

Certification Test Report

Harman Home Heating Freestanding Wood Stove Model: TL2.0

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

Prepared by: OMNI-Test Laboratories, Inc.
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Test Period: June 21-23, 2011

Report Date: June 2011

Report Number: 135-S-29-8.3

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AUTHORIZED SIGNATORIES

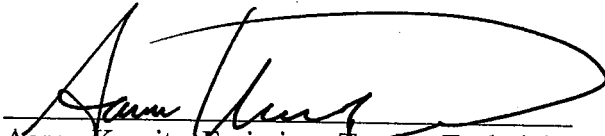
This report has been reviewed and approved by the following authorized signatories:



James Weston, P.E., President
OMNI-Test Laboratories, Inc.



Sebastian Button, Emissions Testing Manager
OMNI-Test Laboratories, Inc.



Aaron Kravitz, Emissions Testing Technician
OMNI-Test Laboratories, Inc.

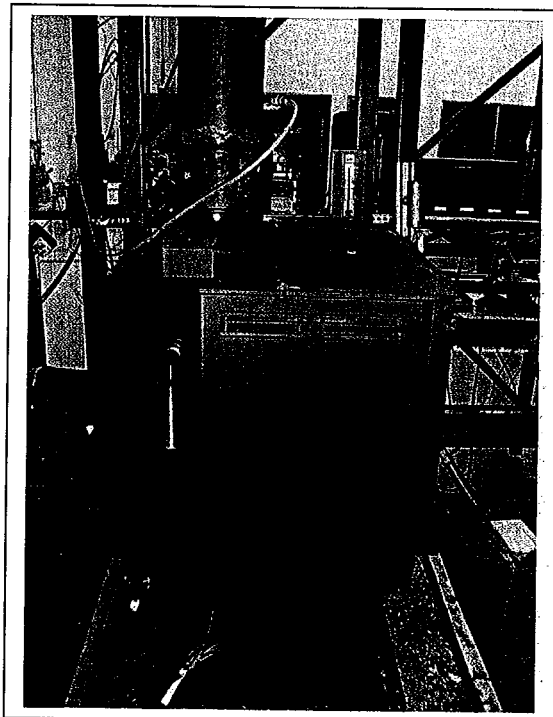
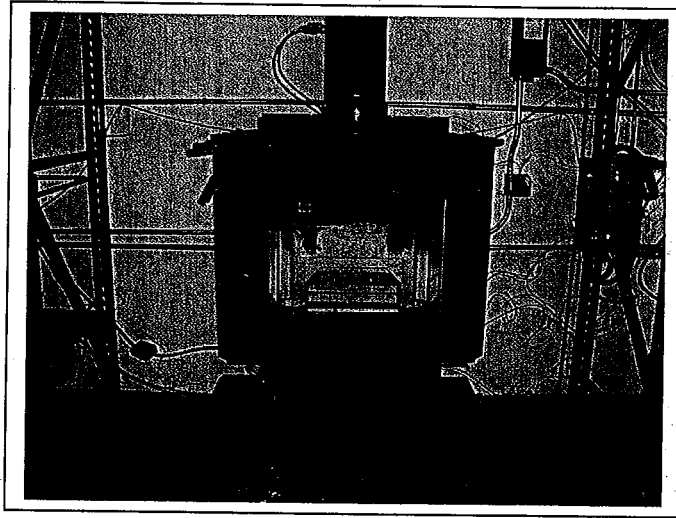
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Section 1

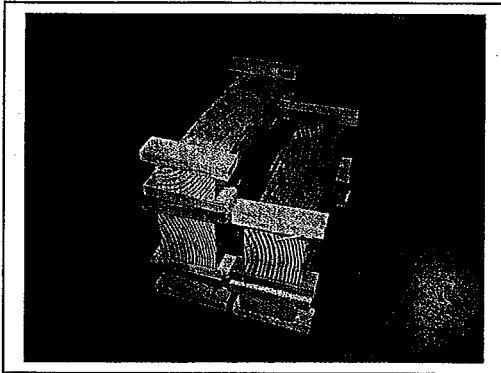
Fuel Photographs/Appliance Description/Drawings

Harman Home Heating
TL2.0
Test Dates: June 21-23, 2011

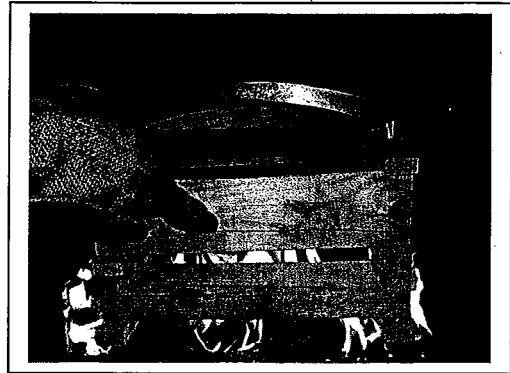


Harman Home Heating TL2.0

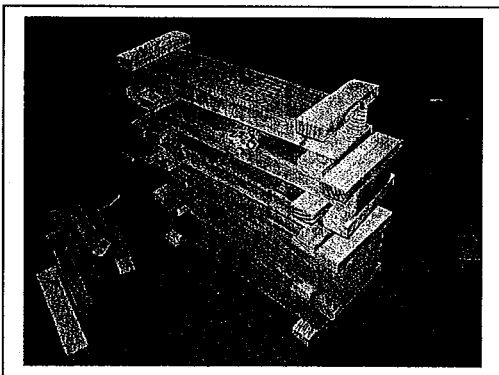
Run 1 – Fuel



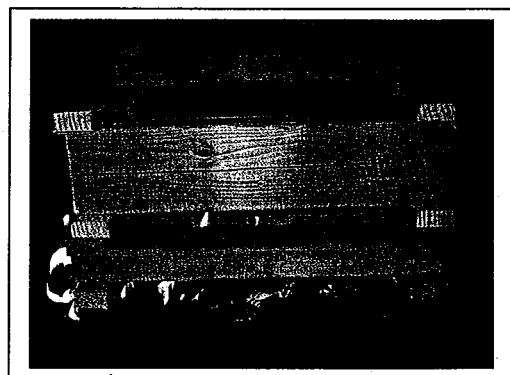
Run 1 – Newly Loaded Stove



Run 2 – Fuel

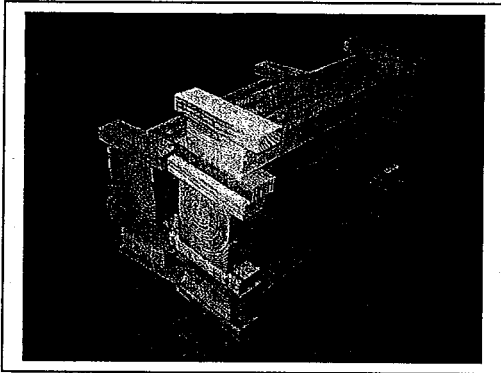


Run 2 – Newly Loaded Stove

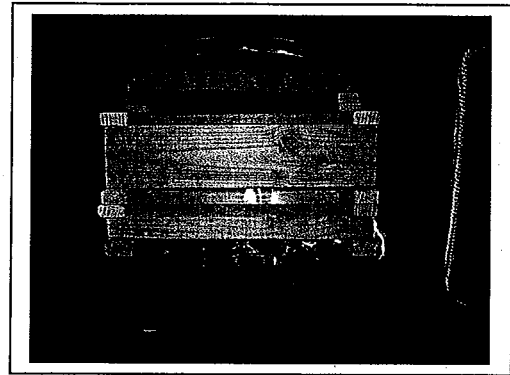


Harman Home Heating TL2.0

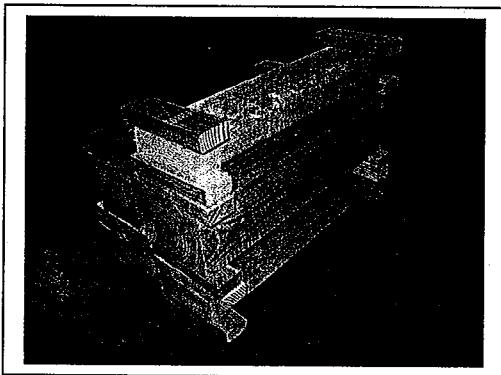
Run 3 – Fuel



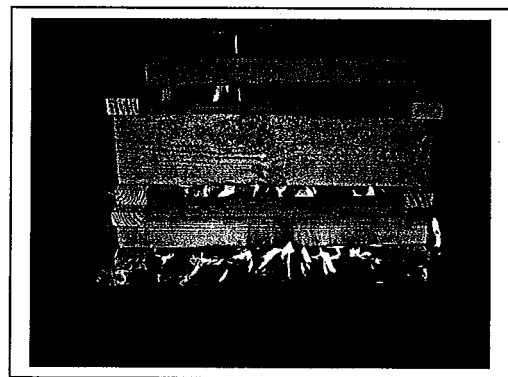
Run 3 – Newly Loaded Stove



Run 4 – Fuel

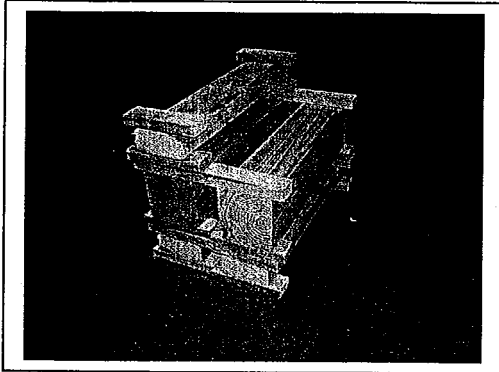


Run 4 – Newly Loaded Stove

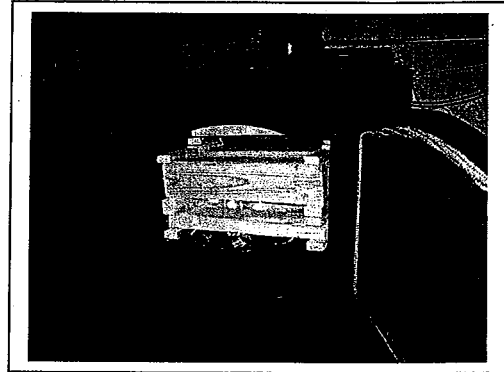


Harman Home Heating TL2.0

Run 5 – Fuel



Run 5 – Newly Loaded Stove



WOOD HEATER DESCRIPTION

Appliance Manufacturer: Harman Home Heating

Wood Stove Model: TL2.0

Type: Freestanding, radiant-type room heater

WOOD HEATER INFORMATION

Materials of Construction: The unit is constructed primarily of mild steel and cast iron. The firebox is lined with cast refractory that measures 4" by 12" and 2.75" by 11.25". The feed door has a 17" by 12.25" glass panel and 1/4-inch rope gasket on the glass and 3/8-inch rope gasket on door.

Air Introduction System: Air enters the firebox through an opening located at the rear/bottom of the appliance. Secondary air enters the appliance through the rear/bottom and is channeled internally to secondary shoe brick and combustion package in the rear of the stove.

Combustion Control Mechanisms: The combustion air inlet is controlled by a handle located below the fuel-loading door in the center of the appliance.

Combustor: N/A.

Internal Baffles: A bypass damper is located at the top of the firebox, which allows for startup fires when open. Air is forced through the combustion package located in back of the firebox.

Other Features: Optional fan accessory.

Flue Outlet: The 6-inch diameter flue outlet is located in the top of the unit.

