial dP	0.026	0.051	0.052	0.030	0.028	0.049	0.052	0.031	0.053
Temp:	118	118	118	118	118	118	118	118	118
V <sub>strav</sub>		13.92		ft/sec		V <sub>scent</sub>		15.93	
						F <sub>p</sub>		0.874	

Elapsed Time (min)	Particulate Sampling Data												Fuel Weight (lb)				Temperature Data (°F)				Stack Gas Data		
	Gas Meter 1 (ft³)	Gas Meter 2 (ft³)	Sample Rate 1 (cfm)	Sample Rate 2 (cfm)	Orifice dH 1 ("H <sub>2</sub> O)	Meter Temp 1 (°F)	Meter Vacuum 1 ("Hg)	Orifice dH 2 ("H <sub>2</sub> O)	Meter Temp 2 (°F)	Meter Vacuum 2 ("Hg)	Dilution Tunnel (°F)	Dilution Tunnel Center dP	Pro. Rate 1	Pro. Rate 2	Scale Reading	Weight Change	Stack	Filter 1	Filter 2	Ambient	Draft ("H <sub>2</sub> O)	CO <sub>2</sub> (%)	CO (%)
210	31.034	31.973	0.15	0.15	1.05	91	2	0.93	91	1.2	98	0.052	100	100	27.6	-0.1	284	82	82	81	-0.039	2.6	0
211	31.182	32.125	0.15	0.15	1.06	91	1.99	0.93	91	1.2	98	0.055	98	97	27.6	0	283	82	82	80	-0.041	2.5	0
212	31.329	32.277	0.15	0.15	1.06	92	2	0.93	91	1.2	98	0.054	98	98	27.6	0	283	82	82	80	-0.043	2.6	0
213	31.477	32.430	0.15	0.15	1.06	92	1.99	0.93	91	1.2	98	0.054	98	99	27.6	0	283	82	82	80	-0.034	2.7	0
214	31.625	32.581	0.15	0.15	1.06	92	1.99	0.93	91	1.2	98	0.053	99	98	27.5	-0.1	280	82	82	80	-0.018	2.7	0
215	31.773	32.734	0.15	0.15	1.05	92	1.99	0.93	91	1.2	98	0.055	97	98	27.5	0	280	82	82	80	0.000	2.5	0
216	31.921	32.886	0.15	0.15	1.06	92	1.99	0.93	91	1.2	98	0.053	99	99	27.4	-0.1	280	82	82	80	-0.008	2.6	0
217	32.068	33.038	0.15	0.15	1.06	92	1.99	0.93	91	1.2	98	0.054	98	98	27.5	0.1	280	82	82	80	-0.015	2.8	0
218	32.216	33.190	0.15	0.15	1.06	92	1.99	0.93	91	1.2	98	0.054	98	98	27.4	-0.1	282	82	82	80	-0.018	2.8	0
219	32.365	33.343	0.15	0.15	1.05	92	2	0.93	91	1.2	98	0.052	101	101	27.4	0	283	82	82	80	-0.015	2.9	0
220	32.513	33.494	0.15	0.15	1.06	92	1.99	0.93	91	1.2	98	0.054	98	97	27.4	0	284	82	82	80	-0.027	3.2	0
221	32.659	33.646	0.15	0.15	1.06	92	1.99	0.93	91	1.2	98	0.053	98	99	27.3	-0.1	285	82	82	80	-0.016	3.5	0
222	32.807	33.799	0.15	0.15	1.06	92	2	0.93	91	1.2	98	0.054	98	99	27.3	0	285	82	82	80	-0.035	3.5	0
223	32.956	33.950	0.15	0.15	1.05	92	2	0.93	91	1.2	98	0.054	99	97	27.3	0	284	82	82	80	-0.028	3.3	0
224	33.104	34.102	0.15	0.15	1.05	92	1.99	0.93	91	1.2	98	0.052	100	100	27.3	0	283	82	82	80	-0.024	2.9	0
225	33.251	34.255	0.15	0.15	1.06	92	1.99	0.93	91	1.2	98	0.053	98	100	27.2	-0.1	283	82	82	80	-0.014	2.8	0
226	33.398	34.406	0.15	0.15	1.06	92	2	0.93	91	1.2	98	0.053	98	98	27.3	0.1	282	82	82	80	-0.020	2.7	0
227	33.547	34.558	0.15	0.15	1.06	92	1.99	0.93	91	1.2	98	0.052	101	100	27.2	-0.1	282	82	82	81	-0.024	2.7	0
228	33.695	34.711	0.15	0.15	1.05	92	2	0.93	91	1.2	98	0.051	101	102	27.2	0	284	82	82	81	-0.025	2.8	0
229	33.843	34.862	0.15	0.15	1.06	92	2	0.93	91	1.2	98	0.051	101	100	27.1	-0.1	283	82	82	81	-0.023	3.1	0
230	33.989	35.014	0.15	0.15	1.05	92	2	0.93	91	1.2	98	0.054	97	98	27.1	0	282	82	82	80	-0.022	3.1	0
231	34.137	35.167	0.15	0.15	1.05	92	2	0.93	91	1.2	98	0.052	100	101	27.1	0	282	82	82	81	-0.035	2.9	0
232	34.286	35.318	0.15	0.15	1.05	92	2	0.93	91	1.2	98	0.053	100	98	27.1	0	283	82	82	80	-0.014	2.8	0
233	34.434	35.470	0.15	0.15	1.05	92	1.99	0.92	91	1.2	98	0.054	98	98	27.0	-0.1	283	82	82	80	-0.004	3	0
234	34.581	35.623	0.15	0.15	1.06	92	2	0.93	91	1.2	98	0.052	99	101	27.0	0	283	82	82	80	-0.005	3.1	0
235	34.728	35.774	0.15	0.15	1.06	92	1.99	0.93	91	1.2	98	0.055	97	97	26.9	-0.1	282	82	82	80	0.004	2.9	0
236	34.876	35.926	0.15	0.15	1.06	92	2	0.92	92	1.2	98	0.054	98	98	26.9	0	281	82	82	80	-0.004	2.8	0
237	35.024	36.079	0.15	0.15	1.05	92	2	0.93	92	1.2	98	0.052	100	100	26.9	0	281	82	82	80	-0.020	2.8	0
238	35.172	36.230	0.15	0.15	1.05	92	2	0.93	92	1.2	98	0.050	102	101	26.9	0	282	82	82	81	-0.023	3.1	0
239	35.319	36.382	0.15	0.15	1.06	92	2	0.93	92	1.2	98	0.052	99	100	26.9	0	283	82	82	80	-0.025	3.3	0
240	35.467	36.534	0.15	0.15	1.05	92	2	0.92	92	1.2	99	0.052	100	100	26.8	-0.1	285	82	82	81	-0.029	3.5	0
241	35.615	36.685	0.15	0.15	1.05	92	1.99	0.93	92	1.2	98	0.051	101	100	26.8	0	287	83	83	80	-0.028	3.6	0
242	35.763	36.838	0.15	0.15	1.05	92	2	0.92	92	1.2	99	0.055	97	98	26.8	0	287	83	83	81	-0.020	3.9	0
243	35.910	36.990	0.15	0.15	1.05	92	2	0.93	92	1.2	99	0.052	100	100	26.7	-0.1	287	83	83	81	-0.030	3.7	0
244	36.058	37.141	0.15	0.15	1.06	92	2	0.93	92	1.2	99	0.051	101	100	26.8	0.1	286	83	83	81	-0.033	3.3	0



