

Certification Test Report

Heatmor Wood-Fired Hydronic Heater Model: 200X

Prepared for: Heatmor
105 Industrial Park Ct. NE, P.O. Box 787
Warroad, MN 56763

Prepared by: OMNI-Test Laboratories, Inc.
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Test Period: 9/29/14 – 10/6/14

Report Date: December 2014

Report Number: 0275WB011E

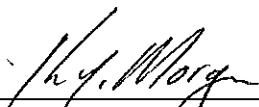
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AUTHORIZED SIGNATORIES

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



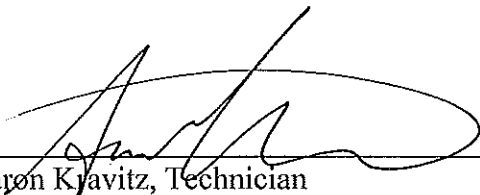
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Section 1

Introduction/Appliance Description/Photographs/Drawings

INTRODUCTION

Heatmor retained OMNI-Test Laboratories, Inc. (*OMNI*) to perform certification emissions testing on the 200X boiler using the EPA Method 28-WHH Test Standard. The 200X furnace meets EPA's WHH Program Phase II emissions level of 0.32 lbs/mmbtu heat output. The 200X furnace qualifies for year-round use.

Weighting	Emissions (lb/mmbtu output)
Heating Season	0.29
Year-Round Use	0.30

The testing was performed at *OMNI*'s testing facility in Portland, Oregon. The unit was received in good condition and logged in on September 22, 2014, then assigned and labeled with *OMNI* ID #1997 *OMNI* representatives Aaron Kravitz and Jeremy Clark conducted the certification testing and completed all testing by October 6, 2014.

The unit was conditioned by operating it at a Category II heat draw rate for over 10 hours. Flue gas temperature data was recorded in accordance with the method.

The testing method used is composed of three distinct aspects:

- **Dilution Tunnel:** Method 5G-3/ASTM E 2515-07.
- **Efficiency:** Uses entering and exiting water temperature differences along with measured flow rate to determine useful heat output.
- **Operation:** The appliance is brought to operating temperature before adding the test fuel charge, providing for a hot-to-hot test cycle with measurements taken under constant heat draw conditions within pre-determined ranges. There is no attempt to modulate heat demand to simulate an indoor thermostat cycling on and off in response to changes in the indoor environment.

Four test categories are used within the "Operation" scope:

- Category I: Heat Output 15% Or Less of Manufacturer's Rated Heat Output Capacity
- Category II: Heat Output 16 To 24% of Manufacturer's Rated Heat Output Capacity
- Category III: Heat Output 25 To 50% of Manufacturer's Rated Heat Output Capacity
- Category IV: Manufacturer's Rated Heat Output Capacity

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APPLIANCE DESCRIPTION

The 200X is a wood fired outdoor hydronic heater. It is designed to heat and circulate water in a closed loop, supplying energy to an existing system. Its heavy gauge stainless steel structure consists of a large, roughly rectangular firebox surrounded by a water jacket with an integrated heat exchanger. The unit is well insulated and protected by an outer sheet metal skin designed for outdoor installation.

Combustion air is regulated by a blower, and flue gasses are routed through the heat exchanger and exit through an 8" flue opening at the top of the unit. The 200X responds to heat demand by cycling the combustion blower on and off depending on water temperature. The temperature set point is user adjustable.

Other features of the 200X include:

- Overtemperature protection
- Atmospheric pressure vent for water circuit
- Firebox spacers to reduce fuel contact with firebox walls
- Bladder system to reduce water loss
- Large water-cooled firebox door
- Insulated outer door

The firebox of the 200X is approximately 25" deep, 31" wide, and 27" high. Firebox intrusions including spacer bars and air supply box shrouds reduce usable firebox volume considerably. This volume is 9.5 ft³. The dry weight of the unit is 2,752 lb and the approximate capacity of the water jacket is 260 gallons.

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Heatmor
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Heatmor
200X
Test Dates: 9/29/14 – 10/6/14



Model: 200X
Heatmor
105 Industrial Park Ct. NE, P.O. Box 787
Warroad, MN 56763

Heatmor 200X

Run 2 J Fuel



Run 2 J Newly Loaded Boiler



Run 3 J Fuel



Run 3 J Newly Loaded Boiler



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Heatmor 200X

Run 5J Fuel



Run 5 J Newly Loaded Boiler



Run 6 J Fuel



Run 6 J Newly Loaded Boiler



Model: 200X
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105 Industrial Park Ct. NE, P.O. Box 787
Warroad, MN 56763

Heatmor 200X

Run 7 J Fuel



Run 7 J Newly Loaded Boiler



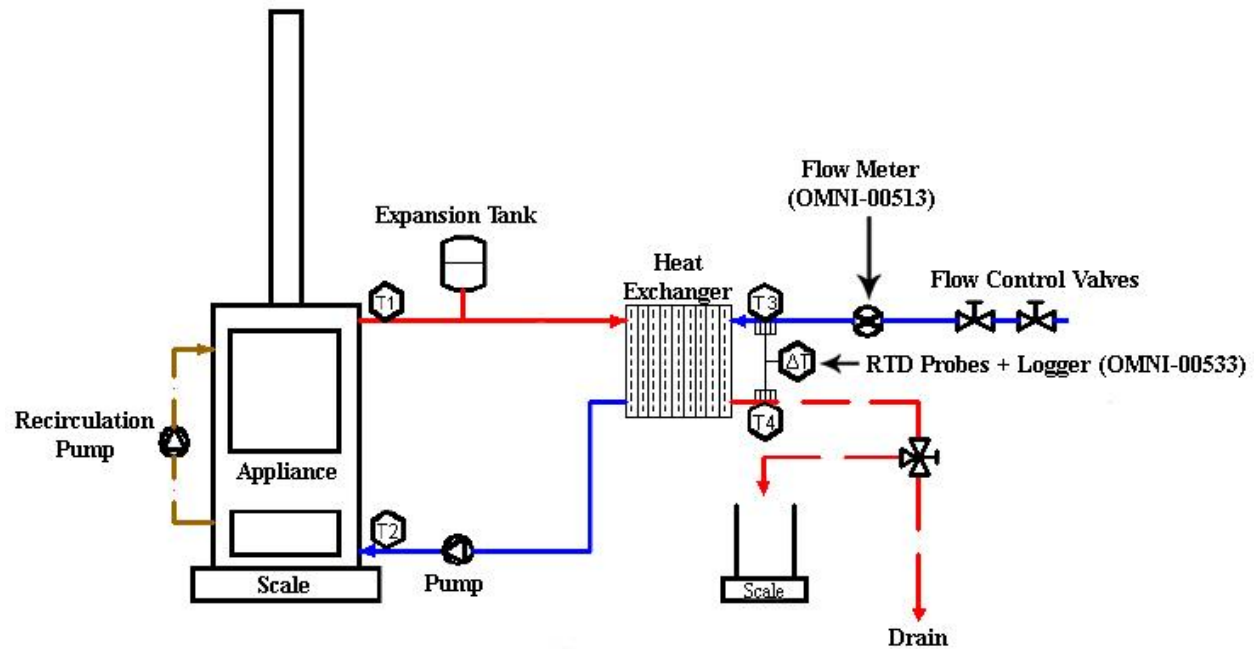
Run 8 J Fuel



Run 8 J Newly Loaded Boiler



Test Equipment Schematic



*Model: 200X
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Manufacturer Design Drawings

CONFIDENTIAL

Section 2

Quality Assurance/Quality Control

QUALITY ASSURANCE/QUALITY CONTROL

As a testing laboratory, *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. As a certification organization, *OMNI* follows ISO/IEC Guide 65, “General Requirements for Bodies Operating Product Certification Systems.”

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

- American National Standards Institute (ANSI) for certification of products to safety standards (Certification ID #0654).
- International Accreditation Service, Inc. (formerly ICBO ES) as a testing laboratory (TL-130).
- Standards Council of Canada (SCC) for certification of products to safety standards.
- 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 200X at Heatmor 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: 200X
Heatmor
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Sample Analysis

Analysis Worksheets

Tared Filter, Probe, and O-Ring Data

Hydronic Heating Appliances - Test Method 28 WHH Results

Manufacturer: Heatmor
 Model: 200X
 Tracking No.: 1997
 Project No.: 0275WB011E
 Run #: 2
 Date: 9/29/14

Equipment Numbers: 23, 131, 343

TRAIN 1

Sample Component	Reagent	Filter, Probe or Dish #	Weights		
			Final, mg	Tare, mg	Particulate, mg
A. Front filter catch	Filter	B225	119.8	113.2	6.6
B. Rear filter catch	Filter	B226	110.0	108.7	1.3
C. Probe catch*	Probe	OES 4	114144.7	114144.9	0.0
D. Filter seals catch*	Seals	R181	4102.3	4101.3	1.0

Total Particulate, mg:	8.9
------------------------	-----

TRAIN 2

Sample Component	Reagent	Filter, Probe or Dish #	Weights		
			Final, mg	Tare, mg	Particulate, mg
A. Front filter catch	Filter	B227/B230	235.3	228.2	7.1
B. Rear filter catch	Filter	B228	113.1	111.9	1.2
C. Probe catch*	Probe	6	115346.3	115346.8	0.0
D. Filter seals catch*	Seals	R182	3410.9	3410.0	0.9

Total Particulate, mg:	9.2
------------------------	-----

AMBIENT

Sample Component	Reagent	Filter # or Probe #	Weights		
			Final, mg	Tare, mg	Particulate, mg
A. Front filter catch*	Filter	B229	108.9	108.4	0.5

Total Particulate, mg:	0.5
------------------------	-----

*Any particulate catch that results in a negative number, is assumed to be zero

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:

Hydronic Heating Appliances - Test Method 28 WHH Results

Manufacturer: Heatmor
 Model: 200X
 Tracking No.: 1997
 Project No.: 0275WB011E
 Run #: 6
 Date: 10/2/14

Equipment Numbers: 23, 131, 343

TRAIN 1

Sample Component	Reagent	Filter, Probe or Dish #	Weights		
			Final, mg	Tare, mg	Particulate, mg
A. Front filter catch	Filter	B246, B251	232.1	222.1	10.0
B. Rear filter catch	Filter	B247, B252	228.2	225.6	2.6
C. Probe catch*	Probe	7	114982.1	114981.6	0.5
D. Filter seals catch*	Seals	R185	3557.5	3556.4	1.1

Total Particulate, mg:	14.2
------------------------	------

TRAIN 2

Sample Component	Reagent	Filter, Probe or Dish #	Weights		
			Final, mg	Tare, mg	Particulate, mg
A. Front filter catch	Filter	B248	118.3	108.5	9.8
B. Rear filter catch	Filter	B249	112.6	113.4	-0.8
C. Probe catch*	Probe	67	122965.0	122964.3	0.7
D. Filter seals catch*	Seals	R190	3544.1	3541.0	3.1

Total Particulate, mg:	12.8
------------------------	------

AMBIENT

Sample Component	Reagent	Filter # or Probe #	Weights		
			Final, mg	Tare, mg	Particulate, mg
A. Front filter catch*	Filter	B250	112.9	112.3	0.6

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

*Any particulate catch that results in a negative number, is assumed to be zero

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:

Hydronic Heating Appliances - Test Method 28 WHH Results

Manufacturer: Heatmor
 Model: 200X
 Tracking No.: 1997
 Project No.: 0275WB011E
 Run #: 7
 Date: 10/3/14

Equipment Numbers: 23, 131, 343

TRAIN 1

Sample Component	Reagent	Filter, Probe or Dish #	Weights		
			Final, mg	Tare, mg	Particulate, mg
A. Front filter catch	Filter	B253	128.7	112.4	16.3
B. Rear filter catch	Filter	B254	108.0	108.8	-0.8
C. Probe catch*	Probe	36	114877.4	114877.2	0.2
D. Filter seals catch*	Seals	R191	3374.8	3372.8	2.0

Total Particulate, mg:	17.7
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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	B255	126.4	113.4	13.0
B. Rear filter catch	Filter	B256	114.0	112.5	1.5
C. Probe catch*	Probe	59	122935.2	122935.0	0.2
D. Filter seals catch*	Seals	R192	3318.3	3316.9	1.4

Total Particulate, mg:	16.1
------------------------	------

AMBIENT

Sample Component	Reagent	Filter # or Probe #	Weights		
			Final, mg	Tare, mg	Particulate, mg
A. Front filter catch*	Filter	B257	109.5	108.0	1.5

Total Particulate, mg:	1.5
------------------------	-----

*Any particulate catch that results in a negative number, is assumed to be zero

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:

Hydronic Heating Appliances - Test Method 28 WHH Results

Manufacturer: Heatmor
 Model: 200X
 Tracking No.: 1997
 Project No.: 0275WB011E
 Run #: 8
 Date: 10/6/14