WOOD HEATER OPERATING INSTRUCTIONS

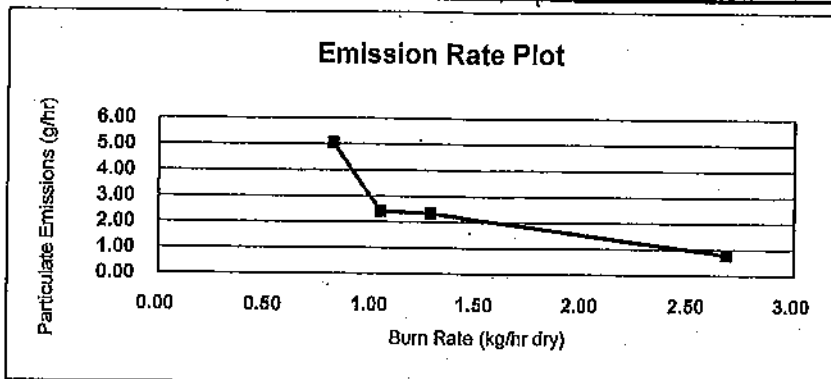
Specific Written Instructions: See Section 3 of this report. All markings and instruction materials were reviewed for content prior to printing.

Section 4

Test Data by Run

EPA Weighted Average Emissions EPA Method 28

Client: Harman	Status: Final
Stove Model: TL 2.0	Stove Type: Non-Catalytic Stove
Test Dates: 6/21/11 - 6/23/11	
Project Number: 135-S-29-8.3	
Tracking Number: 1694	Weighted Average (g/hr) 2.6
Signature/Date: <i>[Signature]</i> 6/27/11	



Run #	3	
Burn Rate (dry kg/hr)	0.81	
Category	2	
Overall Efficiency (%)	63%	
Emissions (g/hr)	5.06	
Cap (g/hr)	15.00	
Weighting Factor	0.402	22.96%
Heat Output (BTU/hr)	9619	

Run #	1	
Burn Rate (dry kg/hr)	1.04	
Category	2	
Overall Efficiency (%)	63%	
Emissions (g/hr)	2.43	
Cap (g/hr)	15.00	
Weighting Factor	0.374	21.38%
Heat Output (BTU/hr)	12350	

Run #	4	
Burn Rate (dry kg/hr)	1.28	
Category	3	
Overall Efficiency (%)	63%	
Emissions (g/hr)	2.35	
Cap (g/hr)	15.00	
Weighting Factor	0.575	32.85%
Heat Output (BTU/hr)	15200	

Run #	2	
Burn Rate (dry kg/hr)	2.68	
Category	4	
Overall Efficiency (%)	63%	
Emissions (g/hr)	0.79	
Cap (g/hr)	18.00	
Weighting Factor	0.399	22.82%
Heat Output (BTU/hr)	31825	

Model: TL2.0
Harman Home Heating
352 Mountain House Road
Halifax, PA 17032

Run 1

Wood Heater Test Data - EPA Method 5G

Manufacturer: Harman
 Model: TL 2.0
 Project No.: 135-S-29-8.3
 Tracking No.: 1694
 Run: 1
 Test Date: 06/21/11

Burn Rate	1.04 kg/hr dry
Average Tunnel Temperature	100 degrees Fahrenheit
Average Gas Velocity in Dilution Tunnel - vs	13.9 feet/second
Average Gas Flow Rate in Dilution Tunnel - Qsd	8939.8 dscf/hour
Average Delta p	0.042 inches H2O
Average Delta H	0.96 inches H2O
Total Time of Test	330 minutes

	AVERAGE	SAMPLE TRAIN 1	SAMPLE TRAIN 2
Total Sample Volume - Vm	50.02 cubic feet	47.10 cubic feet	52.95 cubic feet
Average Gas Meter Temperature	89 degrees Fahrenheit	83 degrees Fahrenheit	95 degrees Fahrenheit
Total Sample Volume (Standard Conditions) - Vmstd	48.9 dscf	46.0 dscf	51.8 dscf
Total Particulates - mn		7.6 mg	7.9 mg
Particulate Concentration (dry-standard)	0.00016 grams/dscf	0.00017 grams/dscf	0.00015 grams/dscf
Particulate Emission Rate	1.42 grams/hour	1.48 grams/hour	1.36 grams/hour
Adjusted Emissions	2.43 grams/hour	2.51 grams/hour	2.35 grams/hour
Difference from Average		0.08 grams/hour	0.08 grams/hour
7.5% of the average emission rate	0.18		
Weighted Average Emission Rate Limit	4.10 grams/hour		
7.5% of the weighted average emission rate limit	0.31		
Results Are Acceptable			

PRINT

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

Client Name: <u>Harman</u>	Equipment Numbers: <u>23, 343, 131</u>	Run #: <u>1</u>
Model: <u>TL 2.0</u>		Train #: <u>A</u>
Project No.: <u>135-S-29-8.3</u>		Date: <u>06/21/11</u>
Tracking No.: <u>1694</u>		

Sample Component	Reagent	Filter # or Probe #	Weights		
			Final, mg	Tare, mg	Particulate, mg
A. Front filter catch	Filter	G108	126.6	119.7	6.9
B. Rear filter catch	Filter	G107	121.8	121.1	0.7
C. Probe catch	Probe	64	122846.1	122846.1	0.0

Total Particulate, mg :	7.6
-------------------------	-----

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

Analyst: AL

Date: 6/27/11

PRINT

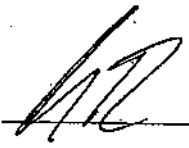
**Final Laboratory Report - Method 5G Dual-Train
Dilution Tunnel Particulate Calculations**

Client Name: Harman Equipment Numbers: 23, 343, 131 Run #: 1
 Model: TL 2.0 Train #: B
 Project No.: 135-S-29-8.3 Date: 06/21/11
 Tracking No.: 1694

Sample Component	Reagent	Filter # or Probe #	Weights		
			Final, mg	Tare, mg	Particulate, mg
A. Front filter catch	Filter	G106	127.3	119.8	7.5
B. Rear filter catch	Filter	G105	119.7	119.3	0.4
C. Probe catch	Probe	20	114253.2	114253.2	0.0

Total Particulate, mg :	7.9
-------------------------	-----

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

Analyst:  Date: 6/27/11

STOVE TEMPERATURE TEST DATA - METHOD 5G

Client/Model: Harman Project #: 135-S-29-8.3 Tracking #: 1694
 Date: 6/21/11 Test Crew: S.Button/A. Kravitz Run #: 1
 OMNI Equipment ID #: 185,355,356

Preburn Test	Coal Bed										Actual
	Fuel Weight	Delta Weight	Stack Draft	Ambient	Top	Bottom	Back	Left	Right	Flue	
0	10.5	-	-0.055	85	391	146	369	273	289	609	n/a
10	9.4	-1.1	-0.039	85	305	174	301	315	311	426	n/a
20	8.5	-0.9	-0.038	86	277	202	278	316	311	416	n/a
30	7.4	-1.1	-0.038	85	272	222	283	317	310	416	n/a
40	6.4	-1	-0.039	83	286	238	286	322	313	421	n/a
50	5.5	-0.9	-0.038	83	309	250	284	332	321	402	n/a
60	4.8	-0.7	-0.036	82	334	257	268	340	330	384	n/a
70	3.8	-1	-0.04	82	315	263	313	345	339	439	n/a
76	3.5	-0.3	-0.038	82	307	270	309	348	348	412	n/a
AVG											

Technician signature: [Signature] Date: 6/30/11

FUEL DATA

Client: Harman

Model: TL 2.0

Project #: 135-S-29-8.3 Tracking #: 1694

Date: 6/21/11 Test Crew: S. Button Run #: 1

OMNI Equipment ID #: 507, 185, 431

FUEL LOAD PREPARED BY: S. Button

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

PRE-BURN FUEL					
MOISTURE CONTENT (METER -- DRY BASIS)					
CALIBRATION:	Cal Value (1) = 12%	Actual Reading	<u>12%</u>		
	Cal Value (2) = 22%	Actual Reading	<u>22%</u>		
Piece	Length	Readings			Type
1	<u>8</u> ft	<u>21.1</u>	<u>19.4</u>	<u>19.0</u>	<u>2x4</u>
2	<u>8</u> ft	<u>19.8</u>	<u>20.1</u>	<u>23.2</u>	<u>2x4</u>
3	<u> </u> ft	<u> </u>	<u> </u>	<u> </u>	<u> </u>
Length of cut pieces: <u>8"</u> inches		Pre-Burn Fuel Average Moisture: <u>20.43</u> %			
Time (clock): <u>10:00</u>		Room Temperature (F): <u>78</u>	Initials: <u>SB</u>		

TEST FUEL				
FUEL TYPE AND AMOUNT:	2x4	<u>3</u>	4x4	<u>2</u>
CALCULATED LOAD WEIGHT:	<u> </u>		ACTUAL LOAD WEIGHT:	<u>6.1</u> (2x4)
	<u> </u>			<u>9.0</u> (4x4)
FUEL PIECE LENGTH:	<u>15"</u>			<u>15.1</u> Total
MOISTURE CONTENT (METER -- DRY BASIS)				
PIECE	READINGS			TYPE
1	<u>20.3</u>	<u>19.5</u>	<u>21.1</u>	<u>4x4</u>
2	<u>21.7</u>	<u>20.3</u>	<u>22.4</u>	<u>4x4</u>
3	<u>18.7</u>	<u>19.9</u>	<u>20.2</u>	<u>2x4</u>
4	<u>19.2</u>	<u>19.3</u>	<u>19.5</u>	<u>2x4</u>
5	<u>19.9</u>	<u>20.2</u>	<u>19.3</u>	<u>2x4</u>
6	<u> </u>	<u> </u>	<u> </u>	<u> </u>
7	<u> </u>	<u> </u>	<u> </u>	<u> </u>
8	<u> </u>	<u> </u>	<u> </u>	<u> </u>
9	<u> </u>	<u> </u>	<u> </u>	<u> </u>
10	<u> </u>	<u> </u>	<u> </u>	<u> </u>
OVERALL TEST FUEL LOAD MOISTURE AVERAGE: <u>20.13%</u>				
Time (clock):	<u>10:30</u>	Room Temperature (F):	<u>75</u>	Initials: <u>SB</u>

Technician signature: [Signature] Date: 6/21/11

Run Notes

Client: Harman

Model: TL 2.0

Project #: 135-S-29-8.3

Tracking #: 1694

Run #: _____ Date: 6/2/11

Test Crew: S. Button

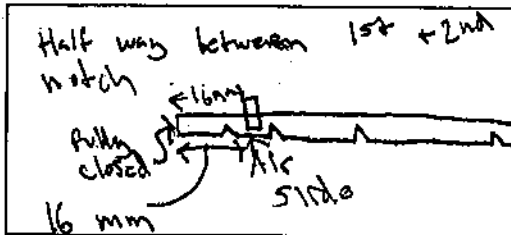
OMNI Equipment ID #(s): 296, 455

PREBURN

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

PRIMARY:

SECONDARY: Fixed



TERTIARY: N/A

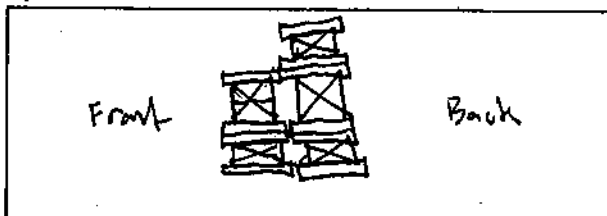
FAN: ON High

PREBURN SETTINGS AND ACTIVITIES

TIME	AIR (THERMO) CHANGES PRIMARY/SECONDARY/TERTIARY	FAN SETTING CHANGE	ADD FUEL + WT.	ADD FUEL - WT.	RAKE COAL	COMMENT
61 min	stirred coal bed					