### Pellet Heater Test Data - ASTM E2779 / ASTM E2515

Run: 2

Manufacturer: Harman High Burn End Time: 62  
 Model: Allure 43 Medium Burn End Time: 183  
 Tracking No.: 2123 Total Sampling Time: 363 min  
 Project No.: 0135PS037E Recording Interval: 1 min  
 Test Date: 10-Sep-15  
 Beginning Clock Time: 09:22 Background Sample Volume: 74.988 cubic feet

Meter Box Y Factor: 1.001 (1) 1.003 (2) 1.009 (Amb)

Barometric Pressure: Begin Middle End Average  
30.10 30.08 30.07 30.08 "Hg

OMNI Equipment Numbers: 23, 131, 185, 132, 209, 291, 335, 336, 410, 420, 559

PM Control Modules: 335/336  
 Dilution Tunnel MW(dry): 29.00 lb/lb-mole  
 Dilution Tunnel MW(wet): 28.78 lb/lb-mole  
 Dilution Tunnel H2O: 2.00 percent  
 Dilution Tunnel H2O: -0.530 "H2O  
 Tunnel Area: 0.19635 ft2  
 Pitot Tube Cp: 0.99

Avg. Tunnel Velocity: 13.69 ft/sec.  
 Initial Tunnel Flow: 144.8 scfm  
 Average Tunnel Flow: 149.2 scfm  
 Post-Test Leak Check (1): 0.001 cfm @ -1 in. Hg  
 Post-Test Leak Check (2): 0 cfm @ -1 in. Hg  
 Fuel Moisture: 5.05 Dry Basis %

Velocity Traverse Data									
	Pt.1	Pt.2	Pt.3	Pt.4	Pt.5	Pt.6	Pt.7	Pt.8	Center
Initial dP	0.026	0.051	0.052	0.030	0.028	0.049	0.052	0.031	0.053
Temp:	118	118	118	118	118	118	118	118	118
V <sub>strav</sub>		13.92		ft/sec		V <sub>scent</sub>		15.93	
						F <sub>p</sub>		0.874	