Equipment Numbers: 23, 131, 343

TRAIN 1

Sample Component	Reagent	Filter, Probe or Dish #	Weights		
			Final, mg	Tare, mg	Particulate, mg
A. Front filter catch	Filter	B258/B263	227.2	216.6	10.6
B. Rear filter catch	Filter	B259	113.9	112.4	1.5
C. Probe catch*	Probe	1	114732.7	114731.5	1.2
D. Filter seals catch*	Seals	R193	3460.0	3458.1	1.9

Total Particulate, mg:	15.2
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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	B260/B264	232.6	222.1	10.5
B. Rear filter catch	Filter	B261	110.3	108.6	1.7
C. Probe catch*	Probe	23	114077.2	114076.5	0.7
D. Filter seals catch*	Seals	R194	4116.9	4115.6	1.3

Total Particulate, mg:	14.2
------------------------	------

AMBIENT

Sample Component	Reagent	Filter # or Probe #	Weights		
			Final, mg	Tare, mg	Particulate, mg
A. Front filter catch*	Filter	B262	114.6	113.6	1.0

Total Particulate, mg:	1.0
------------------------	-----

*Any particulate catch that results in a negative number, is assumed to be zero

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:

Filter Train Analysis Worksheet

Client: Heatmor

Model: 200X

Project #: 0275WB011E Tracking #: 1997

Date: 9/29/14 Test Crew: AK, JC, SB Run #: 2

Sample Train #: A Train assembled by: A. Krawiec

Balance ID #: OMNI - 00023 Thermo/Hygro meter ID #: OMNI - 343

Audit weight ID #: OMNI - 00131 (Balance audit mfr. std: 500 ± 0.72 mg)

Train Part	Weighing Record						
	Date	Time	Weight (grams)	Audit (grams)	R/H %	Temp. (F)	Initials
Front Filter Lab/ ID #: <u>B225</u> Tare wt.: <u>6.1132</u> D/T in desiccators: <u>9/29 1430</u> Preliminary wt.: <u>.1201</u>	<u>10/1/14</u>	<u>0900</u>	<u>0.1199</u>	<u>.5000</u>	<u>15.2</u>	<u>72.6</u>	<u>AK</u>
	<u>10/2/14</u>	<u>1030</u>	<u>0.1199</u>	<u>.5001</u>	<u>18.9</u>	<u>73.0</u>	<u>AK</u>
Rear Filter Lab/ ID #: <u>B226</u> Tare wt.: <u>0.1087</u> D/T in desiccator: <u>9/29 1430</u> Preliminary wt.: <u>.1105</u>	<u>10/1/14</u>	<u>0900</u>	<u>0.1100</u>	<u>.5000</u>	<u>15.2</u>	<u>72.6</u>	<u>AK</u>
	<u>10/2/14</u>	<u>1030</u>	<u>0.1100</u>	<u>.5001</u>	<u>18.9</u>	<u>73.0</u>	<u>AK</u>
Probe Lab/ ID #: <u>OES 4</u> Tare wt.: <u>114.1449</u> Cleaned by: <u>AK</u> D/T in desiccator: <u>9/29 1430</u> Preliminary wt.: <u>114.1450</u>	<u>10/1/14</u>	<u>0900</u>	<u>114.1446</u>	<u>.5000</u>	<u>15.2</u>	<u>72.6</u>	<u>AK</u>
	<u>10/2/14</u>	<u>1030</u>	<u>114.1447</u>	<u>.5001</u>	<u>18.9</u>	<u>73.0</u>	<u>AK</u>
O-Rings (ASTM E2515 Only) Lab/ ID #: <u>R181</u> Tare wt.: <u>4.1013</u> D/T in desiccator: <u>9/29 1430</u> Preliminary wt.: <u>4.1028</u>	<u>10/1/14</u>	<u>0900</u>	<u>4.1025</u>	<u>.5000</u>	<u>15.2</u>	<u>72.6</u>	<u>AK</u>
	<u>10/2/14</u>	<u>1030</u>	<u>4.1023</u>	<u>.5001</u>	<u>18.9</u>	<u>73.0</u>	<u>AK</u>

Technician signature: [Signature] Date: 10/2/14

Filter Train Analysis Worksheet

Client: Heatmor

Model: 200X

Project #: 0275WB011E Tracking #: 1997

Date: 9/24/14 Test Crew: AK, JC, SB Run #: 2

Sample Train #: B Train assembled by: A. Krowitz

Balance ID #: OMNI - 00023 Thermo/Hygro meter ID #: OMNI - 343

Audit weight ID #: OMNI - 00131 (Balance audit mfr. std: 500 ± 0.72 mg)

Train Part	Weighing Record						
	Date	Time	Weight (grams)	Audit (grams)	R/H %	Temp. (F)	Initials
Front Filter Lab/ ID #: <u>B227/930</u> Tare wt.: <u>0.1140/1142</u> D/T in desiccators: <u>9/24 1430</u> Preliminary wt.: <u>.23853</u>	10/1/14	0906	0.2355	.5000	15.2	72.6	AK
	10/2/14	1030	0.2353	.5001	18.9	73.0	AK
Rear Filter Lab/ ID #: <u>B224</u> Tare wt.: <u>0.1119</u> D/T in desiccator: <u>9/24 1430</u> Preliminary wt.: <u>.1136</u>	10/1/14	0900	0.1132	.5000	15.2	72.6	AK
	10/2/14	1036	0.1131	.5001	18.9	73.0	AK
Probe Lab/ ID #: <u>6</u> Tare wt.: <u>115.3468</u> Cleaned by: <u>AK</u> D/T in desiccator: <u>9/24 1430</u> Preliminary wt.: <u>115.3468</u>	10/1/14	0906	115.3462	~~115.3462~~ .5000	15.2	72.6	AK
	10/2/14	1030	115.3463	.5001	18.9	73.0	AK
O-Rings (ASTM E2515 Only) Lab/ ID #: <u>R182</u> Tare wt.: <u>3.4100</u> D/T in desiccator: <u>9/24 1430</u> Preliminary wt.: <u>3.4114</u>	10/1/14	0900	3.4111	~~3.4111~~ .5000	15.2	72.6	AK
	10/2/14	1030	3.4109	.5001	18.9	73.0	AK

Technician signature: AK Date: 10/2/14

Filter change @ 30-33 min

Filter Train Analysis Worksheet

Client: Heatmor

Model: 200X

Project #: 0275WB011E Tracking #: 1997

Date: 10/2/14

Test Crew: AK, JC, SB

Run #: 6

Sample Train #: A

Train assembled by: A Krawitz

Balance ID #: OMNI - 00023

Thermo/Hygro meter ID #: OMNI - 343

Audit weight ID #: OMNI - 00131

(Balance audit mfr. std: 500 ± 0.72 mg)

Train Part	Weighing Record						
	Date	Time	Weight (grams)	Audit (grams)	R/H %	Temp. (F)	Initials
Front Filter Lab/ ID #: <u>B246, B251</u> Tare wt.: <u>0.1132, 0.1089</u> D/T in desiccators: <u>10/3/14 0830</u> Preliminary wt.: <u>N/A</u>	<u>10/6/14</u>	<u>0830</u>	<u>0.2301</u>	<u>0.5001</u>	<u>15.0</u>	<u>77.0</u>	<u>A</u>
	<u>10/7/14</u>	<u>0900</u>	<u>0.2321</u>	<u>0.5001</u>	<u>18.8</u>	<u>77.0</u>	<u>A</u>
Rear Filter Lab/ ID #: <u>B247, B252</u> Tare wt.: <u>0.1127, 0.1124</u> D/T in desiccator: <u>10/3/14 0830</u> Preliminary wt.: <u>N/A</u>	<u>10/6/14</u>	<u>0830</u>	<u>0.2284</u>	<u>0.5001</u>	<u>15.0</u>	<u>77.0</u>	<u>A</u>
	<u>10/7/14</u>	<u>0900</u>	<u>0.2284</u>	<u>0.5001</u>	<u>18.8</u>	<u>77.0</u>	<u>A</u>
Probe Lab/ ID #: <u>7</u> Tare wt.: <u>114.9816</u> Cleaned by: <u>AK</u> D/T in desiccator: <u>10/2/14 0830</u> Preliminary wt.: <u>N/A</u>	<u>10/6/14</u>	<u>0830</u>	<u>114.9820</u>	<u>0.5001</u>	<u>15.0</u>	<u>77.0</u>	<u>A</u>
	<u>10/7/14</u>	<u>0900</u>	<u>114.9821</u>	<u>0.5001</u>	<u>18.8</u>	<u>77.0</u>	<u>A</u>
O-Rings (ASTM E2515 Only) Lab/ ID #: <u>R185</u> Tare wt.: <u>3.5564</u> D/T in desiccator: <u>10/3/14 0830</u> Preliminary wt.: <u>N/A</u>	<u>10/6/14</u>	<u>0830</u>	<u>3.5582</u>	<u>0.5001</u>	<u>15.0</u>	<u>77.0</u>	<u>A</u>
	<u>10/7/14</u>	<u>0900</u>	<u>3.5577</u>	<u>0.5001</u>	<u>18.8</u>	<u>77.0</u>	<u>A</u>
	<u>10/8/14</u>	<u>1030</u>	<u>3.5575</u>	<u>0.5001</u>	<u>16.4</u>	<u>75.7</u>	<u>A</u>

Technician signature: AK

Date: 10/8/14

Filter Train Analysis Worksheet

Client: Heatmor

Model: 200X

Project #: 0275WB011E Tracking #: 1997

Date: 10/2/14

Test Crew: AK, JC, SB

Run #: 6

Sample Train #: B

Train assembled by: A. Krawitz

Balance ID #: OMNI - 00023

Thermo/Hygro meter ID #: OMNI - 343

Audit weight ID #: OMNI - 00131

(Balance audit mfr. std: 500 ± 0.72 mg)

Train Part	Weighing Record						
	Date	Time	Weight (grams)	Audit (grams)	R/H %	Temp. (F)	Initials
Front Filter Lab/ ID #: <u>B248</u> Tare wt.: <u>0.1085</u> D/T in desiccators: <u>10/3/14 0830</u> Preliminary wt.: <u>N/A</u>	<u>10/6/14</u>	<u>0830</u>	<u>0.1182</u>	<u>0.5001</u>	<u>15.0</u>	<u>77.0</u>	<u>AK</u>
	<u>10/7/14</u>	<u>0900</u>	<u>0.1183</u>	<u>0.5001</u>	<u>15.8</u>	<u>77.0</u>	<u>AK</u>
Rear Filter Lab/ ID #: <u>B249</u> Tare wt.: <u>0.1134</u> D/T in desiccator: <u>10/3/14 0830</u> Preliminary wt.: <u>N/A</u>	<u>10/6/14</u>	<u>0830</u>	<u>0.1128</u>	<u>0.5001</u>	<u>15.0</u>	<u>77.0</u>	<u>AK</u>
	<u>10/7/14</u>	<u>0900</u>	<u>0.1126</u>	<u>0.5001</u>	<u>15.8</u>	<u>77.0</u>	<u>AK</u>
Probe Lab/ ID #: <u>122.9643</u> Tare wt.: <u>67</u> Cleaned by: <u>AK</u> D/T in desiccator: <u>10/3/14 0830</u> Preliminary wt.: <u>N/A</u>	<u>10/6/14</u>	<u>0830</u>	<u>122.9650</u>	<u>0.5001</u>	<u>15.0</u>	<u>77.0</u>	<u>AK</u>
	<u>10/7/14</u>	<u>0900</u>	<u>122.9650</u>	<u>0.5001</u>	<u>15.8</u>	<u>77.0</u>	<u>AK</u>
O-Rings (ASTM E2515 Only) Lab/ ID #: <u>R190</u> Tare wt.: <u>3.5410</u> D/T in desiccator: <u>10/3/14 0830</u> Preliminary wt.: <u>N/A</u>	<u>10/6/14</u>	<u>0830</u>	<u>3.5450</u>	<u>0.5001</u>	<u>15.0</u>	<u>77.0</u>	<u>AK</u>
	<u>10/7/14</u>	<u>0900</u>	<u>3.5442</u>	<u>0.5001</u>	<u>15.8</u>	<u>77.0</u>	<u>AK</u>
	<u>10/8/14</u>	<u>1030</u>	<u>3.5441</u>	<u>0.5001</u>	<u>16.4</u>	<u>75.7</u>	<u>AK</u>

Technician signature: AK

Date: 10/8/14

Filter Train Analysis Worksheet

Client: Heatmor

Model: 200X

Project #: 0275WB011E Tracking #: 1997

Date: 10/3/14

Test Crew: AK, JC, SB

Run #: 7

Sample Train #: A

Train assembled by: A. Knowlton

Balance ID #: OMNI - 00023

Thermo/Hygro meter ID #: OMNI - 343

Audit weight ID #: OMNI - 00131

(Balance audit mfr. std: 500 ± 0.72 mg)