TEST

TEST FUEL CONFIGURATION SKETCH
(INDICATE VIEW ANGLE)



START UP PROCEDURES

BYPASS: Never open

FUEL LOADING Done @ 1:30

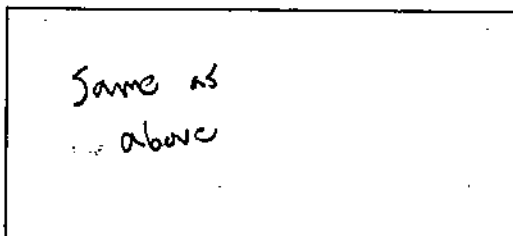
DOOR: closed @ 1:30

PRIMARY AIR: Shut to test setting @ 5:00

OTHER: N/A

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

PRIMARY:



SECONDARY: Fixed

TERTIARY: N/A

FAN: on High

Technician signature: [Signature] Date: 6/2/11

Supplemental Data EPA 5G/5H

Client: Harman

Model: TL 2.0

Project #: 135-S-29-8.3

Tracking #: 1694

Date: 6/21/11 Run #: 1 Booth: E1

Test Crew: S. Bitten Start Time: 13:26 Stop Time: 18:50

OMNI Equipment #(s): 420, 132, 265, 40, 209, ALM068058, ALM06210
AW0571

Gas Analyzer Train Leak Check:

Stack:

Dilution Tunnel (Method 5G Only):

Initial: ∅

Initial: N/A

Final: ∅

Final: N/A

Calibrations: Span Gas CO₂: 17.10 O₂: ~~4.250~~ N/A CO: 4.250 CO₂(DT): N/A
Mil CO: 5.06 O₂: 5.03 CO: 2.500

	(N ₂) Span	N ₂ Span	N ₂ Span	(N ₂) Span	N ₂ Span	N ₂ Span	N ₂ Span
Time	1235	1239	1241	19:30	19:30	19:30	
O ₂	N/A	N/A	N/A	N/A	N/A	N/A	
CO ₂	0.00	17.10	5.19	0.05	17.21	5.29	
CO	0.000	4.250	2.471	0.061	4.305	2.453	
CO ₂ (DT)	N/A	N/A	N/A	N/A	N/A	N/A	

Stack Diameter (inches): 6"

Air Velocity (ft/min): Initial: < 50 ft/min Final: < 50 ft/min

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

Induced Draft: ∅ %Smoke Capture: 100%

Pitot Tube Leak Test: Pre: ∅ Post: ∅

Flue Pipe Cleaned Prior to First Test in Series: Date: 6/20/11 Initials: JB

	Initial	Middle	Ending
Pb (in/Hg)	30.06	30.03	29.98
Room Temp (°F)	83	86	86

Technician signature: [Signature] Date: 6/21/11

Model: TL2.0
Harman Home Heating
352 Mountain House Road
Halifax, PA 17032

Run 2

Wood Heater Test Data - EPA Method 5G

Manufacturer: Harman
Model: TL 2.0
Project No.: 135-S-29-8.3
Tracking No.: 1694
Run: 2
Test Date: 06/22/11

Burn Rate	2.68 kg/hr dry
Average Tunnel Temperature	112 degrees Fahrenheit
Average Gas Velocity In Dilution Tunnel - vs	14.4 feet/second
Average Gas Flow Rate in Dilution Tunnel - Qsd	9050.0 dscf/hour
Average Delta p	0.044 inches H2O
Average Delta H	1.01 inches H2O
Total Time of Test	120 minutes

	AVERAGE	SAMPLE TRAIN 1	SAMPLE TRAIN 2
Total Sample Volume - Vm	18.36 cubic feet	17.35 cubic feet	19.36 cubic feet
Average Gas Meter Temperature	78 degrees Fahrenheit	71 degrees Fahrenheit	84 degrees Fahrenheit
Total Sample Volume (Standard Conditions) - Vmstd	18.3 dscf	17.3 dscf	19.3 dscf
Total Particulates - mn		0.6 mg	0.9 mg
Particulate Concentration (dry-standard)	0.00004 grams/dscf	0.00003 grams/dscf	0.00005 grams/dscf
Particulate Emission Rate	0.37 grams/hour	0.31 grams/hour	0.42 grams/hour
Adjusted Emissions	0.79 grams/hour	0.69 grams/hour	0.89 grams/hour
Difference from Average		0.10 grams/hour	0.10 grams/hour
7.5% of the average emission rate	0.06		
Weighted Average Emission Rate Limit	4.10 grams/hour		
7.5% of the weighted average emission rate limit	0.31		
Results Are Acceptable			

Wood Heater Test Data - EPA Method 5G

Run: 2
 Manufacturer: Harman
 Model: TL 2.0
 Tracking No.: 1694
 Project No.: 135-S-29-8.3
 Test Date: 22-Jun-11
 Beginning Clock Time: 06:37
 Recording Interval: 10 min.
 Total Sampling Time: 120 min.

Velocity Traverse Data								
	Pt.1	Pt.2	Pt.3	Pt.4	Pt.5	Pt.6	Pt.7	Pt.8
Initial dP	0.044	0.048	0.046	0.042	0.046	0.038	0.050	0.034
Initial Temp.	118	118	118	118	118	118	118	118

OMNI Equipment Numbers: _____

PM Control Module: 335/336
 Dilution Tunnel MW(dry): 29.00 lb/lb-mole
 Dilution Tunnel MW(wet): 28.56 lb/lb-mole
 Dilution Tunnel H2O: 4.00 percent
 Dilution Tunnel Static: -0.560 "H2O
 Pitot Tube Cp: 0.99
 Meter Box Y Factor: 0.999 (1) 1.023 (2)
 Barometric Pressure: 29.99 30.01 30 Average

Signature/Date: [Signature] 6/30/11
 Tunnel Velocity: 14.43 ft/sec.
 Initial Tunnel Flow: 149.8 scfm
 Average Tunnel Flow: 150.8 scfm
 Tunnel Area: 0.1963 ft²
 Post-Test Leak Check (1): 0.005 cfm@"Hg
 Post-Test Leak Check (2): 0 cfm@"Hg
 Fuel Moisture (dry basis %): 22.03
 Total Particulate (1): 0.6
 Total Particulate (2): 0.9

Elapsed Time	Particulate Sampling Data														Fuel Weight, lb		Wood Heater Temperature Data, °F														Stack Draft In. H2O
	Gas Meter Cubic Feet (1)	Gas Meter Cubic Feet (2)	Sample Rate, cfm (1)	Sample Rate, cfm (2)	Orifice dH (1)	Orifice dH (2)	Meter °F (1)	Meter °F (2)	Meter Vac. In. Hg. (1)	Meter Vac. In. Hg. (2)	Dilution Tunnel Temp.	Dilution Tunnel dP	Pro. Rate (10%) (1)	Pro. Rate (10%) (2)	Scale Reading	Weight Change	Firebox Top	Firebox Bottom	Firebox Back	Firebox Left	Firebox Right	Catalyst Exit	Average Surface	Stack	Filter (1)	Filter (2)	Impinger exit (1)	Impinger exit (2)	Ambient		
0	0.004	0.008			0.70	0.70	72	80	1.07	1.1	118	0.044			14.4		462	293	408	423	492	n/a	415.6	551	74	75	n/a	n/a	73	-0.057	
10	1.461	1.628	0.15	0.16	1.05	1.10	70	80	1.13	1.1	120	0.044	102	103	12.3	-2.1	372	298	458	438	467	n/a	406.6	607	79	80	n/a	n/a	73	-0.063	
20	2.901	3.233	0.14	0.16	1.04	1.09	71	81	1.14	1.1	121	0.044	101	102	10.1	-2.2	390	301	469	436	445	n/a	408.2	600	81	81	n/a	n/a	71	-0.062	
30	4.339	4.837	0.14	0.16	1.04	1.08	71	83	1.13	1.1	121	0.044	101	101	8.0	-2.1	460	304	488	437	447	n/a	427.2	608	81	82	n/a	n/a	72	-0.062	
40	5.775	6.442	0.14	0.16	1.03	1.09	71	84	1.12	1.1	119	0.044	101	101	6.0	-2	502	306	475	449	456	n/a	437.6	580	81	80	n/a	n/a	72	-0.060	
50	7.216	8.050	0.14	0.16	1.03	1.08	71	85	1.13	1.1	115	0.044	101	101	4.6	-1.4	543	306	416	462	466	n/a	438.6	536	79	79	n/a	n/a	72	-0.055	
60	8.659	9.661	0.14	0.16	1.04	1.09	71	86	1.12	1.1	112	0.044	101	100	3.5	-1.1	560	304	369	467	469	n/a	433.8	509	79	78	n/a	n/a	72	-0.052	
70	10.105	11.275	0.14	0.16	1.04	1.09	71	86	1.12	1.1	109	0.044	101	100	2.7	-0.8	523	298	326	470	468	n/a	417.0	471	79	78	n/a	n/a	72	-0.048	
80	11.554	12.893	0.14	0.16	1.03	1.09	71	86	1.12	1.1	107	0.044	101	100	2.0	-0.7	511	288	293	469	460	n/a	404.2	447	79	79	n/a	n/a	72	-0.046	
90	13.004	14.510	0.15	0.16	1.04	1.09	71	86	1.12	1.1	105	0.044	100	100	1.4	-0.6	496	277	271	465	453	n/a	392.4	428	79	78	n/a	n/a	72	-0.044	
100	14.454	16.128	0.15	0.16	1.04	1.09	71	86	1.12	1.1	104	0.044	100	100	0.9	-0.5	493	269	259	457	450	n/a	385.6	422	78	78	n/a	n/a	73	-0.042	
110	15.904	17.747	0.15	0.16	1.04	1.09	71	86	1.13	1.1	103	0.044	100	100	0.4	-0.5	479	262	255	453	451	n/a	380.0	417	78	78	n/a	n/a	72	-0.042	
120	17.357	19.367	0.15	0.16	1.05	1.09	72	86	1.13	1.1	102	0.044	100	100	0.0	-0.4	457	258	246	451	454	n/a	373.2	404	78	78	n/a	n/a	71	-0.040	
Avg/Total	17.353	19.359	0.14	0.16	1.01	1.06	71.08	84.23			112.00	0.044	100.73	100.66									42		78.85	78.77	#DIV/0!	#DIV/0!		-0.052	

PRINT

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

Client Name: <u>Harman</u>	Equipment Numbers: <u>23, 343, 131</u>	Run #: <u>2</u>
Model: <u>TL 2.0</u>		Train #: <u>A</u>
Project No.: <u>135-S-29-8.3</u>		Date: <u>06/22/11</u>
Tracking No.: <u>1694</u>		

Sample Component	Reagent	Filter # or Probe #	Weights		
			Final, mg	Tare, mg	Particulate, mg
A. Front filter catch	Filter	G089	121.5	120.9	0.6
B. Rear filter catch	Filter	G090	121.0	121.0	0.0
C. Probe catch	Probe	25	114297.7	114297.7	0.0

Total Particulate, mg :	0.6
-------------------------	-----

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

Analyst: ht Date: 6/27/11

PRINT

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

Client Name: Harman Equipment Numbers: 23, 343, 131 Run #: 2
 Model: TL 2.0 Train #: B
 Project No.: 135-S-29-8.3 Date: 06/22/11
 Tracking No.: 1694

Sample Component	Reagent	Filter # or Probe #	Weights		
			Final, mg	Tare, mg	Particulate, mg
A. Front filter catch	Filter	G091	121.1	120.4	0.7
B. Rear filter catch	Filter	G092	119.2	119.0	0.2
C. Probe catch	Probe	13	114315.3	114315.3	0.0