Elapsed Time (min)	Particulate Sampling Data												Fuel Weight (lb)				Temperature Data (°F)				Stack Gas Data		
	Gas Meter 1 (ft³)	Gas Meter 2 (ft³)	Sample Rate 1 (cfm)	Sample Rate 2 (cfm)	Orifice dH 1 ("H₂O)	Meter Temp 1 (°F)	Meter Vacuum 1 ("Hg)	Orifice dH 2 ("H₂O)	Meter Temp 2 (°F)	Meter Vacuum 2 ("Hg)	Dilution Tunnel (°F)	Dilution Tunnel Center dP	Pro. Rate 1	Pro. Rate 2	Scale Reading	Weight Change	Stack	Filter 1	Filter 2	Ambient	Draft ("H₂O)	CO₂ (%)	CO (%)
245	36.206	37.294	0.15	0.15	1.06	92	1.99	0.92	92	1.2	99	0.052	100	101	26.7	-0.1	285	83	83	80	-0.029	3.2	0
246	36.354	37.446	0.15	0.15	1.05	92	2	0.93	92	1.2	99	0.049	103	103	26.7	0	283	83	83	81	-0.027	2.8	0
247	36.502	37.597	0.15	0.15	1.05	92	2	0.93	92	1.2	99	0.051	101	100	26.6	-0.1	282	83	83	81	-0.027	2.7	0
248	36.649	37.749	0.15	0.15	1.05	92	2	0.93	92	1.2	98	0.053	98	99	26.6	0	283	83	83	81	-0.018	2.5	0
249	36.797	37.901	0.15	0.15	1.05	92	1.99	0.92	92	1.2	98	0.050	102	102	26.6	0	281	83	83	80	-0.009	2.7	0
250	36.945	38.053	0.15	0.15	1.05	92	1.99	0.93	92	1.2	98	0.051	101	101	26.6	0	280	83	83	80	-0.019	2.7	0
251	37.093	38.205	0.15	0.15	1.05	92	2	0.92	92	1.2	99	0.051	101	101	26.5	-0.1	280	83	83	81	-0.020	2.6	0
252	37.240	38.357	0.15	0.15	1.06	93	2	0.93	92	1.2	98	0.052	99	100	26.5	0	280	83	83	80	-0.023	2.8	0
253	37.387	38.508	0.15	0.15	1.06	92	2	0.93	92	1.2	98	0.051	100	100	26.5	0	280	83	83	80	-0.025	3.1	0
254	37.535	38.661	0.15	0.15	1.05	93	2	0.92	92	1.2	98	0.052	100	100	26.5	0	281	83	83	80	-0.029	3.2	0
255	37.684	38.813	0.15	0.15	1.05	92	2	0.93	92	1.2	99	0.053	100	99	26.4	-0.1	282	83	83	81	-0.025	3.3	0
256	37.831	38.964	0.15	0.15	1.05	93	2	0.93	92	1.2	99	0.051	100	100	26.3	-0.1	285	83	83	81	-0.029	3.4	0
257	37.978	39.117	0.15	0.15	1.05	93	1.99	0.92	92	1.2	98	0.050	101	102	26.3	0	287	83	83	80	-0.030	3.7	0
258	38.126	39.269	0.15	0.15	1.05	93	2	0.93	92	1.2	99	0.053	99	99	26.3	0	288	83	83	81	-0.031	3.9	0
259	38.274	39.420	0.15	0.15	1.04	93	1.99	0.93	92	1.2	98	0.053	99	98	26.3	0	288	83	83	81	-0.015	3.8	0
260	38.422	39.572	0.15	0.15	1.05	93	2	0.92	92	1.2	99	0.053	99	99	26.3	0	289	83	83	80	-0.023	3.6	0
261	38.569	39.724	0.15	0.15	1.05	93	2	0.92	92	1.2	98	0.054	97	98	26.2	-0.1	289	83	83	80	-0.005	3.3	0
262	38.716	39.875	0.15	0.15	1.05	93	2	0.93	92	1.2	98	0.052	99	99	26.2	0	289	83	83	80	-0.011	3.4	0
263	38.865	40.028	0.15	0.15	1.05	93	2	0.92	92	1.2	98	0.052	101	100	26.2	0	289	83	83	80	0.002	3.3	0
264	39.013	40.180	0.15	0.15	1.05	93	1.99	0.93	92	1.2	98	0.049	103	103	26.1	-0.1	289	83	83	81	-0.012	3.1	0
265	39.160	40.331	0.15	0.15	1.05	93	2	0.93	92	1.2	98	0.054	97	97	26.1	0	289	83	83	80	-0.010	3.1	0
266	39.308	40.484	0.15	0.15	1.05	93	2	0.92	92	1.2	98	0.052	100	100	26.1	0	290	83	83	80	-0.015	3.1	0
267	39.456	40.635	0.15	0.15	1.05	93	2	0.92	92	1.2	98	0.051	101	100	26.1	0	290	83	83	80	-0.008	3.2	0
268	39.604	40.787	0.15	0.15	1.05	93	1.99	0.93	92	1.2	99	0.048	104	104	26.0	-0.1	289	83	83	80	-0.011	3.2	0
269	39.752	40.939	0.15	0.15	1.05	93	2	0.92	92	1.2	98	0.053	99	99	26.0	0	288	83	83	80	-0.031	3.2	0
270	39.898	41.091	0.15	0.15	1.05	93	2	0.93	92	1.2	98	0.052	99	100	26.0	0	287	83	83	79	-0.031	3	0
271	40.046	41.242	0.15	0.15	1.05	93	2	0.92	92	1.2	98	0.053	99	98	26.0	0	286	83	83	80	-0.023	2.8	0
272	40.194	41.395	0.15	0.15	1.05	93	2	0.92	92	1.2	98	0.053	99	100	26.0	0	285	83	83	80	-0.022	2.7	0
273	40.343	41.547	0.15	0.15	1.06	93	2	0.93	92	1.2	98	0.050	103	102	25.9	-0.1	284	83	83	80	-0.024	2.6	0
274	40.490	41.698	0.15	0.15	1.05	93	2	0.93	92	1.2	98	0.052	99	99	25.9	0	283	83	83	80	-0.030	2.5	0
275	40.637	41.851	0.15	0.15	1.05	93	2	0.92	92	1.2	98	0.053	98	100	25.9	0	282	83	83	80	-0.030	2.5	0
276	40.785	42.002	0.15	0.15	1.05	93	2	0.92	92	1.2	98	0.054	98	97	25.8	-0.1	281	83	83	80	-0.031	2.5	0
277	40.934	42.154	0.15	0.15	1.05	93	2	0.93	92	1.2	98	0.052	101	100	25.8	0	281	83	83	80	-0.038	2.4	0
278	41.082	42.306	0.15	0.15	1.05	93	2.01	0.92	92	1.2	98	0.054	98	98	25.8	0	281	83	83	80	-0.037	2.5	0
279	41.228	42.458	0.15	0.15	1.05	93	2	0.93	92	1.2	98	0.054	97	98	25.8	0	281	83	83	80	-0.035	2.7	0