Train Part	Weighing Record						
	Date	Time	Weight (grams)	Audit (grams)	R/H %	Temp. (F)	Initials
Front Filter Lab/ ID #: <u>B253</u> Tare wt.: <u>0.1124</u> D/T in desiccators: <u>10/3/14 0830</u> Preliminary wt.: <u>-</u>	<u>10/6/14</u>	<u>0830</u>	<u>0.1284</u>	<u>0.5001</u>	<u>15.0</u>	<u>77.0</u>	<u>AK</u>
	<u>10/7/14</u>	<u>0900</u>	<u>0.1287</u>	<u>0.5001</u>	<u>18.8</u>	<u>77.0</u>	<u>AK</u>
Rear Filter Lab/ ID #: <u>B254</u> Tare wt.: <u>0.1088</u> D/T in desiccator: <u>10/3/14</u> Preliminary wt.: <u>-</u>	<u>10/6/14</u>	<u>0830</u>	<u>0.1082</u>	<u>0.5001</u>	<u>15.0</u>	<u>77.0</u>	<u>AK</u>
	<u>10/7/14</u>	<u>0900</u>	<u>0.1080</u>	<u>0.5001</u>	<u>18.8</u>	<u>77.0</u>	<u>AK</u>
Probe Lab/ ID #: <u>36</u> Tare wt.: <u>114.8772</u> Cleaned by: <u>AK</u> D/T in desiccator: <u>10/3/14</u> Preliminary wt.: <u>-</u>	<u>10/6/14</u>	<u>0830</u>	<u>114.8775</u>	<u>0.5001</u>	<u>15.0</u>	<u>77.0</u>	<u>AK</u>
	<u>10/7/14</u>	<u>0900</u>	<u>114.8774</u>	<u>0.5001</u>	<u>18.8</u>	<u>77.0</u>	<u>AK</u>
O-Rings (ASTM E2515 Only) Lab/ ID #: <u>R191</u> Tare wt.: <u>3.3728</u> D/T in desiccator: <u>10/3/14</u> Preliminary wt.: <u>-</u>	<u>10/6/14</u>	<u>0830</u>	<u>3.3748</u>	<u>0.5001</u>	<u>15.0</u>	<u>77.0</u>	<u>AK</u>
	<u>10/7/14</u>	<u>0900</u>	<u>3.3748</u>	<u>0.5001</u>	<u>18.8</u>	<u>77.0</u>	<u>AK</u>

Technician signature: [Signature]

Date: 10/7/14

Filter Train Analysis Worksheet

Client: Heatmor

Model: 200X

Project #: 0275WB011E Tracking #: 1997

Date: 10/3/14

Test Crew: AK, JC, SB

Run #: 7

Sample Train #: B

Train assembled by: A. Knowlton

Balance ID #: OMNI - 00023

Thermo/Hygro meter ID #: OMNI - 343

Audit weight ID #: OMNI - 00131

(Balance audit mfr. std: 500 ± 0.72 mg)

Train Part	Weighing Record						
	Date	Time	Weight (grams)	Audit (grams)	R/H %	Temp. (F)	Initials
Front Filter Lab/ ID #: <u>B256</u> Tare wt.: <u>0.1134</u> D/T in desiccators: <u>10/3/14</u> Preliminary wt.: <u>-</u>	<u>10/6/14</u>	<u>0830</u>	<u>0.1266</u>	<u>0.5001</u>	<u>15.0</u>	<u>77.0</u>	<u>AK</u>
	<u>10/7/14</u>	<u>0900</u>	<u>0.1264</u>	<u>0.5001</u>	<u>18.8</u>	<u>77.0</u>	<u>AK</u>
Rear Filter Lab/ ID #: <u>B256</u> Tare wt.: <u>0.1125</u> D/T in desiccator: <u>10/3/14</u> Preliminary wt.: <u>-</u>	<u>10/6/14</u>	<u>0830</u>	<u>0.1141</u>	<u>0.5001</u>	<u>15.0</u>	<u>77.0</u>	<u>AK</u>
	<u>10/7/14</u>	<u>0900</u>	<u>0.1140</u>	<u>0.5001</u>	<u>18.8</u>	<u>77.0</u>	<u>AK</u>
Probe Lab/ ID #: <u>59</u> Tare wt.: <u>122.9350</u> Cleaned by: <u>AK</u> D/T in desiccator: <u>10/3/14</u> Preliminary wt.: <u>-</u>	<u>10/6/14</u>	<u>0830</u>	<u>122.9352</u>	<u>0.5001</u>	<u>15.0</u>	<u>77.0</u>	<u>AK</u>
	<u>10/7/14</u>	<u>0900</u>	<u>122.9352</u>	<u>0.5001</u>	<u>18.8</u>	<u>77.0</u>	<u>AK</u>
O-Rings (ASTM E2515 Only) Lab/ ID #: <u>R192</u> Tare wt.: <u>3.3169</u> D/T in desiccator: <u>10/3/14</u> Preliminary wt.: <u>-</u>	<u>10/6/14</u>	<u>0830</u>	<u>3.3182</u>	<u>0.5001</u>	<u>15.0</u>	<u>77.0</u>	<u>AK</u>
	<u>10/7/14</u>	<u>0900</u>	<u>3.3183</u>	<u>0.5001</u>	<u>18.8</u>	<u>77.0</u>	<u>AK</u>

Technician signature: [Signature]

Date: 10/7/14

Filter Train Analysis Worksheet

Client: Heatmor

Model: 200X

Project #: 0275WB011E Tracking #: 1997

Date: 10/6/14

Test Crew: AK, JC, SB

Run #: 8

Sample Train #: A

Train assembled by: A. Krawitz

Balance ID #: OMNI - 00023

Thermo/Hygro meter ID #: OMNI - 343

Audit weight ID #: OMNI - 00131

(Balance audit mfr. std: 500 ± 0.72 mg)

Train Part	Weighing Record						
	Date	Time	Weight (grams)	Audit (grams)	R/H %	Temp. (F)	Initials
Front Filter Lab/ ID #: <u>B258/B283</u> Tare wt.: <u>0.1123 / 0.1013</u> D/T in desiccators: <u>10/6/14 1906</u> Preliminary wt.: <u>-</u>	10/8/14	0830	0.2273	0.5001	17.7	77.1	A
	10/10/14	0200	0.2272	0.5001	18.6	76.1	A
Rear Filter Lab/ ID #: <u>B259</u> Tare wt.: <u>0.1124</u> D/T in desiccator: <u>10/6/14 1906</u> Preliminary wt.: <u>-</u>	10/8/14	0830	0.1140	0.5001	17.7	77.1	A
	10/10/14	0200	0.1139	0.5001	18.6	76.1	A
Probe Lab/ ID #: <u>01</u> Tare wt.: <u>114.7315</u> Cleaned by: <u>AK</u> D/T in desiccator: <u>10/6/14 1906</u> Preliminary wt.: <u>-</u>	10/8/14	0830	114.7328	0.5001	17.7	77.1	A
	10/10/14	0200	114.7327	0.5001	18.6	76.1	A
O-Rings (ASTM E2515 Only) Lab/ ID #: <u>R193</u> Tare wt.: <u>3.4581</u> D/T in desiccator: <u>10/6/14 1906</u> Preliminary wt.: <u>-</u>	10/8/14	0830	3.4601	0.5001	17.7	77.1	A
	10/10/14	0200	3.4600	0.5001	18.6	76.1	A

Technician signature: [Signature]

Date: 10/14/14

Filter Train Analysis Worksheet

Client: Heatmor

Model: 200X

Project #: 0275WB011E Tracking #: 1997

Date: 10/6/14

Test Crew: AK, JC, SB

Run #: 8

Sample Train #: B

Train assembled by: A. Krawitz

Balance ID #: OMNI - 00023

Thermo/Hygro meter ID #: OMNI - 343

Audit weight ID #: OMNI - 00131

(Balance audit mfr. std: 500 ± 0.72 mg)

Train Part	Weighing Record						
	Date	Time	Weight (grams)	Audit (grams)	R/H %	Temp. (F)	Initials
Front Filter Lab/ ID #: <u>B260/B264</u> Tare wt.: <u>0.1127/1089</u> D/T in desiccators: <u>10/6/14 1900</u> Preliminary wt.: <u>—</u>	10/8/14	0830	0.2330	0.5001	17.7	77.1	Ah
	10/10/14	0200	0.2325	0.5001	18.6	76.1	Ah
	10/11/14	1045	0.2326	0.5001	14.8	74.9	Ah
Rear Filter Lab/ ID #: <u>B261</u> Tare wt.: <u>0.1086</u> D/T in desiccator: <u>10/6/14 1900</u> Preliminary wt.: <u>—</u>	10/8/14	0830	0.1005	0.5001	17.7	77.1	Ah
	10/10/14	0200	0.1103	0.5001	18.6	76.1	Ah
Probe Lab/ ID #: <u>23</u> Tare wt.: <u>114.0765</u> Cleaned by: <u>Ah</u> D/T in desiccator: <u>10/6/14 1900</u> Preliminary wt.: <u>—</u>	10/8/14	0830	114.0772	0.5001	17.7	77.1	Ah
	10/10/14	0200	114.0772	0.5001	18.6	76.1	Ah
O-Rings (ASTM E2515 Only) Lab/ ID #: <u>R194</u> Tare wt.: <u>4.1156</u> D/T in desiccator: <u>10/6/14 1900</u> Preliminary wt.: <u>—</u>	10/8/14	0830	4.1171	0.5001	17.7	77.1	Ah
	10/10/14	0200	4.1169	0.5001	18.6	76.1	Ah

Technician signature: Ah

Date: 10/11/14

FILTER TARES

Date Placed in Desiccator: 8/13/14

Technician: J. Clark

Balance ID # OMNI-00023

Thermo/Hygro meter ID #: OMNI-00343

Audit Weight ID # OMNI-00131

(Balance audit mfr. Std.: 500 ± 0.72)

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Dried per Method 5: 2 hours in oven, 2 hours in desiccator

Filter Size/ID#	Date: 8/14/14 Time: 14:55 RH%: 1.9 T (F): 73.5 Initials: SC	Date: 9/26/14 Time: 1015 RH%: 16.7 T (F): 76.4 Initials: A	Date: Time: RH%: T (F): Initials:	Date: Time: RH%: T (F): Initials:	Manufacturer	Appliance	Project No.	Run No.
102 (4) 110 55								
B211	0.1134				~~XXXXXXXXXXXXXXXXXXXX~~			
B 212	0.1078				↓	↓	↓	9a
B 213	0.1139				↓	↓	↓	9b
B 214	0.1132				↓	↓	↓	9b
B 215	0.1072				~~XXXXXXXXXXXXXXXXXXXX~~			
B 216	0.1132				↓	↓	↓	10b
B 217	0.1132				↓	↓	↓	10b
B 218	0.1080	0.1081			Hestner	200x	0275WB011E	1
B 219	0.1117	0.1118			↓	↓	↓	
B 220	0.1126	0.1126			↓	↓	↓	
B 221	0.1085	0.1097			↓	↓	↓	
B 222	0.1119	0.1120			↓	↓	↓	
B 223	0.1128	0.1129			↓	↓	↓	
B 224	0.1089	0.1089			↓	↓	↓	

Final Technician signature: [Signature]

Date: 8/14/14

9/26/14

FILTER TARES

Date Placed in Desiccator: 9/25/14

Technician: A. Krawitz

Balance ID # 23

Thermo/Hygro meter ID #: 343

Audit Weight ID # 131

(Balance audit mfr. Std.: 500 ± 0.72)

2-17 of 2-58

Filter Size/ID#	Date: 9/26/14 Time: 1015 RH%: 16.7 T (F): 76.4 Initials: A	Date: Time: RH%: T (F): Initials:	Date: Time: RH%: T (F): Initials:	Date: Time: RH%: T (F): Initials:	Manufacturer	Appliance	Project No.	Run No.
102 (4) 110 55								
B225	0.1132				Heater	200X	0275WBOLLE	2
B226	0.1087				↓	↓	↓	↓
B227	0.1140				↓	↓	↓	↓
B228	0.1119				↓	↓	↓	↓
B229	0.1084				↓	↓	↓	↓
B230	0.1142				↓	↓	↓	↓
B231	0.1119				↓	↓	↓	3
B232	0.1081				↓	↓	↓	↓
B233	0.1134				↓	↓	↓	↓
B234	0.1117				↓	↓	↓	↓
B235	0.1075				↓	↓	↓	↓
B236	0.1086				↓	↓	↓	4
B237	0.1128				↓	↓	↓	↓
B238	0.1126				↓	↓	↓	↓