Total Particulate, mg :	0.9
-------------------------	-----

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

Analyst: HR

Date: 6/27/11

STOVE TEMPERATURE TEST DATA - METHOD 5G

Client/Model: Harman Project #: 135-S-29-8.3 Tracking #: 1694
 Date: 6/22/11 Test Crew: A. Kravitz Run #: 2
 OMNI Equipment ID #: 185.355.356

Preburn Test	Coal Bed										Actual		
	Fuel Weight	Delta Weight	Stack Draft	Ambient	Top	Bottom	Back	Left	Right	Flue	Catalyst	Coal Bed: 2.9	
Time	TEMPERATURES (oF)												
0	14	0.0	-0.064	74	441	171	275	270	313	765	n/a		
10	12.3	-1.7	-0.055	73	342	190	275	299	352	509	n/a		
20	10.8	-1.5	-0.053	72	329	206	293	312	376	489	n/a		
30	9.1	-1.7	-0.053	73	330	222	311	319	401	500	n/a		
40	7.5	-1.6	-0.056	72	349	239	336	329	431	534	n/a		
50	5.7	-1.7	-0.057	72	368	262	382	348	453	553	n/a		
60	3.7	-2.0	-0.058	72	441	288	431	389	481	571	n/a		
66	2.9	-0.8	-0.056	73	458	291	411	419	492	545	n/a		
AVG													

Technician signature:  Date: 6/30/11

FUEL DATA

Client: Harman

Model: TL 2.0

Project #: 135-S-29-8.3 Tracking #: 1694

Date: 6/22/11 Test Crew: A. Kravitz Run #: 2

OMNI Equipment ID #: 183, 185, 131

FUEL LOAD PREPARED BY: A. Kravitz

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

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

CALIBRATION: Cal Value (1) = 12% Actual Reading 12.0
Cal Value (2) = 22% Actual Reading 22.0

Piece	Length	Readings	Type
1	<u>12</u> ft	<u>22.6</u>	<u>2x4</u>
2	ft		
3	ft		

Length of cut pieces: 8 inches Pre-Burn Fuel Average Moisture: 23.2%

Time (clock): 4:15 Room Temperature (F): 75 Initials: AK

TEST FUEL

FUEL TYPE AND AMOUNT: 2x4 3 4x4 2

CALCULATED LOAD WEIGHT: 14.5 lb ACTUAL LOAD WEIGHT: 6.1 (2x4)
8.3 (4x4)
14.4 Total

FUEL PIECE LENGTH: 15.5"

MOISTURE CONTENT (METER --- DRY BASIS)

PIECE	READINGS	TYPE
1	<u>22.1</u> <u>23.5</u> <u>24.1</u>	<u>4x4</u>
2	<u>16.2</u> <u>23.7</u> <u>23.1</u>	<u>4x4</u>
3	<u>22.2</u> <u>22.2</u> <u>22.0</u>	<u>2x4</u>
4	<u>14.2</u> <u>21.4</u> <u>22.2</u>	<u>2x4</u>
5	<u>22.2</u> <u>23.1</u> <u>21.2</u>	<u>2x4</u>
6		
7		
8		
9		
10		

OVERALL TEST FUEL LOAD MOISTURE AVERAGE: 22.03

Time (clock): 5:10 Room Temperature (F): 74 Initials: AK

Technician signature: [Signature] Date: 6/22/11

Run Notes

Client: Harman

Model: TL 2.0

Project #: 135-S-29-8.3

Tracking #: 1694

Run #: 2 Date: 6/22/11

Test Crew: A. Kravitz

OMNI Equipment ID #(s): 335/336, 455

PREBURN

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

PRIMARY:

wide open

SECONDARY: Fixed

TERTIARY: N/A

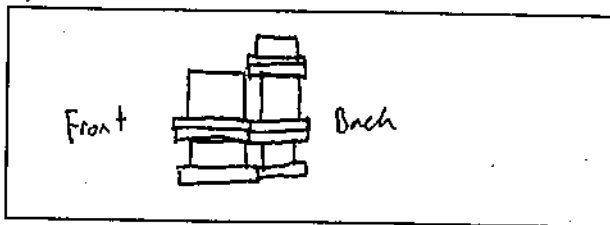
FAN: On High

PREBURN SETTINGS AND ACTIVITIES

TIME	AIR (THERMO) CHANGES PRIMARY/SECONDARY/TERTIARY	FAN SETTING CHANGE	ADD FUEL + WT.	ADD FUEL - WT.	RAKE COAL	COMMENT
62:00					Coals raked	

TEST

TEST FUEL CONFIGURATION SKETCH
(INDICATE VIEW ANGLE)



START UP PROCEDURES

BYPASS: Never Open

FUEL LOADING: Done @ 30 sec

DOOR: Close @ 55 sec

PRIMARY AIR: wide open whole time

OTHER: N/A

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

PRIMARY:

wide open

SECONDARY: Fixed

TERTIARY: N/A

FAN: On High

Technician signature: [Signature] Date: 6/22/11

Supplemental Data EPA 5G/5H

Client: Harman

Model: TL 2.0

Project #: 135-S-29-8.3

Tracking #: 1694

Date: 6/22/11

Run #: 2 Booth: E1

Test Crew: A. Krawitz Start Time: 0637 Stop Time: 0837

OMNI Equipment #(s): 420, 132, 265, 410, 209, AvM068058, AvM066210, AvM574

Gas Analyzer Train Leak Check:

Stack:

Dilution Tunnel (Method 5G Only):

Initial: ∅

Initial: N/A

Final: ∅

Final: N/A

Calibrations: Span Gas CO₂: 17.10 O₂: N/A CO: 4.250 CO₂(DT): N/A
 Mic Gas CO₂: 5.06 O₂: 5.83 CO: 2.500

	(N₂) Span	N ₂ Span	N₂ Span	(N ₂) Span	N ₂ Span	N₂ Span	N ₂ Span
Time	0545	0550	0555	0842	0844	0846	
O ₂	N/A	N/A	N/A	N/A	N/A	N/A	
CO ₂	0.00	17.10	5.24	.03	17.10	5.28	
CO	0.000	4.280	2.481	.017	4.285	2.509	
CO ₂ (DT)	N/A	N/A	N/A	N/A	N/A	N/A	

Stack Diameter (inches): 6"

Air Velocity (ft/min): Initial: < 50 ft/min Final: < 50 ft/min

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

Induced Draft: ∅ %Smoke Capture: 100%

Pitot Tube Leak Test: Pre: ∅ Post: ∅

Flue Pipe Cleaned Prior to First Test in Series: Date: 6/20/11 Initials: A

	Initial	Middle	Ending
Pb (in/Hg)	29.99	30.01	30.00
Room Temp (°F)	74	73	73

Technician signature: [Signature] Date: 6/22/11

Model: TL2.0
Harman Home Heating
352 Mountain House Road
Halifax, PA 17032

Run 3

Wood Heater Test Data - EPA Method 5G

Manufacturer: Harman
 Model: TL 2.0
 Project No.: 135-S-29-8.3
 Tracking No.: 1694
 Run: 3
 Test Date: 06/22/11

Burn Rate	0.81 kg/hr dry
Average Tunnel Temperature	86 degrees Fahrenheit
Average Gas Velocity in Dilution Tunnel - vs	13.4 feet/second
Average Gas Flow Rate In Dilution Tunnel - Qsd	8795.7 dscf/hour
Average Delta p	0.039 inches H2O
Average Delta H	1.02 inches H2O
Total Time of Test	400 minutes

	AVERAGE	SAMPLE TRAIN 1	SAMPLE TRAIN 2
Total Sample Volume - Vm	60.95 cubic feet	57.74 cubic feet	64.15 cubic feet
Average Gas Meter Temperature	81 degrees Fahrenheit	75 degrees Fahrenheit	87 degrees Fahrenheit
Total Sample Volume (Standard Conditions) - Vmstd	60.5 dscf	57.2 dscf	63.7 dscf
Total Particulates - mn		22 mg	25.1 mg
Particulate Concentration (dry-standard)	0.00039 grams/dscf	0.00038 grams/dscf	0.00039 grams/dscf
Particulate Emission Rate	3.42 grams/hour	3.38 grams/hour	3.47 grams/hour
Adjusted Emissions	6.08 grams/hour	5.00 grams/hour	5.11 grams/hour
Difference from Average		0.05 grams/hour	0.05 grams/hour
7.5% of the average emission rate	0.38		
Weighted Average Emission Rate Limit	4.10 grams/hour		
7.5% of the weighted average emission rate limit	0.31		
Results Are Acceptable			

PRINT

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

Client Name: <u>Harman</u>	Equipment Numbers: <u>23, 343, 131</u>	Run #: <u>3</u>
Model: <u>TL 2.0</u>		Train #: <u>A</u>
Project No.: <u>135-S-29-8.3</u>		Date: <u>06/22/11</u>
Tracking No.: <u>1694</u>		

Sample Component	Reagent	Filter # or Probe #	Weights		
			Final, mg	Tare, mg	Particulate, mg
A. Front filter catch	Filter	G093	140.1	119.6	20.5
B. Rear filter catch	Filter	G094	119.5	118.2	1.3
C. Probe catch	Probe	3	116009.8	116009.6	0.2

Total Particulate, mg:	22.0
------------------------	------

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

Analyst: *ALP* Date: 6/27/11

PRINT

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

Client Name: <u>Harman</u>	Equipment Numbers: <u>23,343,131</u>	Run #: <u>3</u>
Model: <u>TL 2.0</u>		Train #: <u>B</u>
Project No.: <u>135-S-29-8.3</u>		Date: <u>06/22/11</u>
Tracking No.: <u>1694</u>		

Sample Component	Reagent	Filter # or Probe #	Weights		
			Final, mg	Tare, mg	Particulate, mg
A. Front filter catch	Filter	G095	143.8	121.0	22.8
B. Rear filter catch	Filter	G096	122.9	121.6	1.3
C. Probe catch	Probe	2	115020.3	115019.3	1.0

Total Particulate, mg :	25.1
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Component	Equations:
A. Front filter catch	Final (mg) - Tare (mg) = Particulate, mg
B. Rear filter catch	Final (mg) - Tare (mg) = Particulate, mg
C. Probe catch	Final (mg) - Tare (mg) = Particulate, mg

Analyst: *HR* Date: 6/27/11

STOVE TEMPERATURE TEST DATA - METHOD 5G

Client/Model: Harman Project #: 135-S-29-8.3 Tracking #: 1694

Date: 6/22/11 Test Crew: S. Button/A. Kravitz Run #: 3

OMNI Equipment ID #: 185.355.356

Preburn Test	Coal Bed										Actual
	Fuel Weight	Delta Weight	Stack Draft	Ambient	Top	Bottom	Back	Left	Right	Flue	
0	10.2	0.0	-0.052	74	275	257	301	380	366	503	n/a
10	9	-1.2	-0.042	73	273	268	272	383	357	390	n/a
20	8.1	-1.0	-0.041	72	277	273	250	380	346	385	n/a
30	7.2	-0.9	-0.04	73	286	273	256	380	339	388	n/a
40	6.3	-0.9	-0.039	73	300	272	258	381	340	381	n/a
50	5.6	-0.7	-0.038	74	323	271	254	378	343	376	n/a
60	4.9	-0.7	-0.037	74	334	268	248	376	345	371	n/a
70	4	-0.9	-0.045	75	327	269	294	375	349	456	n/a
80	3.3	-0.7	-0.041	75	314	278	317	387	355	422	n/a
90	3.1	-0.2	-0.033	76	324	297	262	390	359	348	n/a
94	3	-0.1	-0.03	76	321	303	241	386	359	330	n/a
AVG											

Technician signature: Date: 6/24/11

FUEL DATA

Client: Harman
 Model: TL 2.0
 Project #: 135-S-29-8.3 Tracking #: 1694
 Date: 6/22/11 Test Crew: A. Kravitz, S. Button Run #: 3
 OMNI Equipment ID #: 183, 185, 431
 FUEL LOAD PREPARED BY: A. Kravitz
 FUEL: DOUGLAS-FIR SPECIES, UNTREATED, AIR-DRIED, STANDARD GRADE OR BETTER, DIMENSIONAL LUMBER.