### Pellet Heater Test Data - ASTM E2779 / ASTM E2515

Run: 2

Manufacturer: Harman High Burn End Time: 62  
 Model: Allure 43 Medium Burn End Time: 183  
 Tracking No.: 2123 Total Sampling Time: 363 min  
 Project No.: 0135PS037E Recording Interval: 1 min  
 Test Date: 10-Sep-15  
 Beginning Clock Time: 09:22 Background Sample Volume: 74.988 cubic feet

Meter Box Y Factor: 1.001 (1) 1.003 (2) 1.009 (Amb)

Barometric Pressure: Begin Middle End Average  
30.10 30.08 30.07 30.08 "Hg

OMNI Equipment Numbers: 23, 131, 185, 132, 209, 291, 335, 336, 410, 420, 559

PM Control Modules: 335/336  
 Dilution Tunnel MW(dry): 29.00 lb/lb-mole  
 Dilution Tunnel MW(wet): 28.78 lb/lb-mole  
 Dilution Tunnel H2O: 2.00 percent  
 Dilution Tunnel Static: -0.530 "H2O  
 Tunnel Area: 0.19635 ft2  
 Pitot Tube Cp: 0.99

Avg. Tunnel Velocity: 13.69 ft/sec.  
 Initial Tunnel Flow: 144.8 scfm  
 Average Tunnel Flow: 149.2 scfm  
 Post-Test Leak Check (1): 0.001 cfm @ -1 in. Hg  
 Post-Test Leak Check (2): 0 cfm @ -1 in. Hg  
 Fuel Moisture: 5.05 Dry Basis %

Velocity Traverse Data									
	Pt.1	Pt.2	Pt.3	Pt.4	Pt.5	Pt.6	Pt.7	Pt.8	Center
Initial dP	0.026	0.051	0.052	0.030	0.028	0.049	0.052	0.031	0.053
Temp:	118	118	118	118	118	118	118	118	118
V <sub>strav</sub>		13.92		ft/sec		V <sub>scent</sub>		15.93	
						F <sub>p</sub>		0.874	