Final Technician signature: *A. Krawitz*

Date: 9/26/14

FILTER TARES

Date Placed in Desiccator: 9/25/14 Technician: A. Kowitz Balance ID # 23

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

2-18 of 2-58

Filter Size/ID#	Date: 9/26/14 Time: 1015 RH%: 6.7 T (F): 76.4 Initials: A	Date: Time: RH%: T (F): Initials:	Date: Time: RH%: T (F): Initials:	Date: Time: RH%: T (F): Initials:	Manufacturer	Appliance	Project No.	Run No.
102 47 110 55								
B239	0.1084				Heatmor	200x	0275W8011E	4
B240	0.1132				↓	↓	↓	↓
B241	0.1121				↓	↓	↓	5
B242	0.1082				↓	↓	↓	↓
B243	0.1132				↓	↓	↓	↓
B244	0.1117				↓	↓	↓	↓
B245	0.1084				↓	↓	↓	↓
B246	0.1132				↓	↓	↓	6
B247	0.1127				↓	↓	↓	↓
B248	0.1085				↓	↓	↓	↓
B249	0.1134				↓	↓	↓	↓
B250	0.1123				↓	↓	↓	↓
B251	0.1089				↓	↓	↓	6
B252	0.1129				↓	↓	↓	↓

Final Technician signature: A. Kowitz

Date: 9/26/14

FILTER TARES

Date Placed in Desiccator: 9/25/14 Technician: A. Krawitz Balance ID # 23

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

2-19 of 2-58

Filter Size/ID#	Date: 9/26/14 Time: 10:15 RH%: 6.7 T (F): 76.4 Initials: A	Date: Time: RH%: T (F): Initials:	Date: Time: RH%: T (F): Initials:	Date: Time: RH%: T (F): Initials:	Manufacturer	Appliance	Project No.	Run No.
102 47								
110 55								
B253	0.1124				Heatmor	200X	02754BOLLE	7
B254	0.1088				↓	↓	↓	↓
B255	0.1134				↓	↓	↓	↓
B256	0.1125				↓	↓	↓	↓
B257	0.1080				↓	↓	↓	↓
B258	0.1123				↓	↓	↓	8
B259	0.1124				↓	↓	↓	↓
B260	0.1127				↓	↓	↓	↓
B261	0.1086				↓	↓	↓	↓
B262	0.1136				↓	↓	↓	↓
B263	0.1043				↓	↓	↓	↓
B264	0.1084				↓	↓	↓	↓
B265	0.1145				↓	↓	↓	↓
B266	0.1135							

Final Technician signature: A. Krawitz

Date: 9/26/14

PROBE TARES

Date Placed in Desiccator: 8/8/14

Technician: A. Kravitz

Balance ID # 23

Thermo/Hygro meter ID #: 343

Audit Weight ID # 131

(Balance audit mfr. Std.: 500 ± 0.72)

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Probe Size/ID#	Date: 8/12/14 Time: 1400 RH%: 14.7 T (F): 73.5 Initials: A	Date: 8/27 Time: 1600 RH%: 24.1 T (F): 73.4 Initials: A	Date: 8/28 Time: 0800 RH%: 17.5 T (F): 76.6 Initials: A	Date: Time: RH%: T (F): Initials:	Manufacturer	Appliance	Project No.	Run No.
47								
05 4	114.1451	114.1447	114.1449		Heatmor	200X	0275WB01E	2
6	115.3470	115.3468	-		↓	↓	↓	↓
8	115.5947	115.5941	115.5943		~~FRS~~	~~FRS~~	~~0275WB01E~~	~~3~~
11	114.1818	114.1817	-		~~FRS~~	~~FRS~~	~~0275WB01E~~	~~3~~
12	114.2811	114.2809	-		Heatmor	200X	0275WB01E	3
17	114.5609	114.5607	-		↓	↓	↓	↓
28	114.7457	114.7455	-		~~FRS~~	~~FRS~~	~~0275WB01E~~	~~3~~
30	114.3240	114.3232	114.3234		~~FRS~~	~~FRS~~	~~0275WB01E~~	~~3~~
58	121.9627	121.9620	121.9621		~~FRS~~	~~FRS~~	~~0275WB01E~~	~~3~~
59	122.9353	122.9348	122.9350		Heatmor	200X	0275WB01E	7
60	121.8523	121.8521	-		~~FRS~~	~~FRS~~	~~0275WB01E~~	~~3~~
62	123.0290	123.0288	-		Heatmor	200X	0275WB01E	5
63	121.6017	121.6009	121.6011		↓	↓	↓	↓
65	122.1935	122.1929	122.1931		~~FRS~~	~~FRS~~	~~0275WB01E~~	~~3~~

Final Technician signature: [Signature]

Date: 8/29/14

(P. 6)

PROBE TARES

Date Placed in Desiccator: 8/8/14

Technician: A. Krawitz

Balance ID # 23

Thermo/Hygro meter ID #: 343

Audit Weight ID # 131

(Balance audit mfr. Std.: 500 ± 0.72)

2-21 of 2-58

Probe Size/ID#	Date: 8/12/14 Time: 1400 RH%: 14.7 T (F): 73.5 Initials: A	Date: 8/13/14 Time: 0400 RH%: T (F): Initials: A	Date: 8/27/14 Time: 1600 RH%: 24.1 T (F): 74.3 Initials: A	Date: Time: RH%: T (F): Initials:	Manufacturer	Appliance	Project No.	Run No.
47								
2	115.0207	115.0206			~~FPT~~	~~2500~~	~~2478~~	~~32~~
0Es 5	113.6956	113.6955			↓	↓	↓	36
9	115.6913	115.6913			~~FPT~~	~~2500~~	~~2478~~	~~32~~
14	114.5420	114.5420			↓	↓	↓	46
16	114.2665	114.2663			~~FPT~~	~~2500~~	~~2478~~	~~32~~
20	114.2566	114.2565			↓	↓	↓	56
29	114.2794	114.2798	114.2796		Heatmor	200X	0275WB011E	1
32	114.7412	114.7412			~~Heatmor~~	~~200X~~	~~0275WB011E~~	~~7~~
64	122.8515	122.8515			~~FPT~~	~~2500~~	~~2478~~	~~32~~
36	114.8779	114.8774	114.8772		Heatmor	200X	0275WB011E	7
53	122.9284	122.9284			~~Heatmor~~	~~200X~~	~~0275WB011E~~	~~7~~
54	122.8257	122.8255			~~FPT~~	~~2500~~	~~2478~~	~~32~~
55	123.2318	123.2319			~~FPT~~	~~2500~~	~~2478~~	~~32~~
56	123.0891	123.0891			~~FPT~~	~~2500~~	~~2478~~	~~32~~

Final Technician signature: A. Krawitz

Date: 8/27/14

(0.5)

PROBE TARES

Date Placed in Desiccator: 9/22/14

Technician: A. Krasite

Balance ID # 23

Thermo/Hygro meter ID #: 343

Audit Weight ID # 131

(Balance audit mfr. Std.: 500 ± 0.72)

2-22 of 2-58

Probe Size/ID#	Date: 9/25/14 Time: 0900 RH%: 18.9 T (F): 74.3 Initials: A	Date: 9/26/14 Time: 1006 RH%: 11.4 T (F): 76.1 Initials: A	Date: 10/2/14 Time: 1636 RH%: 13.3 T (F): 73.0 Initials: A	Date: 10/2/14 Time: 1630 RH%: 14.0 T (F): 74.1 Initials: A	Manufacturer	Appliance	Project No.	Run No.
47								
01	114.7328	114.7323	114.7314	114.7315	Heatmor	200x	0275WB01E	8
7	114.9817	114.9816	-	-	Heatmor	200x	0275WB01E	6
23	114.0771	114.0767	114.0765	-	↓	↓	↓	8
24	114.1256	114.1251	114.1249	-				
25	114.2982	114.2980	-	-	Heatmor	200x	0275WB01E	4
27	114.2881	114.2872	114.2872	-				
32	114.7406	114.7404	-	-	Heatmor	200x	0275WB01E	4
35	114.3313	114.3308	114.3303	114.3305	Heatmor	200x	0275WB01E	1
38	114.1525	114.1521	114.1514	-				
53	122.9279	122.9275	122.9268	122.9270				
66	123.1650	123.1646	123.1639	123.1641				
67	122.9644	122.9643	-	-	Heatmor	200x	0275WB01E	6
68	122.4403	122.4395	122.4393	-				
69	123.0816	123.0809	123.0804	123.0805	↓	↓	↓	1

Final Technician signature: A. Krasite

Date: 10/2/14

O-RING TARES

Date Placed in Desiccator: 3/28/14

Technician: A. Krawitz

Balance ID # 23

Thermo/Hygro meter ID #: 343

Audit Weight ID # 131

(Balance audit mfr. Std.: 500 ± 0.72)

2-23 of 2-58

O-Ring Size/ID# (47)	Date: 7/22 Time: 1000 RH%: 4.4 T (F): 73.7 Initials: A	Date: 7/23 Time: 1100 RH%: 11.9 T (F): 76.1 Initials: A	Date: Time: RH%: T (F): Initials:	Date: Time: RH%: T (F): Initials:	Manufacturer	Appliance	Project No.	Run No.
R116	3.4166	3.4165			~~Heatmiser~~	~~200X~~	~~0275WROLIE~~	~~1~~
R120	3.3618	3.3619			↓	↓	↓	↓
R171	3.3402	3.3403			↓	↓	↓	2
R172	3.3555	3.3555			↓	↓	↓	↓
R173	3.3160	3.3161			↓	↓	↓	3
R174	3.3326	3.3327			↓	↓	↓	↓
R175	3.4227	3.4227			↓	↓	↓	4
R176	3.3254	3.3256			↓	↓	↓	↓
R177	3.5395	3.5397			↓	↓	↓	5
R178	*3.40750	4.0752*			↓	↓	↓	↓
R179	3.5571	3.5572			Heatmiser	200X	0275WROLIE	1
R180	3.3557	3.3559			↓	↓	↓	↓
R181	4.1011*	4.1013			↓	↓	↓	2
R182	3.4098	3.4100			↓	↓	↓	↓

Final Technician signature: A. Krawitz

Date: 7/13/14

41

O-RING TARES

Date Placed in Desiccator: 9/22/14

Technician: A. Kravitz

Balance ID # 23

Thermo/Hygro meter ID #: 343

Audit Weight ID # 131

(Balance audit mfr. Std.: 500 ± 0.72)

2-24 of 2-58

O-Ring Size/ID# (47)	Date: 9/25 Time: 0900 RH%: 18.9 T (F): 74.1 Initials: A	Date: 9/25 Time: 1000 RH%: 14.2 T (F): 74.8 Initials: A	Date: 10/2 Time: 1036 RH%: 13.3 T (F): 73.0 Initials: A	Date: 10/2 Time: 1630 RH%: 14.0 T (F): 74.1 Initials: A	Manufacturer	Appliance	Project No.	Run No.
R183	3.4242	3.4244	—	—	Heatmor	200X	0275WBONE	3
R184	3.3259	3.3260	—	—	↓	↓	↓	↓
R185	3.5562	3.5572	3.5562	3.5564	↓	↓	↓	6
R186	4.8927	4.8928	—	—	Heatmor	200X	0275WBONE	4
R187	4.1152	4.1151	—	—	↓	↓	↓	↓
R188	3.2766	3.2768	—	—	↓	↓	↓	5
R189	3.2966	3.2968	—	—	↓	↓	↓	↓
R190	3.5408	3.5413	3.5408	3.5410	↓	↓	↓	6
R191	3.3727	3.3728	—	—	↓	↓	↓	7
R192	3.3168	3.3169	—	—	↓	↓	↓	↓
R193	3.4579	3.4524 ⁴ R1	—	—	↓	↓	↓	8
R194	4.1155	4.1158	4.1154	4.1156	↓	↓	↓	↓
R195	3.5378	3.5381	3.5376	3.5378	~~Control 1410~~	~~2150~~	~~0117WDOSEL~~	~~↓~~
R196	3.3500	3.3503	3.3496	3.3498	~~↓~~	~~↓~~	~~↓~~	~~↓~~

Final Technician signature: A. Kravitz

Date: 10/2/14

Calibrations

ID #	Equipment Name/Description	Attachment Type
1	GAS METER, REFERENCE STD - Rockwell International	Calibration Certificate
23	Balance, Analytical - Mettler Instrument	Calibration Certificate
131	Weight Standard, 500 mg - Ohaus	Calibration Certificate
132	Weight Standard, 10 lb. - WeightMaker	Calibration Log
209	Barometer - Princo	Manual Cover
296-T55	DeWalt 16' Tape Measure	Calibration Log
340	Moisture Meter - Delmhorst	None*
343	Hygrometer/Thermometer, Digital - Omega	Calibration Log
353	Scale, Platform - MTW	Calibration Certificate
356	Scale, Pro-Dec (5000 lbs.) - Avery Weigh-Tronix	None*
410	Microtector	Manual Cover
419	Infrared gas analyzer	None*
428A	Sampling Box, Automated Emissions - Apex XC-60	Calibration Log
428B	Sampling Box, Automated Emissions - Apex XC-60	Calibration Log
431	Delmhorst wood moisture calibrator	Calibration Log
513	Omega Low Flow Magmeter	Calibration Log
533	DaqPro 5300 Data Logger	Calibration Certificate
559	Vaneometer, Air Vel. Meter - Dwyer	Mfgr's Calibration Statement

*Calibrations for these instruments are checked prior to each run. See handwritten data sheets
“Supplemental Data EPA 5G/5H” and “OWHH Fuel Data.”