PRE-BURN FUEL					
MOISTURE CONTENT (METER --- DRY BASIS)					
CALIBRATION:	Cal Value (1) = 12%	Actual Reading	<u>12.0</u>		
	Cal Value (2) = 22%	Actual Reading	<u>22.0</u>		
Piece	Length	Readings		Type	
1	<u>1/2</u> ft	<u>21.4</u>	<u>23.7</u>	<u>20.9</u>	<u>2x4</u>
2	_____ ft	_____	_____	_____	_____
3	_____ ft	_____	_____	_____	_____
Length of cut pieces: <u>8</u> inches		Pre-Burn Fuel Average Moisture: <u>22.0</u> %			
Time (clock): <u>0810</u>		Room Temperature (F): <u>73</u>	Initials: <u>AK</u>		

TEST FUEL				
FUEL TYPE AND AMOUNT:	<u>2x4</u>	<u>6.1</u> ³	<u>4x4</u>	<u>8.2</u> ²
CALCULATED LOAD WEIGHT:	<u>14.6</u>	ACTUAL LOAD WEIGHT:	<u>6.1</u>	(2x4)
			<u>8.2</u>	(4x4)
FUEL PIECE LENGTH:	<u>15.5"</u>		<u>14.3</u>	Total
MOISTURE CONTENT (METER --- DRY BASIS)				
PIECE	READINGS			TYPE
1	<u>23.1</u>	<u>22.2</u>	<u>23.8</u>	<u>4x4</u>
2	<u>22.2</u>	<u>23.1</u>	<u>23.3</u>	<u>4x4</u>
3	<u>19.9</u>	<u>18.3</u>	<u>21.1</u>	<u>2x4</u>
4	<u>20.5</u>	<u>20.9</u>	<u>21.5</u>	<u>2x4</u>
5	<u>18.3</u>	<u>19.5</u>	<u>19.9</u>	<u>2x4</u>
6	_____	_____	_____	_____
7	_____	_____	_____	_____
8	_____	_____	_____	_____
9	_____	_____	_____	_____
10	_____	_____	_____	_____
OVERALL TEST FUEL LOAD MOISTURE AVERAGE: <u>21.17</u> %				
Time (clock): <u>0832</u>		Room Temperature (F): <u>73</u>	Initials: <u>AK</u>	

Technician signature: [Signature] Date: 6/22/11

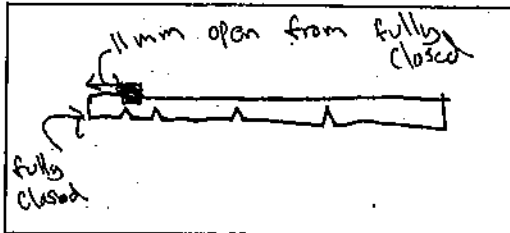
Run Notes

Client: Harman
 Model: TL 2.0
 Project #: 135-S-29-8.3
 Tracking #: 1694
 Run #: 3 Date: 6/22/11
 Test Crew: A. Krawitz, J. Button
 OMNI Equipment ID #(s): 216, 455

PREBURN

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

PRIMARY:



SECONDARY: Fixed

TERTIARY: N/A

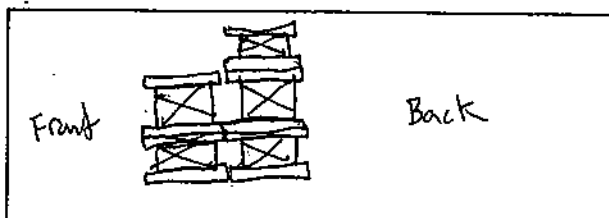
FAN: on High

PREBURN SETTINGS AND ACTIVITIES

TIME	AIR (THERMO) CHANGES PRIMARY/SECONDARY/TERTIARY	FAN SETTING CHANGE	ADD FUEL + WT.	ADD FUEL - WT.	RAKE COAL	COMMENT
65min					stirred cont	

* 341 minutes into test, adjusted fuel load TEST

TEST FUEL CONFIGURATION SKETCH
 (INDICATE VIEW ANGLE)

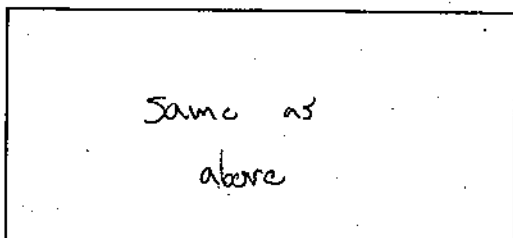


START UP PROCEDURES

BYPASS: Never open
 FUEL LOADING: Done @ 40 sec
 DOOR: closed @ 1 min
 PRIMARY AIR: Set @ 5 min
 OTHER: N/A

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

PRIMARY:



SECONDARY: Fixed

TERTIARY: N/A

FAN: on high

Technician signature: [Signature] Date: 6/22/11

Supplemental Data EPA 5G/5H

Client: Harman

Model: TL 2.0

Project #: 135-S-29-8.3

Tracking #: 1694

Date: 6/22/11

Run #: 3 Booth: E1

Test Crew: A. Kravitz, S. Bilton Start Time: 11:31 Stop Time: 13:11

OMNI Equipment #(s): 420, 132, 265, 410, 209, ALM068053, ALM066210, AWC571

Gas Analyzer Train Leak Check:

Stack:

Dilution Tunnel (Method 5G Only):

Initial: ∅

Initial: MA

Final: ∅

Final: MA

Calibrations: Span Gas CO₂: 17.10 O₂: N/A CO: 4.280 CO₂(DT): N/A
 Mic CO₂: 5.06 O₂: 5.03 CO: 2.5000

Time	<u>N₂ Span</u>	<u>N₂ Span</u>	<u>N₂ Span</u>	<u>N₂ Span</u>	<u>N₂ Span</u>	<u>N₂ Span</u>	N ₂ Span
	0901	0903	0905	18:40	18:42	18:45	
O ₂	N/A	N/A	N/A	N/A	N/A	N/A	
CO ₂	0.00	17.10	5.26	0.09	17.22	5.03	
CO	0.000	4.280	2.489	-0.013	4.283	2.462	
CO ₂ (DT)	N/A	N/A	N/A	N/A	N/A	N/A	

Stack Diameter (inches): 6"

Air Velocity (ft/min): Initial: < 50 ft/min Final: < 50 ft/min

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

Induced Draft: ∅ %Smoke Capture: 100%

Pitot Tube Leak Test: Pre: ∅ Post: ∅

Flue Pipe Cleaned Prior to First Test in Series: Date: 6/20/11 Initials: AS

	Initial	Middle	Ending
Pb (in/Hg)	30.00	30.01	30.02
Room Temp (°F)	73	77	78

Technician signature: [Signature] Date: 6/22/11

Model: TL2.0
Harman Home Heating
352 Mountain House Road
Halifax, PA 17032

Run 4

Wood Heater Test Data - EPA Method 5G

Manufacturer: Harman
 Model: TL 2.0
 Project No.: 135-S-29-8.3
 Tracking No.: 1694
 Run: 4
 Test Date: 06/23/11

Burn Rate	1.28 kg/hr dry
Average Tunnel Temperature	94 degrees Fahrenheit
Average Gas Velocity in Dilution Tunnel - vs	14.1 feet/second
Average Gas Flow Rate in Dilution Tunnel - Qsd	9197.1 dscf/hour
Average Delta p	0.043 inches H2O
Average Delta H	1.08 inches H2O
Total Time of Test	240 minutes

	AVERAGE	SAMPLE TRAIN 1	SAMPLE TRAIN 2
Total Sample Volume - Vm	36.99 cubic feet	35.29 cubic feet	38.69 cubic feet
Average Gas Meter Temperature	77 degrees Fahrenheit	71 degrees Fahrenheit	83 degrees Fahrenheit
Total Sample Volume (Standard Conditions) - Vmstd	37.2 dscf	35.4 dscf	38.9 dscf
Total Particulates - mn		5.2 mg	5.8 mg
Particulate Concentration (dry-standard)	0.00015 grams/dscf	0.00015 grams/dscf	0.00015 grams/dscf
Particulate Emission Rate	1.36 grams/hour	1.35 grams/hour	1.37 grams/hour
Adjusted Emissions	2.35 grams/hour	2.34 grams/hour	2.37 grams/hour
Difference from Average		0.01 grams/hour	0.01 grams/hour
7.5% of the average emission rate	0.18		
Weighted Average Emission Rate Limit	4.10 grams/hour		
7.5% of the weighted average emission rate limit	0.31		
Results Are Acceptable			

Wood Heater Test Data - EPA Method 5G

Run: 4
 Manufacturer: Harman
 Model: TL 2.0
 Tracking No.: 1694
 Project No.: 135-S-29-8.3
 Test Date: 23-Jun-11
 Beginning Clock Time: 05:26
 Recording Interval: 10 min.
 Total Sampling Time: 240 min.

Velocity Traverse Data								
	Pt.1	Pt.2	Pt.3	Pt.4	Pt.5	Pt.6	Pt.7	Pt.8
Initial dP	0.048	0.050	0.048	0.040	0.048	0.026	0.048	0.038
Initial Temp.	106	106	106	106	106	106	106	106

OMNI Equipment Numbers: _____

PM Control Module: 335/336
 Dilution Tunnel MW(dry): 29.09 lb/lb-mole
 Dilution Tunnel MW(wet): 28.56 lb/lb-mole
 Dilution Tunnel H2O: 4.00 percent
 Dilution Tunnel Static: -0.620 "H2O
 Pitot Tube Cp: 0.99
 Meter Box Y Factor: 0.999 (1) 1.023 (2)
 Barometric Pressure: Begin Middle End Average
30.14 30.16 30.18 30.16 "Hg

Signature/Date: [Signature] 6/30/11
 Tunnel Velocity: 14.12 ft/sec.
 Initial Tunnel Flow: 150.9 scfm
 Average Tunnel Flow: 153.3 scfm
 Tunnel Area: 0.1963 ft²
 Post-Test Leak Check (1): 0 cfm@*Hg
 Post-Test Leak Check (2): 0.007 cfm@*Hg
 Fuel Moisture (dry basis %): 22.07
 Total Particulate (1): 5.2
 Total Particulate (2): 5.8