Elapsed Time (min)	Particulate Sampling Data												Fuel Weight (lb)				Temperature Data (°F)				Stack Gas Data		
	Gas Meter 1 (ft³)	Gas Meter 2 (ft³)	Sample Rate 1 (cfm)	Sample Rate 2 (cfm)	Orifice dH 1 ("H <sub>2</sub> O)	Meter Temp 1 (°F)	Meter Vacuum 1 ("Hg)	Orifice dH 2 ("H <sub>2</sub> O)	Meter Temp 2 (°F)	Meter Vacuum 2 ("Hg)	Dilution Tunnel (°F)	Dilution Tunnel Center dP	Pro. Rate 1	Pro. Rate 2	Scale Reading	Weight Change	Stack	Filter 1	Filter 2	Ambient	Draft ("H <sub>2</sub> O)	CO <sub>2</sub> (%)	CO (%)
280	41.376	42.609	0.15	0.15	1.05	93	2.01	0.92	92	1.2	98	0.054	98	97	25.8	0	280	83	83	80	-0.036	2.9	0
281	41.524	42.762	0.15	0.15	1.05	93	2	0.92	92	1.2	98	0.053	99	100	25.7	-0.1	280	83	83	80	-0.033	3	0
282	41.672	42.914	0.15	0.15	1.05	93	2.01	0.93	93	1.2	98	0.055	97	97	25.7	0	280	83	83	80	-0.033	3	0
283	41.820	43.065	0.15	0.15	1.05	93	2	0.93	92	1.2	98	0.054	98	97	25.6	-0.1	281	83	83	80	-0.039	3.1	0
284	41.967	43.217	0.15	0.15	1.05	93	2	0.92	92	1.2	98	0.057	95	95	25.6	0	283	83	83	80	-0.032	3.3	0
285	42.115	43.369	0.15	0.15	1.05	93	2	0.92	93	1.2	98	0.054	98	98	25.6	0	284	83	83	80	-0.032	3.6	0
286	42.263	43.520	0.15	0.15	1.05	93	2	0.92	93	1.2	98	0.056	96	95	25.6	0	285	83	83	80	-0.016	3.8	0
287	42.411	43.673	0.15	0.15	1.05	93	2	0.92	93	1.2	98	0.056	96	97	25.5	-0.1	285	83	83	80	-0.022	3.7	0
288	42.557	43.825	0.15	0.15	1.05	93	1.99	0.92	93	1.2	98	0.055	96	97	25.5	0	285	83	83	80	-0.014	3.6	0
289	42.705	43.976	0.15	0.15	1.05	93	2	0.92	93	1.2	98	0.054	98	97	25.5	0	285	83	83	80	-0.007	3.4	0
290	42.853	44.128	0.15	0.15	1.05	93	2	0.92	93	1.2	98	0.056	96	96	25.5	0	285	83	83	80	0.000	3.2	0
291	43.001	44.280	0.15	0.15	1.05	93	2	0.92	93	1.2	98	0.056	96	96	25.4	-0.1	285	83	83	80	-0.018	3	0
292	43.148	44.431	0.15	0.15	1.05	93	2	0.93	93	1.2	98	0.055	96	96	25.4	0	284	83	83	80	-0.026	2.9	0
293	43.296	44.583	0.15	0.15	1.05	93	2	0.92	93	1.2	99	0.051	101	101	25.3	-0.1	284	83	83	80	-0.034	2.8	0
294	43.444	44.735	0.15	0.15	1.04	93	2	0.92	93	1.2	98	0.053	99	99	25.3	0	284	84	83	80	-0.030	2.8	0
295	43.592	44.886	0.15	0.15	1.04	93	2	0.93	93	1.2	98	0.054	98	97	25.3	0	283	84	83	80	-0.023	2.8	0
296	43.739	45.038	0.15	0.15	1.05	93	1.99	0.92	93	1.2	98	0.054	97	98	25.3	0	282	84	83	80	-0.015	2.8	0
297	43.886	45.190	0.15	0.15	1.05	93	2	0.92	93	1.2	98	0.052	99	100	25.3	0	281	84	83	80	-0.024	2.7	0
298	44.033	45.341	0.15	0.15	1.05	93	2	0.92	93	1.2	98	0.052	99	99	25.3	0	282	84	83	80	-0.028	2.5	0
299	44.182	45.493	0.15	0.15	1.04	93	2	0.92	93	1.2	98	0.055	98	97	25.2	-0.1	281	84	83	81	-0.017	2.5	0
300	44.329	45.646	0.15	0.15	1.05	93	2	0.92	93	1.2	98	0.055	96	98	25.2	0	281	84	83	81	0.007	2.7	0
301	44.477	45.796	0.15	0.15	1.05	93	2	0.92	93	1.2	98	0.054	98	96	25.2	0	282	84	83	80	-0.012	2.8	0
302	44.624	45.948	0.15	0.15	1.05	94	2	0.92	93	1.2	98	0.052	99	100	25.1	-0.1	282	84	83	80	-0.021	2.9	0
303	44.772	46.100	0.15	0.15	1.04	94	2	0.92	93	1.2	98	0.055	97	97	25.1	0	282	84	83	80	-0.027	3.1	0
304	44.920	46.251	0.15	0.15	1.04	94	2	0.92	93	1.2	98	0.056	96	95	25.1	0	282	84	83	81	-0.023	3.2	0
305	45.067	46.403	0.15	0.15	1.04	94	2	0.92	93	1.2	98	0.054	97	98	25.1	0	281	84	83	80	-0.031	3.1	0
306	45.214	46.555	0.15	0.15	1.05	94	2	0.92	93	1.2	98	0.055	96	97	25.0	-0.1	282	84	83	80	-0.016	3	0
307	45.362	46.706	0.15	0.15	1.05	94	1.99	0.92	93	1.2	98	0.054	98	97	25.0	0	280	84	83	80	-0.015	3	0
308	45.510	46.858	0.15	0.15	1.05	94	2	0.92	93	1.2	98	0.053	99	99	24.9	-0.1	281	84	83	80	-0.021	3	0
309	45.658	47.010	0.15	0.15	1.05	94	2	0.92	93	1.2	98	0.053	99	99	24.9	0	281	84	83	81	-0.032	3	0
310	45.805	47.161	0.15	0.15	1.05	94	2	0.92	93	1.2	98	0.054	97	97	24.9	0	283	84	83	81	-0.018	3.1	0
311	45.952	47.313	0.15	0.15	1.05	94	2	0.92	93	1.2	98	0.053	98	99	24.8	-0.1	284	84	83	81	-0.013	3.2	0
312	46.100	47.465	0.15	0.15	1.05	94	2	0.92	93	1.2	98	0.056	96	96	24.8	0	284	84	83	81	-0.024	3.3	0
313	46.248	47.616	0.15	0.15	1.04	94	1.99	0.92	93	1.2	98	0.056	96	95	24.8	0	285	84	83	81	-0.008	3.4	0
314	46.396	47.768	0.15	0.15	1.05	94	2	0.92	93	1.2	98	0.056	96	96	24.8	0	285	84	83	81	-0.023	3.5	0

### Pellet Heater Test Data - ASTM E2779 / ASTM E2515

Run: 2

Manufacturer: Harman High Burn End Time: 62  
 Model: Allure 43 Medium Burn End Time: 183  
 Tracking No.: 2123 Total Sampling Time: 363 min  
 Project No.: 0135PS037E Recording Interval: 1 min  
 Test Date: 10-Sep-15  
 Beginning Clock Time: 09:22 Background Sample Volume: 74.988 cubic feet

Meter Box Y Factor: 1.001 (1) 1.003 (2) 1.009 (Amb)

Barometric Pressure: Begin Middle End Average  
30.10 30.08 30.07 30.08 "Hg

OMNI Equipment Numbers: 23, 131, 185, 132, 209, 291, 335, 336, 410, 420, 559

PM Control Modules: 335/336  
 Dilution Tunnel MW(dry): 29.00 lb/lb-mole  
 Dilution Tunnel MW(wet): 28.78 lb/lb-mole  
 Dilution Tunnel H2O: 2.00 percent  
 Dilution Tunnel Static: -0.530 "H2O  
 Tunnel Area: 0.19635 ft2  
 Pitot Tube Cp: 0.99