CERTIFICATE OF CALIBRATION

CUSTOMER:	OMNI TEST LABS INC. PORTLAND OR	CALIBRATION DATE:	10/23/14
PO NUMBER:	OTL-14-049	CALIBRATION DUE:	10/23/15
INST. MANUFACTURER:	ROCKWELL	PROCEDURE:	NAVAIR 17-20MG-02
INST. DESCRIPTION:	P.D. METER	CALIBRATION FLUID:	AIR @ 14.7 PSIA 70 F
MODEL NUMBER:	S-275	STANDARD(S) USED:	A4, A24, A321 DUE 02-2015
SERIAL NUMBER:	684390L	NIST TRACE #¹ S:	1329407628, 1361269184, 1390386562
RATED UNCERTAINTY:	+/- .5 % RD.	AMBIENT CONDITIONS:	760 mm HGA 51 % RH 72 F
UNCERTAINTY GIVEN:	FLOW measurement uncertainty: +/- .101 % RD. K=2	CERTIFICATE FILE #:	426663.14
NOTES: 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
	SCFM	SCFM		
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, copied, in full or in part, without the approval of DICK MUNN'S COMPANY. The data shown applies only to the instrument being calibrated and under the stated conditions of calibration.

Date:

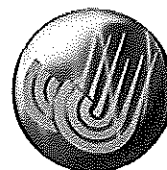
Approved By:

Calibration Technician:

Certificate of Calibration

Certificate Number: **567521**

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



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

OnSite

PO: .

Order Date: **07/24/2014**

Authorized By: **N/A**



0723.01
Calibration

Property #: **OMNI-00023**

User: **N/A**

Department: **N/A**

Make: **Mettler**

Model: **AE200**

Serial #: **E17657**

Description: **Scale, 205g**

Procedure: **DCN 500818/500887**

Accuracy: **$\pm 0.0004g \pm 1$ LSD**

Calibrated on: **07/24/2014**

*Recommended Due: **01/24/2015**

Environment: **24 °C 50 % RH**

As Received: **Out of Tolerance**

As Returned: **Within Tolerance**

Action Taken: **Adjusted**

Technician: **34**

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
503A	Rice Lake	1mg-200g (Class O)	Mass Set	01/06/2015	548562

Parameter	Measurement Data						
Measurement Description	Range Unit	Reference	UUT	Variance	Min	Max	Uncertainty
Before	✖ = OOT condition						
Force							Accredited = ✓
	g	40.00000	40.0008 ✖	-0.0008	39.9995	40.0005	0.000291 ✓
	g	80.00000	80.0013 ✖	-0.0013	79.9995	80.0005	0.000297 ✓
	g	120.00000	120.0020 ✖	-0.0020	119.9995	120.0005	0.000324 ✓
	g	160.00000	160.0025 ✖	-0.0025	159.9995	160.0005	0.00033 ✓
	g	200.00000	200.0034 ✖	-0.0034	199.9995	200.0005	0.000403 ✓
After	Accredited = ✓						
	g	40.00000	40.0001	-0.0001	39.9995	40.0005	0.000291 ✓
	g	80.00000	80.0001	-0.0001	79.9995	80.0005	0.000297 ✓
	g	120.00000	120.0000	0.0000	119.9995	120.0005	0.000324 ✓
	g	160.00000	160.0001	-0.0001	159.9995	160.0005	0.00033 ✓
	g	200.00000	200.0003	-0.0003	199.9995	200.0005	0.000403 ✓

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.

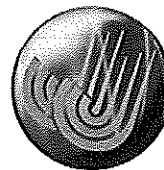
Reviewer

3 Issued 07/28/2014 Rev #14

Inspector

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 (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.

Reviewer

3 Issued 12/06/2013

Rev # 14

Inspector

Certificate: **547339**

2-28 of 2-3 Page 1 of 1

JJ Calibrations, Inc.

Manufacturer: Ohaus

Model: 500mg

Nomenclature: Mass

Serial: 27503

Certificate #: 547339

Date: 02Dec2013

Technician: 34

Calibration Interval: 60 Months

[illegible]

SCALE WEIGHT CALIBRATION DATA SHEET

Weight to be calibrated: 10 lb

ID Number: 132

Standard Calibration Weight: 10 lb

ID Number: 255

Scale Used: MTW-150K

ID Number: 353

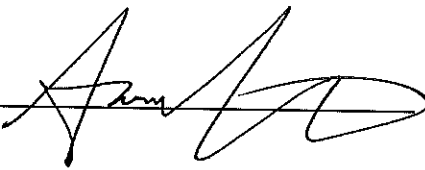
Date: 2/19/13

By: A. Kravitz

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

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

459
National
Weather
Service
Type

469
NOVA
Economy
Model

Tape Measure Calibration Log

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

[illegible]

VWR Temperature Hygrometer Calibration Procedure and Data Sheet

Frequency: Every Year

Step 1: Locate NIST traceable standard.

Step 2: Place unit to be calibrated, tracking No. OMNI-343, inside OMNI desiccate box on the same shelf with the NIST traceable standard.

Step 3: After a period of not less than four hours record the temperature and humidity of both units in the spaces provide below.

Step 4: If the unit to be calibrated matches the NIST standard within $\pm 4\%$, it is acceptable. If not, the unit needs to be sent to a repair company or replaced.

Verification Data:

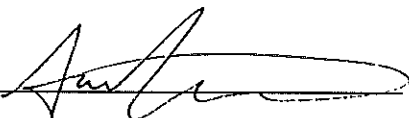
Date: 9/22/14 Technician: A. Kravitz

Time in desiccate: 0815 Recording time: 12:15

NIST Standard Temperature: 76.6 °F NIST Standard Humidity: 19.7%

Test Unit Temperature Reading: 77.0 °F Test Unit Humidity Reading: 17.6%

Test unit OMNI- 343 is ☒ or was not ☐ within acceptable limits.

Technician Signature: 

Comments: Standard equipment: OMNI-291

(OMNI-00353)

[illegible]

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 the pressure measured in this way is negative.

Differential Pressure Measurement

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

Storage

Turn meter circuit switch to "off" position and withdraw "hook" point well clear of fluid (by turning Micrometer under-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 to keep it free of strong solvent fumes.

Maintenance

When the meter reading becomes reduced 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.)

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.

"Microtector"®

A Product From

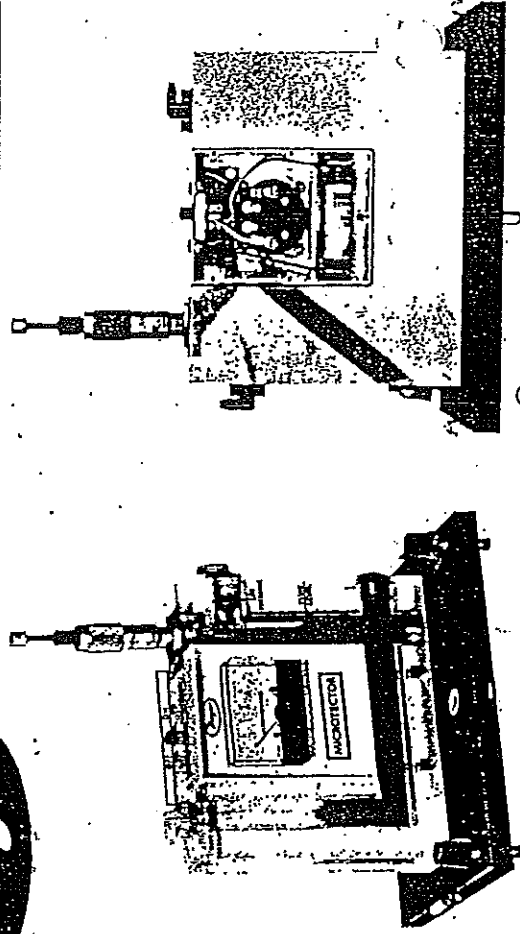
Dwyer Instruments, Inc.

"The Low Pressure People"

38-440190-00

MICROTECTOR®

Operating and Maintenance Instructions



MICROTECTOR®

Specifications and Features*

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

Accuracy and Repeatability: ±0.002 inches 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 219/872-9141 or

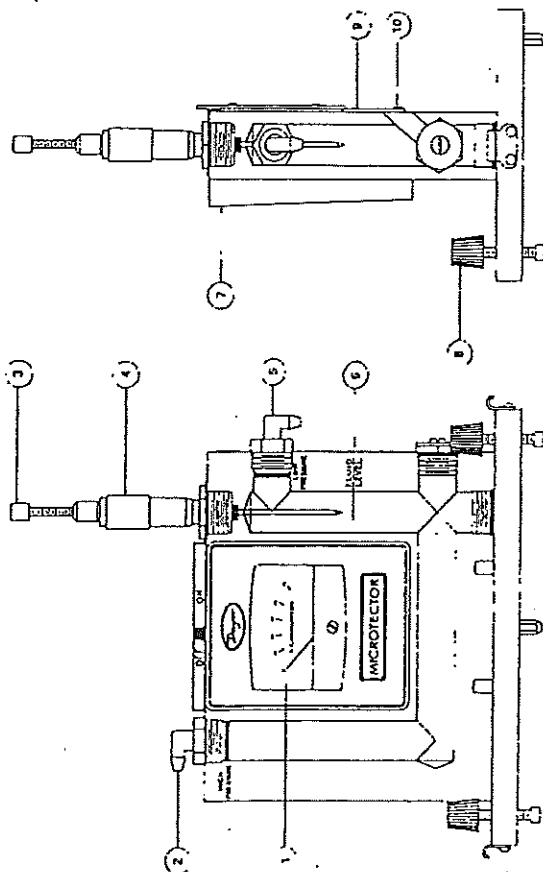


DWYER INSTRUMENTS, INC.

P.O. Box 373, Michigan City, Indiana 46360, U.S.A.

Phone: Area 219/872-9141

Director Chicago Line Area 312/773-7887



MICRORECTOR® GAGE

Precision Pressure Measurement

The Dwyer Microrector® 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 $1/2$ 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 Microrector® 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 $1/32$ 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, relieve the Microrector. 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 recorded 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 $\times 2 =$ 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 Microrector® rechecked. Any change in the zero position will indicate inaccurate readings. Should this happen the zero-set and pressure measurement procedure should be repeated.

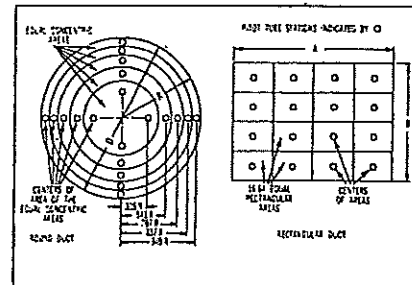
AIR VELOCITIES WITH THE DWYER PITOT TUBE

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

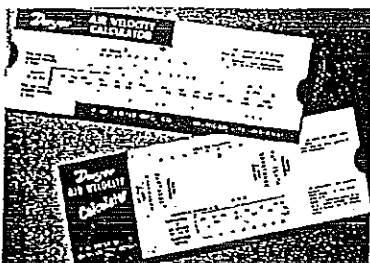
D = Air density in #/cu. ft.