Elapsed Time	Particulate Sampling Data														Fuel Weight, lb		Wood Heater Temperature Data, °F														Stack
	Gas Meter Cubic Feet (1)	Gas Meter Cubic Feet (2)	Sample Rate, cfm (1)	Sample Rate, cfm (2)	Orifice dH (1)	Orifice dH (2)	Meter °F (1)	Meter °F (2)	Meter Vac. In. Hg. (1)	Meter Vac. In. Hg. (2)	Dilution Tunnel Temp.	Dilution Tunnel dP	Pro. Rate (10%) (1)	Pro. Rate (10%) (2)	Scale Reading	Weight Change	Firebox Top	Firebox Bottom	Firebox Back	Firebox Left	Firebox Right	Catalyst Exit	Average Surface	Stack	Filter (1)	Filter (2)	Impinger exit (1)	Impinger exit (2)	Ambient	Draft In. H2O	
0	0.000	0.000			0.70	0.70	69	76	0.05	1.1	106	0.043			13.8		338	308	430	393	395	n/a	372.8	525	71	72	n/a	n/a	70	-0.054	
10	1.466	1.596	0.15	0.16	1.10	1.09	69	77	1.09	1.1	105	0.043	102	102	12.5	-1.3	300	319	384	404	405	n/a	362.4	484	75	75	n/a	n/a	71	-0.051	
20	2.930	3.196	0.15	0.16	1.09	1.09	69	78	1.09	1.1	103	0.043	102	102	11.3	-1.2	276	326	344	396	393	n/a	347.0	478	76	76	n/a	n/a	71	-0.050	
30	4.394	4.799	0.15	0.16	1.09	1.09	69	79	1.08	1.1	102	0.043	102	102	10.1	-1.2	272	327	337	389	385	n/a	342.0	476	76	76	n/a	n/a	71	-0.050	
40	5.861	6.406	0.15	0.16	1.09	1.09	69	81	1.08	1.1	102	0.043	102	102	9.0	-1.1	277	327	347	388	383	n/a	344.4	487	77	76	n/a	n/a	71	-0.050	
50	7.329	8.015	0.15	0.16	1.09	1.09	70	82	1.09	1.1	100	0.043	101	101	8.0	-1	286	326	327	391	384	n/a	342.8	450	77	76	n/a	n/a	71	-0.046	
60	8.797	9.625	0.15	0.16	1.08	1.09	70	82	1.09	1.1	99	0.043	101	101	7.0	-1	294	323	306	392	385	n/a	340.0	444	77	76	n/a	n/a	71	-0.046	
70	10.267	11.237	0.15	0.16	1.07	1.09	70	83	1.09	1.1	98	0.043	101	101	6.2	-0.8	308	316	293	395	384	n/a	339.2	428	76	76	n/a	n/a	71	-0.044	
80	11.736	12.849	0.15	0.16	1.08	1.10	70	83	1.09	1.1	97	0.043	101	101	5.4	-0.8	316	309	276	399	382	n/a	336.4	412	76	76	n/a	n/a	72	-0.042	
90	13.208	14.464	0.15	0.16	1.09	1.10	70	83	1.08	1.1	96	0.043	101	101	4.7	-0.7	317	301	260	403	381	n/a	332.4	398	76	76	n/a	n/a	71	-0.040	
100	14.682	16.079	0.15	0.16	1.08	1.09	70	83	1.09	1.1	94	0.043	101	101	4.0	-0.7	320	293	248	402	382	n/a	329.0	382	76	76	n/a	n/a	72	-0.038	
110	16.156	17.694	0.15	0.16	1.08	1.10	70	83	1.09	1.1	93	0.043	101	101	3.5	-0.5	330	284	234	399	381	n/a	325.6	368	76	75	n/a	n/a	71	-0.036	
120	17.630	19.310	0.15	0.16	1.08	1.10	70	83	1.09	1.1	92	0.043	101	101	3.0	-0.5	331	277	223	396	378	n/a	321.0	353	75	75	n/a	n/a	72	-0.034	
130	19.105	20.927	0.15	0.16	1.09	1.09	70	83	1.09	1.1	91	0.043	101	101	2.6	-0.4	324	268	209	389	375	n/a	313.0	331	75	75	n/a	n/a	72	-0.032	
140	20.579	22.542	0.15	0.16	1.09	1.10	70	83	1.09	1.1	88	0.043	101	100	2.4	-0.2	314	260	189	378	372	n/a	302.6	299	75	74	n/a	n/a	72	-0.028	
150	22.059	24.165	0.15	0.16	1.08	1.10	70	83	1.09	1.1	86	0.043	101	101	2.1	-0.3	305	249	173	363	373	n/a	292.6	278	74	74	n/a	n/a	72	-0.025	
160	23.533	25.782	0.15	0.16	1.08	1.10	70	83	1.1	1.1	85	0.043	100	100	1.8	-0.3	296	238	162	348	372	n/a	283.2	264	74	74	n/a	n/a	72	-0.023	
170	25.007	27.397	0.15	0.16	1.08	1.09	72	83	1.09	1.1	86	0.043	100	100	1.6	-0.2	289	229	156	333	369	n/a	275.2	255	75	74	n/a	n/a	74	-0.020	
180	26.478	29.011	0.15	0.16	1.07	1.09	73	84	1.09	1.2	86	0.043	100	100	1.3	-0.3	281	226	154	321	365	n/a	269.4	255	76	75	n/a	n/a	76	-0.019	
190	27.947	30.623	0.15	0.16	1.07	1.09	74	85	1.09	1.2	87	0.043	100	100	1.1	-0.2	278	225	151	311	361	n/a	265.2	246	76	76	n/a	n/a	76	-0.018	
200	29.415	32.235	0.15	0.16	1.07	1.09	75	86	1.1	1.1	87	0.043	99	100	0.8	-0.3	279	224	149	304	357	n/a	262.6	244	77	77	n/a	n/a	77	-0.017	
210	30.884	33.849	0.15	0.16	1.07	1.09	75	86	1.1	1.2	87	0.043	99	100	0.6	-0.2	277	223	147	298	353	n/a	259.6	241	78	78	n/a	n/a	77	-0.016	
220	32.352	35.462	0.15	0.16	1.07	1.09	76	87	1.1	1.2	89	0.043	99	100	0.4	-0.2	274	223	146	293	347	n/a	256.6	240	78	78	n/a	n/a	78	-0.016	
230	33.820	37.074	0.15	0.16	1.06	1.09	77	88	1.1	1.2	89	0.043	99	99	0.2	-0.2	268	224	146	288	342	n/a	253.6	238	79	79	n/a	n/a	79	-0.015	
240	35.288	38.688	0.15	0.16	1.06	1.08	77	89	1.1	1.2	90	0.043	99	99	0.0	-0.2	263	226	144	284	334	n/a	250.2	233	80	80	n/a	n/a	79	-0.014	
Avg/Total	35.288	38.688	0.15	0.16	1.06	1.08	71.36	82.92			93.52	0.043	100.70	100.67									123		76.04	75.80	#DIV/0!	#DIV/0!		-0.033	

PRINT

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

Client Name: <u>Harman</u>	Equipment Numbers: <u>23, 343, 131</u>	Run #: <u>4</u>
Model: <u>TL 2.0</u>		Train #: <u>A</u>
Project No.: <u>135-S-29-8.3</u>		Date: <u>06/23/11</u>
Tracking No.: <u>1694</u>		

Sample Component	Reagent	Filter # or Probe #	Weights		
			Final, mg	Tare, mg	Particulate, mg
A. Front filter catch	Filter	G097	123.7	119.3	4.4
B. Rear filter catch	Filter	G098	120.5	120.0	0.5
C. Probe catch	Probe	50	121765.0	121764.7	0.3

Total Particulate, mg :	5.2
-------------------------	-----

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

Analyst: *AT* Date: 6/27/11

PRINT

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

Client Name: Harman Equipment Numbers: 23, 343, 131 Run #: 4
 Model: TL 2.0 Train #: B
 Project No.: 135-S-29-8.3 Date: 06/23/11
 Tracking No.: 1694

Sample Component	Reagent	Filter # or Probe #	Weights		
			Final, mg	Tare, mg	Particulate, mg
A. Front filter catch	Filter	G099	126.7	121.7	5.0
B. Rear filter catch	Filter	G100	120.9	120.6	0.3
C. Probe catch	Probe	38	114149.1	114148.6	0.5

Total Particulate, mg :	5.8
-------------------------	-----

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

Analyst: *[Signature]* Date: 6/27/11

STOVE TEMPERATURE TEST DATA - METHOD 5G

Client/Model: Harman Project #: 135-S-29-8.3 Tracking #: 1694
 Date: 6/23/11 Test Crew: A. Kravitz Run #: 4
 OMNI Equipment ID #: 185.355.356

Preburn Test	Coal Bed										Actual		
	Fuel Weight	Delta Weight	Stack Draft	Ambient	Top	Bottom	Back	Left	Right	Flue	Catalyst	Coal Bed: 2.8	
Time	TEMPERATURES (oF)												
0	11.2	0.0	-0.06	73	353	96	398	209	219	575	n/a		
10	10.2	-1.0	-0.037	72	267	125	228	255	257	343	n/a		
20	9.4	-0.8	-0.031	71	225	158	172	258	254	298	n/a		
30	8.5	-0.9	-0.036	71	219	181	169	256	245	341	n/a		
40	7.2	-1.3	-0.045	70	234	200	231	261	252	437	n/a		
50	6.1	-1.1	-0.046	70	261	220	262	280	277	444	n/a		
60	5	-1.1	-0.045	70	294	239	273	299	305	434	n/a		
70	2.9	-2.1	-0.06	70	439	250	277	325	347	676	n/a		
71	2.8	-0.1	-0.057	70	439	251	282	329	350	604	n/a		
71	2.8	0.0	-0.057	70	439	251	282	329	350	602	n/a		
80	8.3	5.5	-0.052	69	373	270	273	355	380	480	n/a		
90	6.8	-1.481	-0.049	69	332	271	273	355	378	460	n/a		
100	5.7	-1.125	-0.049	69	313	280	313	352	372	474	n/a		
110	9.1	3.422	-0.106	70	324	292	323	362	375	950	n/a		
120	2.8	-6.281	-0.054	69	326	302	424	386	389	543	n/a		
121	2.8	-0.021	-0.053	71	327	304	425	389	391	534	n/a		
AVG													

Technician signature: *[Signature]* Date: 6/30/11

FUEL DATA

Client: Harman

Model: TL 2.0

Project #: 135-S-29-8.3 Tracking #: 1694

Date: 6/23/11 Test Crew: A. Kravitz

Run #: 4

OMNI Equipment ID #: 183,185,431

FUEL LOAD PREPARED BY: A. Kravitz

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

PRE-BURN FUEL					
MOISTURE CONTENT (METER -- DRY BASIS)					
CALIBRATION:	Cal Value (1) = 12%	Actual Reading	<u>12.0</u>		
	Cal Value (2) = 22%	Actual Reading	<u>22.0</u>		
Piece	Length	Readings		Type	
1	<u>12</u> ft	<u>19.9</u>	<u>20.1</u>	<u>18.7</u>	<u>2x4</u>
2	_____ ft	_____	_____	_____	_____
3	_____ ft	_____	_____	_____	_____
Length of cut pieces: <u>8</u> inches		Pre-Burn Fuel Average Moisture: <u>19.57</u>			
Time (clock): <u>4:50</u>		Room Temperature (F): <u>74</u>	Initials: <u>AK</u>		

TEST FUEL					
FUEL TYPE AND AMOUNT:	<u>2x4</u>	<u>3</u>	<u>4x4</u>	<u>2</u>	
CALCULATED LOAD WEIGHT:	<u>14</u>	ACTUAL LOAD WEIGHT:		<u>5.7</u>	(2x4)
				<u>8.1</u>	(4x4)
FUEL PIECE LENGTH: <u>15.5"</u>				<u>13.8</u>	Total
MOISTURE CONTENT (METER -- DRY BASIS)					
PIECE	READINGS			TYPE	
1	<u>23.2</u>	<u>23.6</u>	<u>24.0</u>	<u>4x4</u>	
2	<u>23.2</u>	<u>23.5</u>	<u>23.2</u>	<u>4x4</u>	
3	<u>19.9</u>	<u>21.2</u>	<u>20.5</u>	<u>2x4</u>	
4	<u>20.7</u>	<u>18.3</u>	<u>18.5</u>	<u>2x4</u>	
5	<u>23.8</u>	<u>23.2</u>	<u>23.2</u>	<u>2x4</u>	
6	_____	_____	_____	_____	
7	_____	_____	_____	_____	
8	_____	_____	_____	_____	
9	_____	_____	_____	_____	
10	_____	_____	_____	_____	
OVERALL TEST FUEL LOAD MOISTURE AVERAGE: <u>22.07</u>					
Time (clock): <u>0540</u>		Room Temperature (F): <u>72</u>		Initials: <u>AK</u>	