Avg. Tunnel Velocity: 13.69 ft/sec.  
 Initial Tunnel Flow: 144.8 scfm  
 Average Tunnel Flow: 149.2 scfm  
 Post-Test Leak Check (1): 0.001 cfm @ -1 in. Hg  
 Post-Test Leak Check (2): 0 cfm @ -1 in. Hg  
 Fuel Moisture: 5.05 Dry Basis %

Velocity Traverse Data									
	Pt.1	Pt.2	Pt.3	Pt.4	Pt.5	Pt.6	Pt.7	Pt.8	Center
Initial dP	0.026	0.051	0.052	0.030	0.028	0.049	0.052	0.031	0.053
Temp:	118	118	118	118	118	118	118	118	118
V <sub>strav</sub>		13.92		ft/sec		V <sub>scent</sub>		15.93	
						F <sub>p</sub>		0.874	

Elapsed Time (min)	Particulate Sampling Data												Fuel Weight (lb)				Temperature Data (°F)				Stack Gas Data		
	Gas Meter 1 (ft³)	Gas Meter 2 (ft³)	Sample Rate 1 (cfm)	Sample Rate 2 (cfm)	Orifice dH 1 ("H₂O)	Meter Temp 1 (°F)	Meter Vacuum 1 ("Hg)	Orifice dH 2 ("H₂O)	Meter Temp 2 (°F)	Meter Vacuum 2 ("Hg)	Dilution Tunnel (°F)	Dilution Tunnel Center dP	Pro. Rate 1	Pro. Rate 2	Scale Reading	Weight Change	Stack	Filter 1	Filter 2	Ambient	Draft ("H₂O)	CO₂ (%)	CO (%)
315	46.543	47.920	0.15	0.15	1.05	94	2	0.92	93	1.2	98	0.054	97	98	24.7	-0.1	285	84	83	81	-0.028	3.4	0
316	46.690	48.071	0.15	0.15	1.05	94	2	0.92	93	1.2	98	0.056	95	95	24.7	0	285	84	83	81	-0.019	3.2	0
317	46.838	48.223	0.15	0.15	1.05	94	2	0.92	93	1.2	98	0.052	100	100	24.7	0	285	84	83	80	-0.022	3.2	0
318	46.986	48.375	0.15	0.15	1.04	94	2	0.91	93	1.2	99	0.053	99	99	24.6	-0.1	285	84	83	81	-0.036	3.2	0
319	47.134	48.526	0.15	0.15	1.05	94	2	0.92	93	1.2	98	0.053	99	98	24.6	0	284	84	83	80	-0.041	3.1	0
320	47.280	48.678	0.15	0.15	1.05	94	2	0.92	93	1.2	99	0.054	97	98	24.6	0	284	84	84	81	-0.035	3	0
321	47.428	48.830	0.15	0.15	1.05	94	2	0.92	93	1.2	99	0.055	97	97	24.6	0	283	84	84	81	-0.037	2.9	0
322	47.576	48.982	0.15	0.15	1.04	94	2	0.92	93	1.2	99	0.054	98	98	24.5	-0.1	282	84	84	81	-0.028	2.8	0
323	47.724	49.133	0.15	0.15	1.05	94	2	0.92	93	1.2	99	0.055	97	96	24.5	0	282	84	84	81	-0.016	2.7	0
324	47.871	49.285	0.15	0.15	1.04	94	2	0.92	93	1.2	99	0.056	96	96	24.5	0	281	84	84	81	-0.019	2.5	0
325	48.018	49.437	0.15	0.15	1.05	94	2	0.92	93	1.2	99	0.053	98	99	24.5	0	280	84	84	81	-0.027	2.5	0
326	48.166	49.588	0.15	0.15	1.05	94	2	0.92	93	1.2	99	0.051	101	100	24.5	0	280	84	84	81	-0.025	2.6	0
327	48.314	49.740	0.15	0.15	1.04	94	2	0.92	93	1.2	98	0.054	98	98	24.5	0	281	84	84	81	-0.014	2.6	0
328	48.462	49.892	0.15	0.15	1.04	94	2.01	0.92	93	1.2	98	0.054	98	98	24.4	-0.1	280	84	84	81	-0.016	2.6	0
329	48.608	50.043	0.15	0.15	1.05	94	2	0.92	93	1.2	98	0.053	97	98	24.4	0	280	84	84	80	-0.014	2.8	0
330	48.756	50.195	0.15	0.15	1.05	94	2	0.92	93	1.2	98	0.055	97	97	24.4	0	282	84	84	81	-0.025	3.1	0
331	48.904	50.347	0.15	0.15	1.05	94	2	0.92	93	1.2	98	0.053	99	99	24.3	-0.1	282	84	84	81	-0.033	3.3	0
332	49.052	50.497	0.15	0.15	1.04	94	2	0.92	93	1.2	98	0.054	98	96	24.3	0	281	84	84	81	-0.027	3.3	0
333	49.199	50.649	0.15	0.15	1.04	94	2	0.91	93	1.2	99	0.052	99	100	24.2	-0.1	282	84	84	81	-0.023	3.3	0
334	49.346	50.802	0.15	0.15	1.05	94	2	0.92	93	1.2	98	0.055	96	98	24.3	0.1	282	84	84	82	0.000	3.3	0
335	49.493	50.952	0.15	0.15	1.05	94	2	0.92	93	1.2	98	0.053	98	97	24.2	-0.1	283	84	84	82	-0.012	3.3	0
336	49.641	51.104	0.15	0.15	1.04	94	2	0.92	93	1.2	98	0.055	97	97	24.2	0	282	84	84	81	-0.009	3.2	0
337	49.789	51.256	0.15	0.15	1.05	94	2	0.92	93	1.2	98	0.056	96	96	24.1	-0.1	282	84	84	81	-0.008	3.2	0
338	49.936	51.407	0.15	0.15	1.05	94	2	0.92	93	1.2	98	0.053	98	98	24.1	0	282	84	84	82	-0.022	3.1	0
339	50.084	51.559	0.15	0.15	1.05	94	2	0.92	93	1.2	98	0.053	99	99	24.1	0	282	84	84	81	-0.024	3.2	0
340	50.231	51.711	0.15	0.15	1.05	94	2	0.92	93	1.2	98	0.053	98	99	24.0	-0.1	283	84	84	81	-0.027	3.2	0
341	50.379	51.862	0.15	0.15	1.04	94	2	0.92	93	1.2	98	0.056	96	95	24.0	0	283	84	84	82	-0.022	3.1	0
342	50.527	52.013	0.15	0.15	1.04	94	2	0.92	93	1.2	98	0.052	100	99	24.0	0	284	84	84	81	-0.026	3	0
343	50.674	52.165	0.15	0.15	1.05	94	2	0.91	93	1.2	98	0.054	97	98	24.0	0	285	84	84	82	-0.023	2.9	0
344	50.821	52.316	0.15	0.15	1.05	94	2	0.92	93	1.2	98	0.055	96	96	24.0	0	284	84	84	81	-0.029	2.9	0
345	50.969	52.468	0.15	0.15	1.05	94	2	0.92	93	1.2	99	0.054	98	98	23.9	-0.1	283	84	84	82	-0.034	2.9	0
346	51.117	52.620	0.15	0.15	1.05	94	2	0.92	93	1.2	99	0.051	101	101	23.9	0	283	84	84	82	-0.038	2.9	0
347	51.264	52.771	0.15	0.15	1.04	94	2	0.92	93	1.2	99	0.056	96	95	23.9	0	282	84	84	82	-0.010	2.7	0
348	51.411	52.922	0.15	0.15	1.05	94	2	0.92	93	1.2	98	0.053	98	98	23.9	0	282	84	84	82	-0.006	2.7	0
349	51.559	53.074	0.15	0.15	1.04	94	2.01	0.92	93	1.2	98	0.057	95	95	23.8	-0.1	282	84	84	82	0.004	2.6	0