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

where P_B = Barometric Pressure in inches of mercury

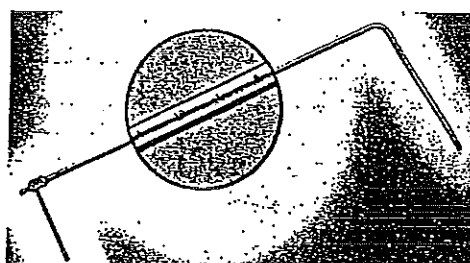
T = Absolute Temperature (indicated temperature °F plus 460)

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



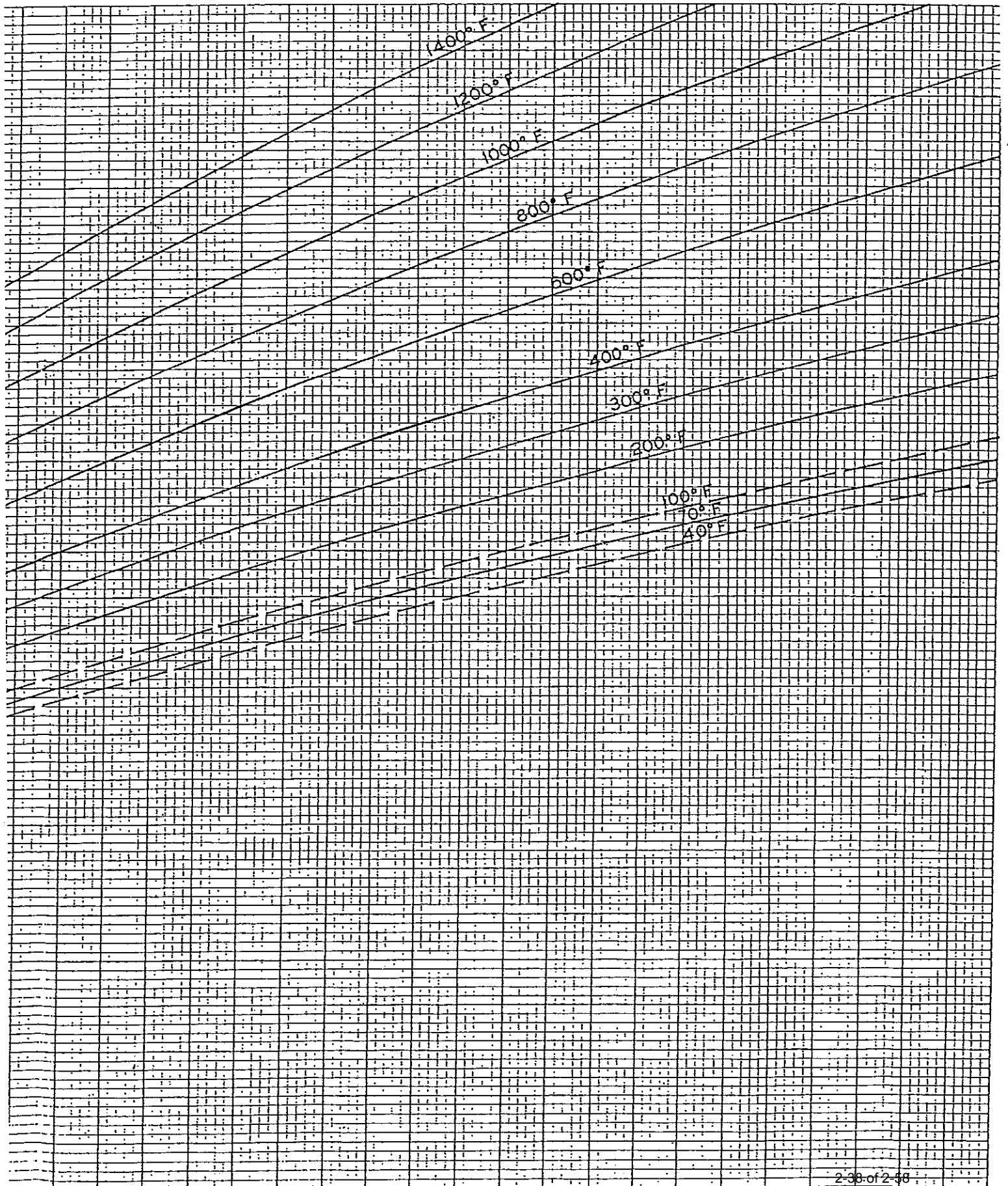
AIR VELOCITY CALCULATOR

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.

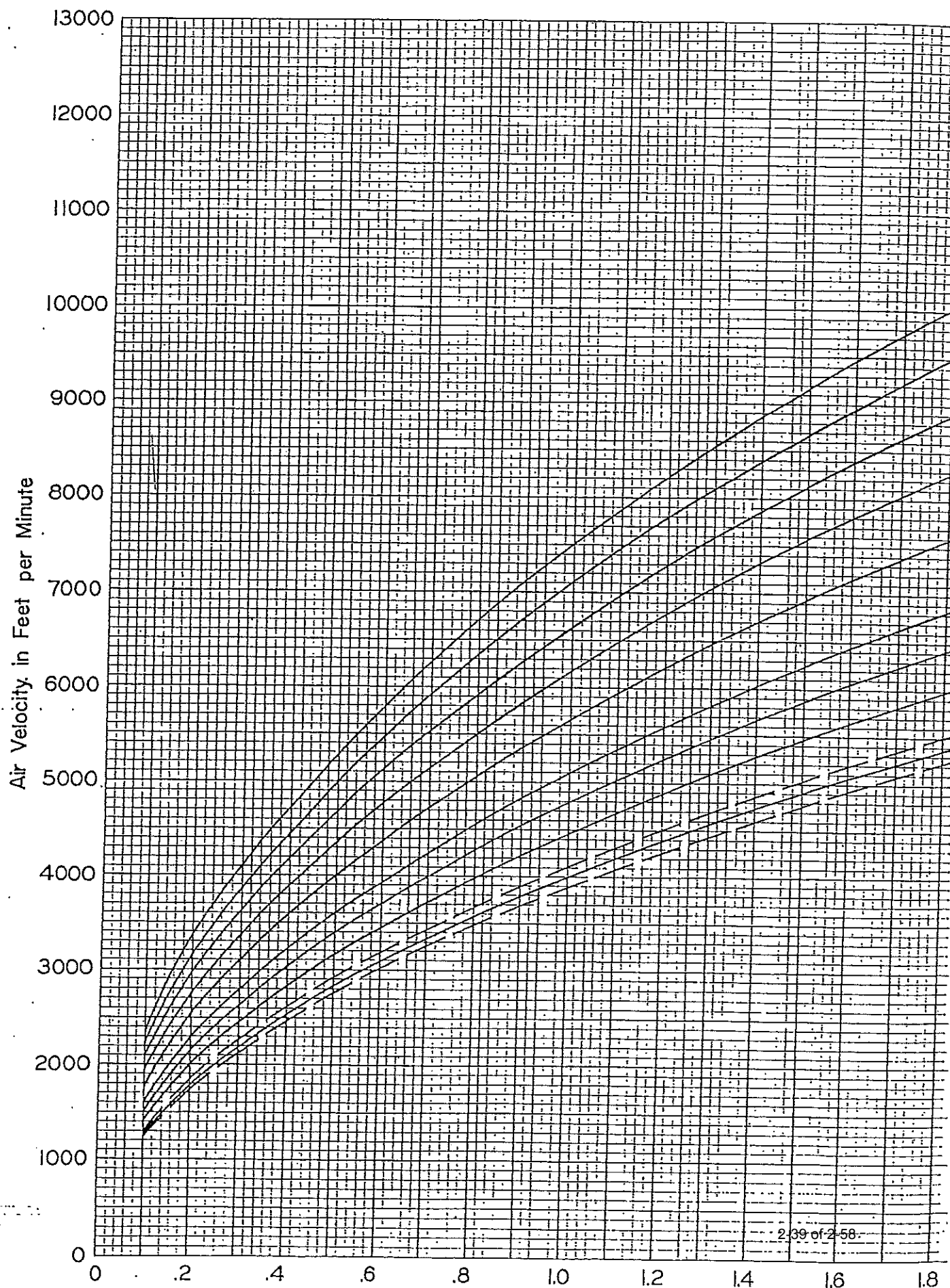


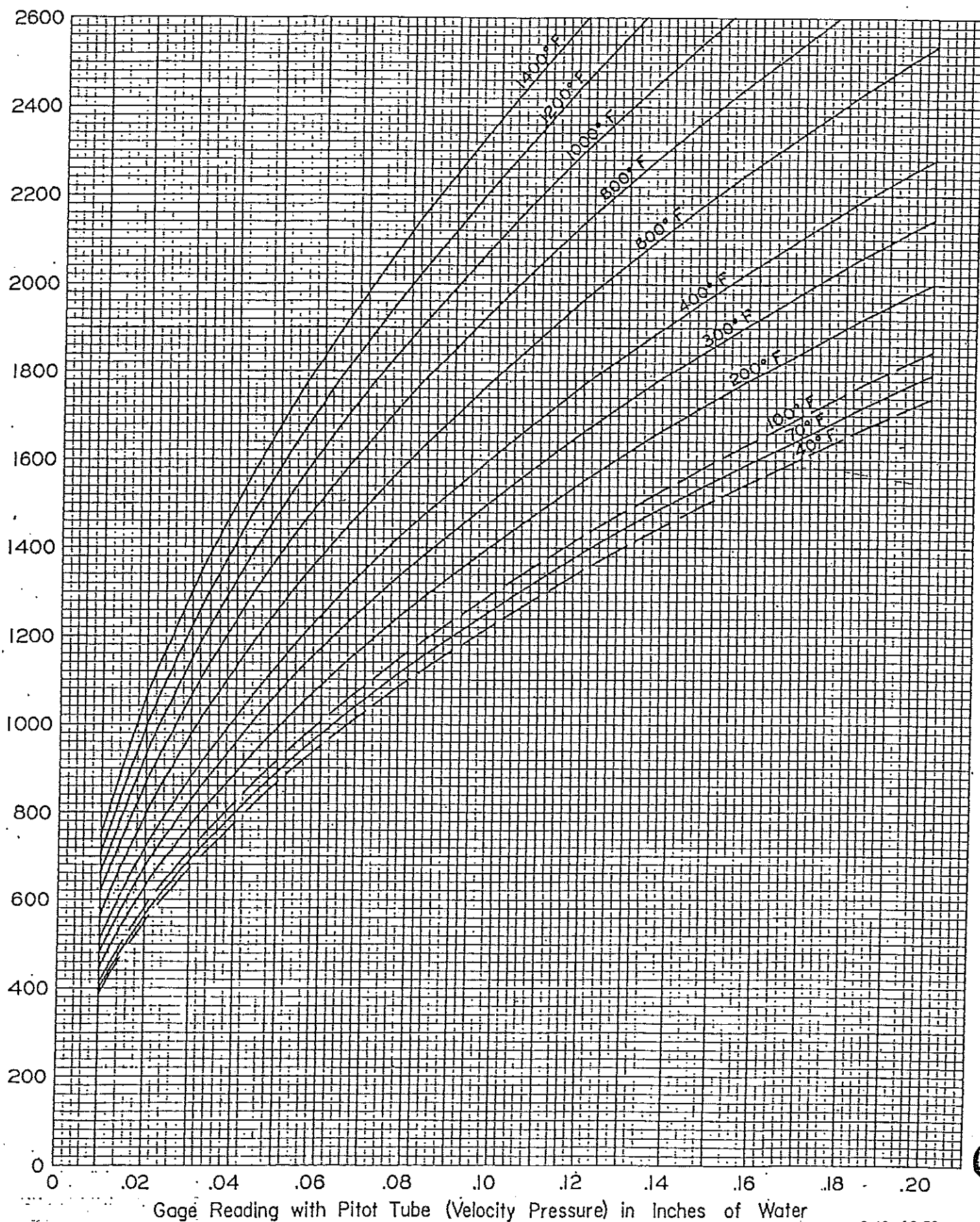
STAINLESS STEEL PITOT TUBES

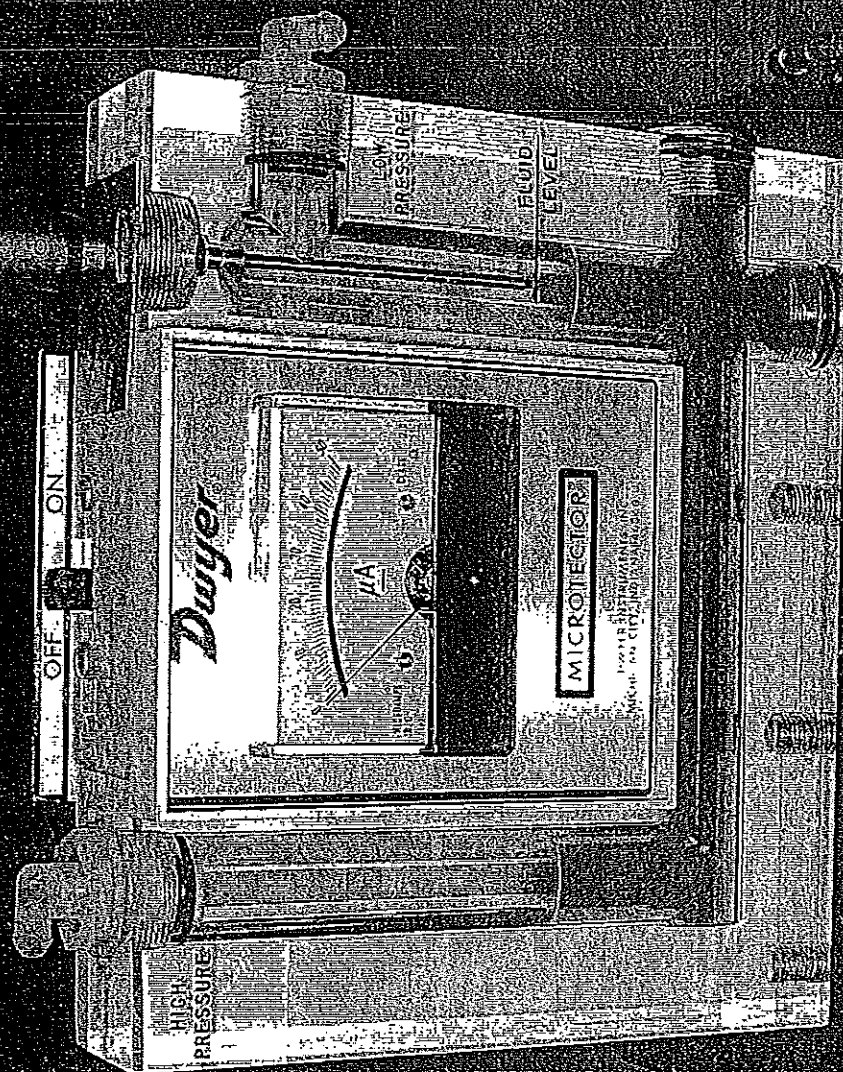
Test-confirmed unity coefficient and lifetime construction of No. 304 stainless steel. Inch graduations show depth of insertion for traversing. Complies with AMCA and ASHRAE specifications. Sizes 12" to 60" long. Hand or fixed mounting types.