Technician signature: *A. Kravitz*

Date: 6/23/11

Run Notes

Client: Harman

Model: TL 2.0

Project #: 135-S-29-8.3

Tracking #: 1694

Run #: 4

Date: 6/23/11

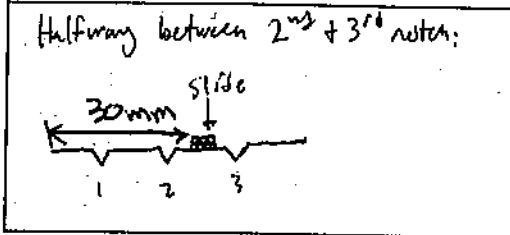
Test Crew: A. Granite

OMNI Equipment ID #(s): 216, 455

PREBURN

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

PRIMARY:



SECONDARY: Fixed

TERTIARY: N/A

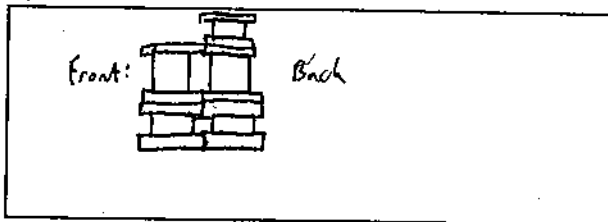
FAN: On high

PREBURN SETTINGS AND ACTIVITIES

TIME	AIR (THERMO) CHANGES PRIMARY/SECONDARY/TERTIARY	FAN SETTING CHANGE	ADD FUEL + WT.	ADD FUEL - WT.	RAKE COAL	COMMENT
1:02:00					Leveled coals	
1:15:00			+6.0 lb			overshot preburn
1:48:00					Leveled coals	

TEST

TEST FUEL CONFIGURATION SKETCH
(INDICATE VIEW ANGLE)



START UP PROCEDURES

BYPASS: Never open

FUEL LOADING Pause 30 sec

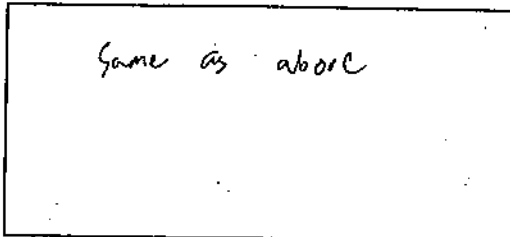
DOOR: closed @ 1:00

PRIMARY AIR: closed to test setting @ 5:00

OTHER: N/A

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

PRIMARY:



SECONDARY: Fixed

TERTIARY: N/A

FAN: On high

Technician signature: A. Granite

Date: 6/23/11

Supplemental Data EPA 5G/5H

Client: Harman

Model: TL 2.0

Project #: 135-S-29-8.3

Tracking #: 1694

Date: 6/23/11

Run #: 4 Booth: E1

Test Crew: A. Kravitz

Start Time: 7:29 Stop Time: 11:29

OMNI Equipment #(s): 420, 132, 265, 410, 209, ALM 068062, ALM 066 210, AVC 571

Gas Analyzer Train Leak Check:

Stack:

Dilution Tunnel (Method 5G Only):

Initial: ∅

Initial: N/A

Final: ∅

Final: N/A

Calibrations: Span Gas CO₂: 17.10 O₂: N/A CO: 4.280 CO₂(DT): N/A
Mid: 5.06 2.500

	<u>N₂ Span</u>	<u>N₂ Span</u>	<u>N₂ Span</u>	<u>N₂ Span</u>	<u>N₂ Span</u>	<u>N₂ Span</u>	<u>N₂ Span</u>
Time	<u>0524</u>	<u>0527</u>	<u>0531</u>	<u>11:40</u>	<u>11:42</u>	<u>11:45</u>	
O ₂	<u>N/A</u>	<u>N/A</u>	<u>N/A</u>	<u>N/A</u>	<u>N/A</u>	<u>N/A</u>	
CO ₂	<u>0.00</u>	<u>17.10</u>	<u>5.25</u>	<u>0.02</u>	<u>16.92</u>	<u>5.12</u>	
CO	<u>0.000</u>	<u>4.280</u>	<u>2.486</u>	<u>0.016</u>	<u>4.248</u>	<u>2.433</u>	
CO ₂ (DT)	<u>N/A</u>	<u>N/A</u>	<u>N/A</u>	<u>N/A</u>	<u>N/A</u>	<u>N/A</u>	

Stack Diameter (inches): 6

Air Velocity (ft/min): Initial: < 50 ft/min Final: < 50 ft/min

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

Induced Draft: ∅ %Smoke Capture: 100

Pitot Tube Leak Test: Pre: ∅ Post: ∅

Flue Pipe Cleaned Prior to First Test in Series: Date: 6/20/11 Initials: AK

	Initial	Middle	Ending
Pb (in/Hg)	<u>30.14</u>	<u>30.16</u>	<u>30.18</u>
Room Temp (°F)	<u>70</u>	<u>72</u>	<u>79</u>

Technician signature: [Signature] Date: 6/23/11

Run 5

Wood Heater Test Data - EPA Method 5G

Manufacturer: Harman
Model: TL 2.0
Project No.: 135-S-29-8.3
Tracking No.: 1694
Run: 5
Test Date: 06/23/11

Burn Rate	1.07 kg/hr dry
Average Tunnel Temperature	103 degrees Fahrenheit
Average Gas Velocity in Dilution Tunnel - vs	14.1 feet/second
Average Gas Flow Rate in Dilution Tunnel - Qsd	9017.8 dscf/hour
Average Delta p	0.042 inches H2O
Average Delta H	1.00 inches H2O
Total Time of Test	290 minutes

	AVERAGE	SAMPLE TRAIN 1	SAMPLE TRAIN 2
Total Sample Volume - Vm	44.44 cubic feet	41.97 cubic feet	46.02 cubic feet
Average Gas Meter Temperature	88 degrees Fahrenheit	81 degrees Fahrenheit	94 degrees Fahrenheit
Total Sample Volume (Standard Conditions) - Vmstd	43.8 dscf	41.3 dscf	46.2 dscf
Total Particulates - mn		4.9 mg	5.6 mg
Particulate Concentration (dry-standard)	0.00012 grams/dscf	0.00012 grams/dscf	0.00012 grams/dscf
Particulate Emission Rate	1.08 grams/hour	1.07 grams/hour	1.09 grams/hour
Adjusted Emissions	1.94 grams/hour	1.92 grams/hour	1.96 grams/hour
Difference from Average		0.02 grams/hour	0.02 grams/hour
7.5% of the average emission rate	0.15		
Weighted Average Emission Rate Limit	4.10 grams/hour		
7.5% of the weighted average emission rate limit	0.31		
Results Are Acceptable			

PRINT


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

Client Name: Harman Equipment Numbers: 23, 343, 131 Run #: 5
 Model: TL 2.0 Train #: A
 Project No.: 135-S-29-8.3 Date: 06/23/11
 Tracking No.: 1694

Sample Component	Reagent	Filter # or Probe #	Weights		
			Final, mg	Tare, mg	Particulate, mg
A. Front filter catch	Filter	G101	125.0	120.9	4.1
B. Rear filter catch	Filter	G102	120.4	119.9	0.5
C. Probe catch	Probe	28	114742.8	114742.5	0.3

Total Particulate, mg :	4.9
-------------------------	-----

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

Analyst:  Date: 6/27/11

PRINT


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

Client Name: <u>Harman</u>	Equipment Numbers: <u>23, 343, 131</u>	Run #: <u>5</u>
Model: <u>TL 2.0</u>		Train #: <u>B</u>
Project No.: <u>135-S-29-8.3</u>		Date: <u>06/23/11</u>
Tracking No.: <u>1694</u>		

Sample Component	Reagent	Filter # or Probe #	Weights		
			Final, mg	Tare, mg	Particulate, mg
A. Front filter catch	Filter	G104	126.4	121.9	4.5
B. Rear filter catch	Filter	G103	119.5	118.9	0.6
C. Probe catch	Probe	61	122554.4	122553.9	0.5

Total Particulate, mg :	5.6
-------------------------	-----

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

Analyst:  Date: 6/27/11

STOVE TEMPERATURE TEST DATA - METHOD 5G

Client/Model: Harman Project #: 135-S-29-8.3 Tracking #: 1694
 Date: 6/23/11 Test Crew: S. Button/A. Kravitz Run #: 5
 OMNI Equipment ID #: 185,355,356

Preburn Test	Coal Bed										Flue	Catalyst
	Data: T = 0 @ 12:14											
	Fuel Weight	Delta Weight	Stack Draft	Ambient	Top	Bottom	Back	Left	Right	Flue		
0	10.5	0.0	-0.054	79	306	229	559	278	316	563	n/a	
10	9.5	-1.0	-0.045	79	323	255	567	293	334	455	n/a	
20	8.5	-1.0	-0.046	79	340	275	555	301	344	458	n/a	
30	7.6	-0.9	-0.043	79	361	287	550	307	354	441	n/a	
40	6.9	-0.7	-0.042	78	386	293	529	313	363	426	n/a	
50	6.2	-0.7	-0.04	79	403	295	515	319	366	419	n/a	
60	5.6	-0.6	-0.035	81	406	297	492	324	370	380	n/a	
70	5	-0.5	-0.033	81	409	292	458	325	376	362	n/a	
80	4.6	-0.5	-0.03	82	416	286	429	325	376	336	n/a	
90	3.8	-0.8	-0.042	83	384	284	514	323	380	451	n/a	
100	3.2	-0.6	-0.038	83	389	295	527	329	390	413	n/a	
101	3.2	-0.014	-0.037	83	390	297	524	330	391	406	n/a	
AVG												

Technician signature: *[Signature]* Date: 6/30/11

FUEL DATA

Client: Harman

Model: TL 2.0

Project #: 135-S-29-8.3 Tracking #: 1694

Date: 6/23/11 Test Crew: A. Kowitz, S. Bittz

OMNI Equipment ID #: 183, 185, 431 Run #: 5

FUEL LOAD PREPARED BY: A. Kowitz, S. Bittz

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

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

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

Piece	Length	Readings		Type
1	<u>12</u> ft	<u>19.7</u>	<u>22.1</u>	<u>2x4</u>
2	ft			
3	ft			

Length of cut pieces: 8 inches Pre-Burn Fuel Average Moisture: 20.25

Time (clock): 0919 Room Temperature (F): 74 Initials: AK

TEST FUEL

FUEL TYPE AND AMOUNT: 2x4 3 4x4 2

CALCULATED LOAD WEIGHT: 146 ACTUAL LOAD WEIGHT: 6.9 (2x4)
8.1 (4x4)
14.0 Total

FUEL PIECE LENGTH: 15.5"

MOISTURE CONTENT (METER -- DRY BASIS)

PIECE	READINGS			TYPE
1	<u>21.2</u>	<u>20.6</u>	<u>21.2</u>	<u>2x4</u>
2	<u>21.2</u>	<u>21.2</u>	<u>21.3</u>	<u>2x4</u>
3	<u>21.2</u>	<u>14.6</u>	<u>20.0</u>	<u>2x4</u>
4	<u>23.2</u>	<u>23.2</u>	<u>22.6</u>	<u>4x4</u>
5	<u>22.6</u>	<u>23.2</u>	<u>21.8</u>	<u>4x4</u>
6				
7				
8				
9				
10				