### Pellet Heater Test Data - ASTM E2779 / ASTM E2515

Run: 2

Manufacturer: Harman High Burn End Time: 62  
 Model: Allure 43 Medium Burn End Time: 183  
 Tracking No.: 2123 Total Sampling Time: 363 min  
 Project No.: 0135PS037E Recording Interval: 1 min  
 Test Date: 10-Sep-15  
 Beginning Clock Time: 09:22 Background Sample Volume: 74.988 cubic feet

Meter Box Y Factor: 1.001 (1) 1.003 (2) 1.009 (Amb)

Barometric Pressure: Begin Middle End Average  
30.10 30.08 30.07 30.08 "Hg

OMNI Equipment Numbers: 23, 131, 185, 132, 209, 291, 335, 336, 410, 420, 559

PM Control Modules: 335/336  
 Dilution Tunnel MW(dry): 29.00 lb/lb-mole  
 Dilution Tunnel MW(wet): 28.78 lb/lb-mole  
 Dilution Tunnel H2O: 2.00 percent  
 Dilution Tunnel Static: -0.530 "H2O  
 Tunnel Area: 0.19635 ft2  
 Pitot Tube Cp: 0.99

Avg. Tunnel Velocity: 13.69 ft/sec.  
 Initial Tunnel Flow: 144.8 scfm  
 Average Tunnel Flow: 149.2 scfm  
 Post-Test Leak Check (1): 0.001 cfm @ -1 in. Hg  
 Post-Test Leak Check (2): 0 cfm @ -1 in. Hg  
 Fuel Moisture: 5.05 Dry Basis %

Velocity Traverse Data									
	Pt.1	Pt.2	Pt.3	Pt.4	Pt.5	Pt.6	Pt.7	Pt.8	Center
Initial dP	0.026	0.051	0.052	0.030	0.028	0.049	0.052	0.031	0.053
Temp:	118	118	118	118	118	118	118	118	118
V <sub>strav</sub>		13.92		ft/sec		V <sub>scent</sub>		15.93	
						F <sub>p</sub>		0.874	