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

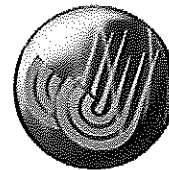






Certificate of Calibration

Certificate Number: **561978**



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-14-022**

Order Date: **05/15/2014**

Authorized By: **N/A**

Property #: **OMNI-00417**

User: **N/A**

Department: **N/A**

Make: **Extech**

Model: **451126**

Serial #: **08120397**

Description: **Anemometer**

Procedure: **DCN 404947/400331**

Accuracy: **± 3% READING**

Calibrated on: **05/19/2014**

*Recommended Due: **05/19/2015**

Environment: **20 °C 40 % RH**

As Received: **Within Tolerance**

As Returned: **Within Tolerance**

Action Taken: **Calibrated w/Parts**

Technician: **124**

Remarks: * Any number of factors may cause the calibration item to drift out of calibration before the recommended interval has expired
Received and returned with case. Replaced battery.

Standards Used

Std ID	Manufacturer	Model	Nomenclature	Due Date	Trace ID
568	TSI	8705	DP-CALC	09/17/2014	541750
635A	Vaisala	MI70	Thermohygrometer	04/09/2015	555771
636A	Vaisala	HMP75	Humidity/Temp Probe	04/09/2015	555772

Parameter	Measurement Data					
Measurement Description	Range	Unit	Reference	UUT	Variance	Min Max
Before/After						
Air Velocity						
	FPM		600.00	594.5	5.5	582.0 618.0
	FPM		995.00	986.3	8.7	965.1 1024.9
	FPM		2005.0	1966	39	1945 2065
Temperature / Ambient						
	°F		70.860	71.36	-0.50	68.86 72.86

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

Issued 05/20/2014

Rev # 14


Inspector

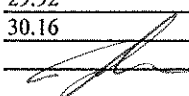
Thermal Metering System Calibration

Y Factor

Manufacturer: Apex
 Model: XC-60A-ED-OMNI
 Serial Number: 0906014
 OMNI Tracking No.: OMNI-00428A
 Calibrated Orifice: ☐ Yes

Average Gas Meter y Factor
1.007

Orifice Meter dH@
N/A

Calibration Date: 07/25/14
 Calibrated by: J. Clark
 Calibration Frequency: 6 months
 Next Calibration Due: 1/25/2015
 Instrument Range: 1.000 cfm
 Standard Temp.: 68 °F
 Standard Press.: 29.92 "Hg
 Barometric Press., Pb: 30.16 "Hg
 Signature/Date:  7/25/14

Previous Calibration Comparison

Date	1/21/2014	Acceptable Deviation (5%)	Deviation
y Factor	0.999	0.04995	0.008
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 Calibrator	Model S/N	Standard Test Meter
		OMNI-00001
	Calib. Date	07-Oct-13
	Calib. Value	0.9980 y factor (ref)

Calibration Parameters	Run 1	Run 2	Run 3
Reference Meter Pressure ("H ₂ O), Pr	0.00	0.00	0.00
DGM Pressure ("H ₂ O), Pd	1.55	3.41	0.66
Initial Reference Meter	950.687	960.75	970.91
Final Reference Meter	960.71	970.886	981.013
Initial DGM	0	0	0
Final DGM	9.988	10.071	10.081
Temp. Ref. Meter (°F), Tr	84.6	88.7	85.9
Temperature DGM (°F), Td	88.9	96.1	89.7
Time (min)	74.0	50.0	113.0
Net Volume Ref. Meter, Vr	10.023	10.136	10.103
Net Volume DGM, Vd	9.988	10.071	10.081
Gas Meter y Factor =	1.006	1.010	1.006
Gas Meter y Factor Deviation (from avg.)	0.001	0.003	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. $y = [V_r \times (y \text{ factor (ref)}) \times (P_b + (P_r / 13.6)) \times (T_d + 460)] / [V_d \times (P_b + (P_d / 13.6)) \times (T_r + 460)]$
- ** 3. $dH@ = 0.0317 \times P_d / (P_b (T_d + 460)) \times [(T_r + 460) \times \text{time}] / V_r]^2$

* 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 0-1" Magnehelic Gauge

Range: 0-1" WC

ID Number: OMNI-00428A (B)

Calibration Instrument: Digital Manometer (A) ID Number: OMNI-00396

Date: 7/23/14

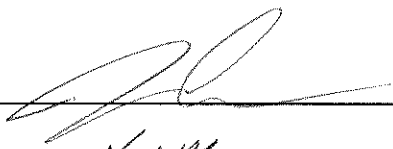
By: J. Clark

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

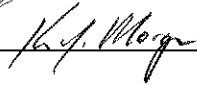
Range of Calibration Point ("WC)	Digital Manometer (A) ("WC)	Magnehelic Gauge (B) ("WC)	Difference (A - B)	% Error of Full Span*
0.0 – 0.2	0.091	0.101	-0.010	-1.0 %
0.2 – 0.4	0.382	0.398	-0.016	-1.6 %
0.4 – 0.6	0.598	0.609	-0.011	-1.1 %
0.6 – 0.8	0.641	0.649	-0.008	-0.8 %
0.8 – 1.0	0.999	1.005	-0.006	-0.6 %

*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.

Technician signature: 

Date: 7/23/2014

Reviewed by: 

Date: 7-23-2014

Temperature Calibration EPA Method 28 and 5G						
BOOTH:		TEMPERATURE MONITOR TYPE:			IDENTIFICATION NUMBER:	
Emissions 3		Type K Thermocouple			OMNI-00428A	
REFERENCE TEMPERATURE MONITOR TYPE:				IDENTIFICATION NUMBER:		
OMEGA Calibrator Model CL300				Serial Number 506		
CALIBRATION PERFORMED BY:		DATE:	AMBIENT TEMPERATURE:		BAROMETRIC PRESSURE:	
J. Clark		7/9/14	79 °F		30.03 in Hg	
Reference Point Source	Temperature Monitor (EF)					
	Method 28 Room	Method 5G Dilution Tunnel				DB
Meter (Tm)		Filters (Tf)	Tunnel (Tt)	Stack Dryer (Ts)		
OMEGA Thermocouple Simulator Serial #506						
0	0	0	1	1	1	N/A
100	100	100	100	101	101	↓
300	301	300	301	301	301	
500	501 ⁵⁰¹	500	501	501 ⁵⁰¹	501	
700	701	700	701	701	701	
Firebox Surface TCs:	Top	Bottom	Left	Right	Back	
0	1	1	1	1	1	
100	101	101	101	101	101	
300	301	301	301	301	301	
500	501	501	501	501	501	
700	701	701	701	701	701	

Technician signature: _____

Date: 7/9/2014

Thermal Metering System Calibration

Y Factor

Manufacturer: Apex
 Model: XC-60A-ED-OMNI
 Serial Number: 0906013
 OMNI Tracking No.: OMNI-00428B
 Calibrated Orifice: ☐ Yes

Average Gas Meter y
 Factor
1.012

Orifice
 Meter
 dH@
 N/A

Calibration Date: 07/25/14
 Calibrated by: J. Clark
 Calibration Frequency: 6 months
 Next Calibration Due: 1/25/2015
 Instrument Range: 1.000 cfm
 Standard Temp.: 68 °F
 Standard Press.: 29.92 "Hg
 Barometric Press., Pb: 30.1 "Hg
 Signature/Date:  7/25/14

Previous Calibration Comparison

Date	1/21/2014	Acceptable Deviation (5%)	Deviation
y Factor	1.003	0.05015	0.009
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 Calibrator	Model	Standard Test Meter
	S/N	OMNI-00001
	Calib. Date	07-Oct-13
	Calib. Value	0.9980 y factor (ref)

Calibration Parameters	Run 1	Run 2	Run 3
Reference Meter Pressure ("H ₂ O), Pr	0.00	0.00	0.00
DGM Pressure ("H ₂ O), Pd	1.85	4.00	1.05
Initial Reference Meter	981.078	991.017	1.575
Final Reference Meter	991.017	1001.522	6.73
Initial DGM	0	0	0
Final DGM	9.817	10.308	5.12
Temp. Ref. Meter (°F), Tr	84.4	85.8	87.0
Temperature DGM (°F), Td	87.1	90.2	91.5
Time (min)	75.0	52.0	55.0
Net Volume Ref. Meter, Vr	9.939	10.505	5.155
Net Volume DGM, Vd	9.817	10.308	5.12
Gas Meter y Factor *	1.011	1.015	1.011
Gas Meter y Factor Deviation (from avg.)	0.001	0.003	0.002
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 0-1" Magnehelic Gauge

Range: 0-1" WC ID Number: OMNI-00428B (B)

Calibration Instrument: Digital Manometer (A) ID Number: OMNI-00396

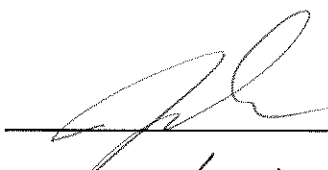
Date: 7/23/14 By: J. Clark

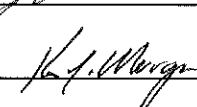
This form is to be used only in conjunction with Standard Procedure C-SPC.

Range of Calibration Point ("WC)	Digital Manometer (A) ("WC)	Magnehelic Gauge (B) ("WC)	Difference (A - B)	% Error of Full Span*
0.0 – 0.2	0.109	0.118	-0.009	-0.9 %
0.2 – 0.4	0.360	0.366	-0.006	-0.6 %
0.4 – 0.6	0.589	0.598	-0.009	-0.9 %
0.6 – 0.8	0.733	0.749	-0.016	-1.6 %
0.8 – 1.0	0.983	0.994	-0.011	-1.1 %

*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.