OVERALL TEST FUEL LOAD MOISTURE AVERAGE: 21.61

Time (clock): 0911 Room Temperature (F): 74 Initials: AK

Technician signature: [Signature] Date: 6/23/11

Run Notes

* Fan Confirmation *

Client: Harman

Model: TL 2.0

Project #: 135-S-29-8.3

Tracking #: 1694

Run #: 5

Date: 6/23/11

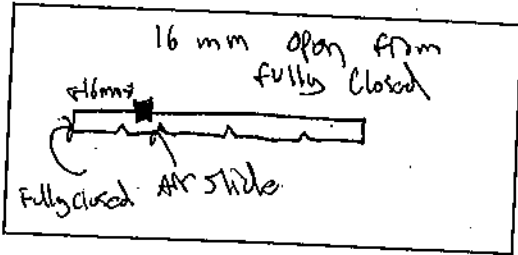
Test Crew: J. Button, A. Krasitz

OMNI Equipment ID #(s): 296, 465

PREBURN

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

PRIMARY:



SECONDARY: Fixed

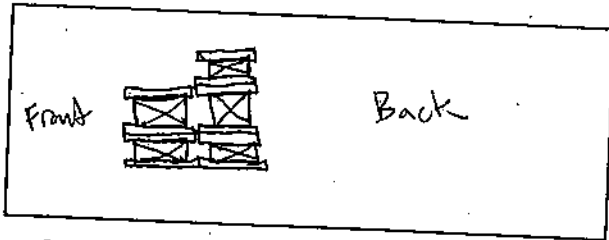
TERTIARY: N/A

FAN: OFF
(Fan Confirmation)

PREBURN SETTINGS AND ACTIVITIES

TIME	AIR (THERMO) CHANGES PRIMARY/SECONDARY/TERTIARY	FAN SETTING CHANGE	ADD FUEL + WT.	ADD FUEL - WT.	RAKE COAL	COMMENT
90					stirred coals	

TEST FUEL CONFIGURATION SKETCH
(INDICATE VIEW ANGLE)



TEST

START UP PROCEDURES

BYPASS: closed @ 0 sec

FUEL LOADING: Done @ 40 sec

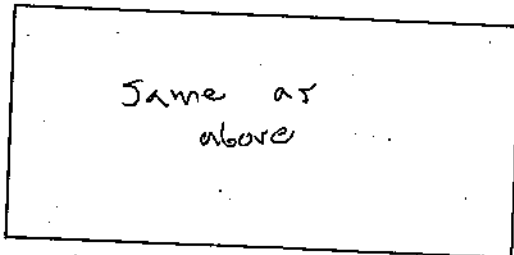
DOOR: closed @ 1 min

PRIMARY AIR: Set @ 5 mm

OTHER: N/A

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

PRIMARY:



SECONDARY: Fixed

TERTIARY: N/A

FAN: OFF
(fan Confirmation)

Technician signature: [Signature]

Date: 6/23/11

Supplemental Data EPA 5G/5H

Client: Harman

Model: TL 2.0

Project #: 135-S-29-8.3

Tracking #: 1694

Date: 6/23/11

Run #: 5 Booth: E1

Test Crew: S. Butler, A. Kowitz Start Time: 13:56 Stop Time: 18:46

OMNI Equipment #(s): 420, 132, 265, 410, 209

Gas Analyzer Train Leak Check:

Stack:

Dilution Tunnel (Method 5G Only):

Initial: N/A

Initial: N/A

Final: N/A

Final: N/A

Calibrations: Span Gas CO₂: N/A O₂: N/A CO: N/A CO₂(DT): N/A

Time	N ₂ Span	N ₂ Span	N ₂ Span	N ₂ Span	N ₂ Span	N ₂ Span	N ₂ Span
O ₂							
CO ₂	<u>N/A</u>						
CO	<u>N/A</u>						
CO ₂ (DT)							

Stack Diameter (inches): 6"

Air Velocity (ft/min): Initial: < 50 ft/min Final: < 50 ft/min

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

Induced Draft: φ %Smoke Capture: 100%

Pitot Tube Leak Test: Pre: φ Post: φ

Flue Pipe Cleaned Prior to First Test in Series: Date: 6/20/11 Initials: SB

	Initial	Middle	Ending
Pb (in/Hg)	<u>30.18</u>	<u>30.17</u>	<u>30.16</u>
Room Temp (°F)	<u>83</u>	<u>84</u>	<u>84</u>

Technician signature: [Signature] Date: 6/23/11

Section 5

Sampling Procedures and Test Results

INTRODUCTION

Harman Home Heating retained *OMNI* to perform U.S. Environmental Protection Agency (EPA) certification testing on the TL2.0 wood stove. The TL2.0 wood stove is a non-catalytic, freestanding, radiant-type room heater. The firebox is constructed of mild steel and cast iron. Usable firebox volume was measured to be 2.1 cubic feet and the stove is vented through a 6-inch diameter flue collar located at the top of the unit.

The testing was performed at *OMNI*'s testing facility in Portland, Oregon. The unit was received in good condition and logged in on June 20, 2011, then assigned and labeled with *OMNI* ID #1694. *OMNI* representative Sebastian Button, Aaron Kravitz, and Alex Tiegs conducted the certification testing and completed all testing by June 23, 2011. The EPA was notified of the testing dates in a letter dated June 20, 2011. A testing contract, including provisions for Random Compliance Audit (RCA) testing, has been signed by Larry Gross of Harman Home Heating and is on file at *OMNI*'s testing facility.

The TL2.0 wood stove was tested in accordance with the U.S. EPA 40 CFR Part 60, Subpart AAA – Standard of Performance for Residential Wood Heaters (Appendix A, Methods 28 and 5G). Particulate emissions were measured using a Method 5G sampling train consisting of two filters (front and back). The weighted average emissions of the four test runs included in the results indicate a particulate emission rate of 2.6 grams per hour. Run #5, a fan confirmation test run, was performed and was not used in the weighted average emission results. Test runs were conducted in each of three burn rate categories (0.80-1.25 kg/hr, 1.25-1.90 kg/hr, and maximum). Emissions for each of their individual test runs did not exceed the cap. The TL2.0 results are within the emission limit of 7.5 grams per hour for non-catalytic affected facilities manufactured on or after July 1, 1990, or sold at retail on or after July 1, 1992.

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

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

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

Table 1.1 – Particulate Emissions

Run	Burn Rate (kg/hr dry)	Method 5G Emissions (g/hr)
1	1.04	2.43
2	2.68	0.79
3	0.81	5.06
4	1.28	2.35

Weighted particulate emission average of four test runs: 2.6 grams per hour.

Table 1.2 – Test Facility Conditions

Run	Room Temperature (°F)		Barometric Pressure (Hg)		Air Velocity (ft/min)	
	Before	After	Before	After	Before	After
1	83	86	30.06	29.98	<50	<50
2	74	73	29.99	30.00	<50	<50
3	73	78	30.00	30.02	<50	<50
4	70	79	30.14	30.18	<50	<50

Table 1.3.1 – Fuel Measurement and Crib Description Summary – PRETEST

Run	Pretest Fuel Weight (Starting weight in lbs)	Pretest Moisture (Dry basis - %)	Coal Bed Weight (lbs)
1	10.5	20.4	3.5
2	14.0	23.2	2.9
3	10.2	22.0	3.0
4	11.2	19.6	2.8

Table 1.3.2 – Fuel Measurement and Crib Description Summary – TEST

Run	Test Fuel Wet Basis (lbs)	Firebox Volume (ft ³)	Fuel Loading Density Wet Basis (lbs/ft ³)	Fuel Moisture Content Dry (%)	Piece Length (in)	2x4s Used	4x4s Used
1	15.1	2.1	7.19	20.1	15	3	2
2	14.4	2.1	6.86	22.0	15.5	3	2
3	14.3	2.1	6.81	21.2	15.5	3	2
4	13.8	2.1	6.57	22.1	15.5	3	2

Table 1.4 – Dilution Tunnel Gas Measurements and Sampling Data Summary

Run	Length of Test (min)	Average Dilution Tunnel Gas Measurements		
		Velocity (ft/sec)	Flow Rate (dscf/min)	Temperature (°F)
1	330	13.94	149.0	99.7
2	120	14.43	150.8	112.0
3	400	13.40	146.6	86.5
4	240	14.12	153.3	93.5

Table 1.5 - Heater Operation Data (Average Temperature Data)

Run	Beginning Surface Temperature Average ^a	Ending Surface Temperature Average ^a	Surface Delta T ^b
1	315.6	223.0	93
2	415.6	373.2	42
3	321.4	195.2	126
4	372.8	250.2	123

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

Table 1.6 – Pretest Configuration

Run	Combustion Air (in)	Fuel Added	Fuel Removed	Time (min)
1	Air Slide Open 16 mm	10.5 lbs at start; no addition; coal bed 3.5 lbs	0.0	76
2	Fully Open	14.0 lbs at start; no addition; coal bed 2.9 lbs	0.0	66
3	Air Slide Open 11 mm	10.2 lbs at start; no addition; coal bed 3.0 lbs	0.0	94
4	Air Slide Open 30 mm	11.2 lbs at start; 6.0 lbs added; coal bed 2.8 lbs	0.0	121

Table 1.7 – Run Data

Run	Average Dry Burn Rate (kg/hr)	Initial (Induced) Draft (H ₂ O)	Primary Air Setting (in)	Run Time (min)	Average Draft (H ₂ O)
1	1.04	0	Air Slide Open 16 mm	330	-0.024
2	2.68	0	Fully Open	120	-0.052
3	0.81	0	Air Slide Open 11 mm	400	-0.018
4	1.28	0	Air Slide Open 30 mm	240	-0.033

Table 1.8 – Test Configurations

Run	Five-Minute Startup	Combustion Air
1	<u>Bypass</u> : Closed. <u>Fuel Loading</u> : Completed by 1 minute 30 seconds. <u>Door</u> : Closed at 1 minute 30 seconds. <u>Primary Air</u> : Closed to test setting at 5 minutes. <u>Other</u> : N/A. <u>Secondary</u> : Fixed. <u>Tertiary</u> : N/A. <u>Fan</u> : On high.	Air Slide Open 16 mm
2	<u>Bypass</u> : Closed. <u>Fuel Loading</u> : Completed by 30 seconds. <u>Door</u> : Closed at 55 seconds. <u>Primary Air</u> : Fully open for duration of test. <u>Other</u> : N/A. <u>Secondary</u> : Fixed. <u>Tertiary</u> : N/A. <u>Fan</u> : On high.	Fully Open
3	<u>Bypass</u> : Closed. <u>Fuel Loading</u> : Completed by 40 seconds. <u>Door</u> : Closed at 1 minute. <u>Primary Air</u> : Closed to test setting at 5 minutes. <u>Other</u> : N/A. <u>Secondary</u> : Fixed. <u>Tertiary</u> : N/A. <u>Fan</u> : N/A.	Air Slide Open 11 mm
4	<u>Bypass</u> : Closed. <u>Fuel Loading</u> : Completed by 30 seconds. <u>Door</u> : Closed at 1 minute. <u>Primary Air</u> : Closed to test setting at 5 minutes. <u>Other</u> : N/A. <u>Secondary</u> : Fixed. <u>Tertiary</u> : N/A. <u>Fan</u> : On high.	Air Slide Open 30 mm

TEST RESULTS AND DISCUSSION

A total of five test runs were performed on the TL2.0 wood stove. Four test runs were conducted in the following categories and included in the weighted average emission level results: two in the 0.80 to 1.25 kg/hr dry category; one in the 1.25 to 1.90 kg/hr dry category; and one at maximum.

The weighted particulate emission rate was measured to be **2.6 g/hr**.

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