Elapsed Time (min)	Particulate Sampling Data												Fuel Weight (lb)		Temperature Data (°F)				Stack Gas Data						
	Gas Meter 1 (ft³)	Gas Meter 2 (ft³)	Sample Rate 1 (cfm)	Sample Rate 2 (cfm)	Orifice dH 1 ("H <sub>2</sub> O)	Meter Temp 1 (°F)	Meter Vacuum 1 ("Hg)	Orifice dH 2 ("H <sub>2</sub> O)	Meter Temp 2 (°F)	Meter Vacuum 2 ("Hg)	Dilution Tunnel (°F)	Dilution Tunnel Center dP	Pro. Rate 1	Pro. Rate 2	Scale Reading	Weight Change	Stack	Filter 1	Filter 2	Ambient	Draft ("H <sub>2</sub> O)	CO <sub>2</sub> (%)	CO (%)		
350	51.706	53.226	0.15	0.15	1.04	94	2	0.92	93	1.2	98	0.054	97	98	23.8	0	281	84	84	82	0.003	2.6	0		
351	51.854	53.376	0.15	0.15	1.05	94	2	0.92	93	1.2	98	0.055	97	96	23.8	0	282	84	84	81	-0.013	2.6	0		
352	52.001	53.529	0.15	0.15	1.05	94	2	0.91	93	1.2	98	0.053	98	99	23.7	-0.1	282	84	84	81	-0.035	2.7	0		
353	52.148	53.680	0.15	0.15	1.05	94	2	0.91	94	1.2	98	0.054	97	97	23.7	0	281	84	84	82	-0.013	2.8	0		
354	52.296	53.831	0.15	0.15	1.04	94	2.01	0.92	94	1.2	98	0.055	97	96	23.7	0	279	84	84	82	-0.011	2.8	0		
355	52.444	53.983	0.15	0.15	1.04	94	2	0.92	94	1.2	98	0.053	99	99	23.7	0	279	84	84	82	-0.013	2.8	0		
356	52.592	54.135	0.15	0.15	1.05	94	2.01	0.91	94	1.2	98	0.052	100	99	23.7	0	279	84	84	82	0.000	2.8	0		
357	52.738	54.286	0.15	0.15	1.05	94	2	0.92	93	1.2	98	0.055	96	96	23.6	-0.1	278	84	84	82	-0.020	2.9	0		
358	52.886	54.437	0.15	0.15	1.04	94	2.01	0.91	94	1.2	98	0.056	96	95	23.6	0	278	84	84	82	-0.010	2.9	0		
359	53.034	54.589	0.15	0.15	1.04	94	2.01	0.91	94	1.2	98	0.054	98	98	23.5	-0.1	278	84	84	82	-0.020	3	0		
360	53.182	54.740	0.15	0.15	1.05	94	2.01	0.92	94	1.2	98	0.059	94	93	23.6	0.1	278	84	84	82	-0.018	3.1	0		
361	53.329	54.891	0.15	0.15	1.04	94	2.01	0.91	94	1.2	98	0.057	95	94	23.5	-0.1	278	84	84	82	-0.015	3.2	0		
362	53.476	55.043	0.15	0.15	1.05	94	2	0.92	94	1.2	98	0.055	96	97	23.4	-0.1	279	84	84	82	-0.026	3.5	0		
363	53.623	55.194	0.15	0.15	1.05	94	2.01	0.92	94	1.2	98	0.054	97	97	23.4	0	280	84	84	82	-0.030	3.6	0		
Avg/Tot	53.623	55.194	0.15	0.15	1.06	90	///	0.93	89	///	102	0.053	100	100	///	///	///	///	///	81	82	79	-0.026	///	///



**ASTM E2779 Pellet Heater Run Sheets**

Client: Harman Project Number: 0135PS037E Run Number: 2  
 Model: Ailure 43 Tracking Number: 2123 Date: 9/10/15  
 Test Crew: A. Kravitz  
 OMNI Equipment ID numbers: 23, 131, 185, 132, 209, 291, 335, 336, 410, 420, 559, 413

**Pellet Heater Supplemental Data**

Start Time: 09:22 Booth #: E1  
 Stop Time: 15:25

**Stack Gas Leak Check:**

Initial: ∅ Final: 0

**Sample Train Leak Check:**

A: 0.001 @ -1 °Hg  
 B: ∅ @ -1 °Hg  
 A<sub>1</sub>: ∅ @ -1

Calibrations: Span Gas CO<sub>2</sub>: 16.78 CO: 4.244

	Pre Test		Post Test	
	Zero	Span	Zero	Span
Time	<u>09:01</u>	<u>09:03</u>	<u>15:26</u>	<u>15:28</u>
CO <sub>2</sub>	<u>0.00</u>	<u>16.84</u>	<u>0.09</u>	<u>16.74</u>
CO	<u>0.000</u>	<u>4.244</u>	<u>0.000</u>	<u>4.287</u>

Air Velocity (ft/min): Initial: 450 Final: 450  
 Scale Audit (lbs): Initial: 10.0 Final: 10.0  
 Pitot Tube Leak Test: Initial: ∅ Final: ∅  
 Stack Diameter (in): 3  
 Induced Draft: ∅  
 % Smoke Capture: 100  
 Flue Pipe Cleaned Prior to First Test in Series:  
 Date: 9/10/15 Initials: A

	Initial	Middle	Ending
P <sub>b</sub> (in/Hg)	<u>30.10</u>	<u>30.18</u>	<u>30.07</u>
Ambient (°F)	<u>77</u>	<u>80</u>	<u>82</u>

Background Filter Volume: 74.988

Tunnel Traverse		
Microtector Reading	dP (in H <sub>2</sub> O)	T(°F)
<u>N/A</u>	<u>0.026</u>	<u>118</u>
	<u>0.051</u>	
	<u>0.052</u>	
	<u>0.030</u>	
	<u>0.028</u>	
	<u>0.049</u>	
	<u>0.052</u>	
	<u>0.031</u>	
Center:		
<u>N/A</u>	<u>0.053</u>	<u>118</u>
Static:		
<u>N/A</u>	<u>-0.51</u>	<u>118</u>

Technician Signature: [Signature]

Date: 9/10/15