Technician signature:  Date: 7/23/2014

Reviewed by:  Date: 7-23-2014

Temperature Calibration EPA Method 28 and 5G						
BOOTH:	TEMPERATURE MONITOR TYPE:				IDENTIFICATION NUMBER:	
Emissions 3	Type K Thermocouple				OMNI-004288	
REFERENCE TEMPERATURE MONITOR TYPE:				IDENTIFICATION NUMBER:		
OMEGA Calibrator Model CL300				Serial Number 506		
CALIBRATION PERFORMED BY:		DATE:	AMBIENT TEMPERATURE:		BAROMETRIC PRESSURE:	
J. Clark		7/9/14	79 °F		30.03 in/hg	
Reference Point Source	Temperature Monitor (EF)					
	Method 28 Room	Method 5G Dilution Tunnel				DB
Meter (Tm)		Filters (Tf)	Tunnel (Tt)	Stack Dryer (Ts)		
OMEGA Thermocouple Simulator Serial #506						
0	0	0	1	1	1	N/A
100	100	100	101	101	101	↓
300	301	300	301	301	301	
500	501	500	501	501	501	
700	701	700	701	701	701	

Technician signature: _____

Date: _____

7/9/2014

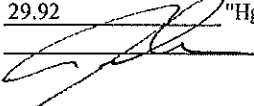
Thermal Metering System Calibration

Y Factor

Manufacturer: Apex
 Model: XC-60A-ED-OMNI
 Serial Number: 0906014
 OMNI Tracking No.: OMNI-00428A
 Calibrated Orifice: ☐ Yes

**Average Gas Meter y
Factor**
1.000

**Orifice
Meter
dH@**
N/A

Calibration Date: 10/31/14
 Calibrated by: J. Clark
 Calibration Frequency: Post-Test Verification
 Next Calibration Due: N/A
 Instrument Range: 1.000 cfm
 Standard Temp.: 68 °F
 Standard Press.: 29.92 "Hg
 Barometric Press., Pb: 29.92 "Hg
 Signature/Date:  10/31/14

Previous Calibration Comparison

Date	7/25/2014	Acceptable Deviation (5%)	Deviation
y Factor	1.006940002	0.050347	0.007
Acceptance	Acceptable		

Current Calibration

Acceptable y Deviation	0.020
Maximum y Deviation	0.002
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 ("H ₂ O), Pr	0.00	0.00	0.00
DGM Pressure ("H ₂ O), Pd	0.74	3.66	2.61
Initial Reference Meter	383.536	388.544	393.702
Final Reference Meter	388.544	393.626	398.765
Initial DGM	0	0	0
Final DGM	5.02	5.057	5.069
Temp. Ref. Meter (°F), Tr	66.0	67.0	67.0
Temperature DGM (°F), Td	69.0	71.0	71.0
Time (min)	54.0	25.0	54.5
Net Volume Ref. Meter, Vr	5.008	5.082	5.063
Net Volume DGM, Vd	5.02	5.057	5.069
Gas Meter y Factor **	1.000	1.002	0.998
Gas Meter y Factor Deviation (from avg.)	0.000	0.002	0.002
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. $y = [V_r \times (y \text{ factor (ref)}) \times (P_b + (P_r / 13.6)) \times (T_d + 460)] / [V_d \times (P_b + (P_d / 13.6)) \times (T_r + 460)]$
- ** 3. $dH@ = 0.0317 \times P_d / (P_b (T_d + 460)) \times [(T_r + 460) \times \text{time}] / V_r^2$

* 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.

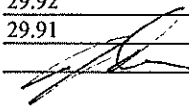
Thermal Metering System Calibration

Y Factor

Manufacturer: Apex
 Model: XC-60A-ED-OMNI
 Serial Number: 0906013
 OMNI Tracking No.: OMNI-00428B
 Calibrated Orifice: ☐ Yes

Average Gas Meter y
 Factor
0.985

Orifice
 Meter
 dH@
 N/A

Calibration Date: 10/31/14
 Calibrated by: J. Clark
 Calibration Frequency: Post-Test Verification
 Next Calibration Due: N/A
 Instrument Range: 1.000 cfm
 Standard Temp.: 68 °F
 Standard Press.: 29.92 "Hg
 Barometric Press., Pb: 29.91 "Hg
 Signature/Date:  10/31/14

Previous Calibration Comparison

Date	7/25/2014	Acceptable Deviation (5%)	Deviation
y Factor	1.012255528	0.050612776	0.028
Acceptance	Acceptable		

Current Calibration

Acceptable y Deviation	0.020
Maximum y Deviation	0.007
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 ("H ₂ O), Pr	0.00	0.00	0.00
DGM Pressure ("H ₂ O), Pd	1.21	3.73	0.52
Initial Reference Meter	366.352	372.347	378.61
Final Reference Meter	372.347	378.543	383.536
Initial DGM	0	0	0
Final DGM	6.116	6.226	5.058
Temp. Ref. Meter (°F), Tr	66.0	66.0	66.0
Temperature DGM (°F), Td	70.0	70.0	70.0
Time (min)	60.0	32.0	78.0
Net Volume Ref. Meter, Vr	5.995	6.196	4.926
Net Volume DGM, Vd	6.116	6.226	5.058
Gas Meter y Factor =	0.983	0.992	0.979
Gas Meter y Factor Deviation (from avg.)	0.001	0.007	0.006
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.

WOOD MOISTURE CONTENT CALIBRATION WORKSHEET

Moisture Content Standard OMNI ID #: OMNI-00431 (shop)

Reference Moisture Content Standard: OMNI # 00430

[# 430] ~~# 431~~ ~~(# 430)~~ ~~de~~

Date	Temp. (°F)	Barometric Pressure (in Hg)	Fixed Moisture %	Fixed Moisture %	Observed Moisture % <u>[#431]</u>		Initials
4/29/11	72	30.3	22%	12%	~~22%~~ 12%	~~22%~~ 12%	SW
8/10/11	85	29.2	22%	12%	~~22%~~ 12%	~~22%~~ 12%	SW
11/29/11	73	30.15	22%	12%	~~22%~~ 12%	~~22%~~ 12%	SW
6/14/12	71	30.21	22%	12%	12.0%/22.0%	12.0%/22.0%	SW
9/19/2012	74	30.20	22%	12%	12.0/22.0	12.0/22.0	JC
12/31/2012	67°F	30.25 in Hg	22%	12%	12.0	22.0	JC
3/28/2013	71°F	30.10 in Hg	22%	12%	12.0	22.0	JC
6/28/2013	82 °F	30.14 in Hg	22%	12%	12.0	22.0	JC
9/19/2013	75 °F	29.95 in Hg	22%	12%	12.0	22.0	JC
12/17/2013	72 °F	30.29 in Hg	22%	12%	22.0	12.0	JC
3/13/2014	65.0 °F	30.23 in Hg	22%	12%	22.0	12.0	JC
7/2/2014	77.5 °F	30.04 in Hg	22%	12%	22.0%	12.0%	JC
10/2/2014	66.0 °F	30.08 in Hg	22%	12%	22.0%	12.0%	JC
			22%	12%			
			22%	12%			
			22%	12%			
			22%	12%			
			22%	12%			

Notes: _____

Technician signature: [Signature] Date: 4/29/11

WOOD MOISTURE CONTENT CALIBRATION WORKSHEET

Moisture Content Standard OMNI ID #: OMNI-00431 (sup)

Reference Moisture Content Standard: OMNI # 00430

[# 430] ~~# 431~~ ~~# 430~~ ^{JE}

Date	Temp. (°F)	Barometric Pressure (in Hg)	Fixed Moisture %	Fixed Moisture %	Observed Moisture % [# 431]		Initials
4/29/11	72	30.3	22%	12%	22% 12%	22% 12%	JE
8/10/11	85	29.2	22%	12%	22% 12%	22% 12%	JE
11/29/11	73	30.15	22%	12%	22% 12%	22% 12%	JE
6/14/12	71	30.21	22%	12%	12.0/22.0	12.0/22.0	JE
9/19/2012	74	30.20	22%	12%	12.0/22.0	12.0/22.0	JE
12/31/2012	67°F	30.25 in Hg	22%	12%	12.0	22.0	JE
3/28/2013	71°F	30.10 in Hg	22%	12%	12.0	22.0	JE
6/28/2013	82°F	30.14 in Hg	22%	12%	12.0	22.0	JE
9/19/2013	75°F	29.95 in Hg	22%	12%	12.0	22.0	JE
12/17/2013	72°F	30.29 in Hg	22%	12%	22.0	12.0	JE
3/13/2014	65.0°F	30.23 in Hg	22%	12%	22.0	12.0	JE
7/2/2014	77.5°F	30.04 in Hg	22%	12%	22.0%	12.0%	JE
			22%	12%			
			22%	12%			
			22%	12%			
			22%	12%			
			22%	12%			
			22%	12%			

Notes: _____

Technician signature: JE Date: 4/29/11

NIST Stopwatch Calibration, Time Proficiency Testing Procedure and Data Sheet

Date: 2/14/14 User/Technician: J. Clark ☒ Pass ☐ Fail

NIST traceable stopwatch OMNI tracking number: -00292 Last Cal: 12/12/2013

Stopwatch to be tested for time proficiency OMNI tracking number: OMNI-00443

1. Start the NIST traceable stopwatch: at a predetermined time (i.e. 1.00 minutes), the technician shall start the watch being tested. When 15.00 seconds have passed (i.e. the NIST traceable stopwatch reads 1 minute, 15 seconds), the technician shall stop the watch being tested. Record the target time interval (i.e. 15.00 seconds). Repeat this step twice and record the data.
2. Repeat step #1 for each of the following target time intervals: 30.00 seconds, 10.00 minutes, and 30 minutes.
3. If the delta between the target time and measured time is less than 5% of the target time interval or 2.00 seconds (whichever is less), then the technician has demonstrated proficiency with the specific instrument utilized in the proficiency test. The proficiency is valid for a period of 12 months.
4. Archive the proficiency test data and information, including the effective date and expiration date of the proficiency, in the equipment record for the instrument involved.

Target time: <u>15.00 seconds</u>	#1 Measured time: <u>15.02</u>	#2 Measured time: <u>15.01</u>	#3 Measured time: <u>14.98</u>
Target time: <u>30.00 seconds</u>	#1 Measured time: <u>29.98</u>	#2 Measured time: <u>29.97</u>	#3 Measured time: <u>30.00</u>
Target time: <u>45.00 seconds</u>	#1 Measured time: <u>45.00</u>	#2 Measured time: <u>45.01</u>	#3 Measured time: <u>44.98</u>
Target time: <u>60.00 seconds</u>	#1 Measured time: <u>60.00</u>	#2 Measured time: <u>59.98</u>	#3 Measured time: <u>60.02</u>
Target time: <u>10.00 minutes</u>	#1 Measured time: <u>9.59.98</u>	#2 Measured time: <u>9.59.98</u>	#3 Measured time: <u>10.00.01</u>
Target time: <u>30.00 minutes</u>	#1 Measured time: <u>30.00.03</u>	#2 Measured time: <u>29.59.98</u>	#3 Measured time: <u>30.00.01</u>

The uncertainty of measurement is ± 1 sec. This is based on the reference standard having a TAR (Test Accuracy Ratio) of at least 4:1.

This calibration procedure is confirmed by the manufacturer as a proper method for evaluating the accuracy of timers.

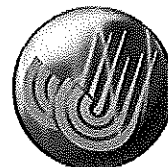
Technician Signature: [Signature] Date: 2/14/14

Reviewed by: [Signature] Date: 2/14/14

Certificate of Calibration

Certificate Number: **556524**

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



JJ Calibrations, Inc.

7007 SE Lake Rd
Portland, OR 97267-2105
Phone 503.786.3005
FAX 503.786.2994



0723.01
Calibration

PO: OTL-14-011

Order Date: **03/07/2014**

Authorized By: N/A

Calibrated on: **03/13/2014**

*Recommended Due: **03/13/2015**

Environment: **20 °C 40 % RH**

As Received: **Within Tolerance**

As Returned: **Within Tolerance**

Action Taken: **Calibrated**

Technician: **112**

Property #: **OMNI-00533**

User: **N/A**

Department: **N/A**

Make: **Fourier**

Model: **DaqPRO 5300**

Serial #: **0105287**

Description: **Data Acquisition / analysis**

Procedure: **DCN 404915**

Accuracy: **Refer Manual**

Remarks: * Any number of factors may cause the calibration item to drift out of calibration before the recommended interval has expired
Received/returned in case with probes, power cord, and cd.

Standards Used

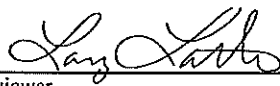
Std ID	Manufacturer	Model	Nomenclature	Due Date	Trace ID
446A	Fluke	5500A-SC600	Calibrator W/600MHz	10/01/2014	541049
497A	Hart Scientific	1502A	Precision Digital Thermometer	08/11/2014	538871
601A	Burns Engineering	200G05B085	INDUSTRIAL PRT	02/11/2016	554126
552A	Hart Scientific	7103	MICRO BATH	10/24/2014	544941

Parameter

Measurement Data

Measurement Description	Range	Unit	Reference	UUT	Variance	Min	Max	Uncertainty	
Before/After									Accredited = ✓
Temperature									
PT/100 probe 1		°C	-24.3680	-25.400	1.032	-26.368	-22.368	0.0137	✓
PT/100 probe 2		°C	-24.3680	-25.200	0.832	-26.368	-22.368	0.0137	✓
PT/100 probe 1		°C	90.1140	90.800	-0.686	88.114	92.114	0.0137	✓
PT/100 probe 2		°C	90.1140	90.700	-0.586	88.114	92.114	0.0137	✓
PT/100 probe 1		°C	119.7060	120.300	-0.594	117.706	121.706	0.0137	✓
PT/100 probe 2		°C	119.7060	120.100	-0.394	117.706	121.706	0.0137	✓
Thermocouple/ Type K									
		°C	0.00	-1.2	1.2	-6.0	6.0	0.16	✓
		°C	500.00	499.3	0.7	494.0	506.0	0.26	✓
		°C	1100.00	1099.6	0.4	1094.0	1106.0	0.4	✓

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 03/14/2014

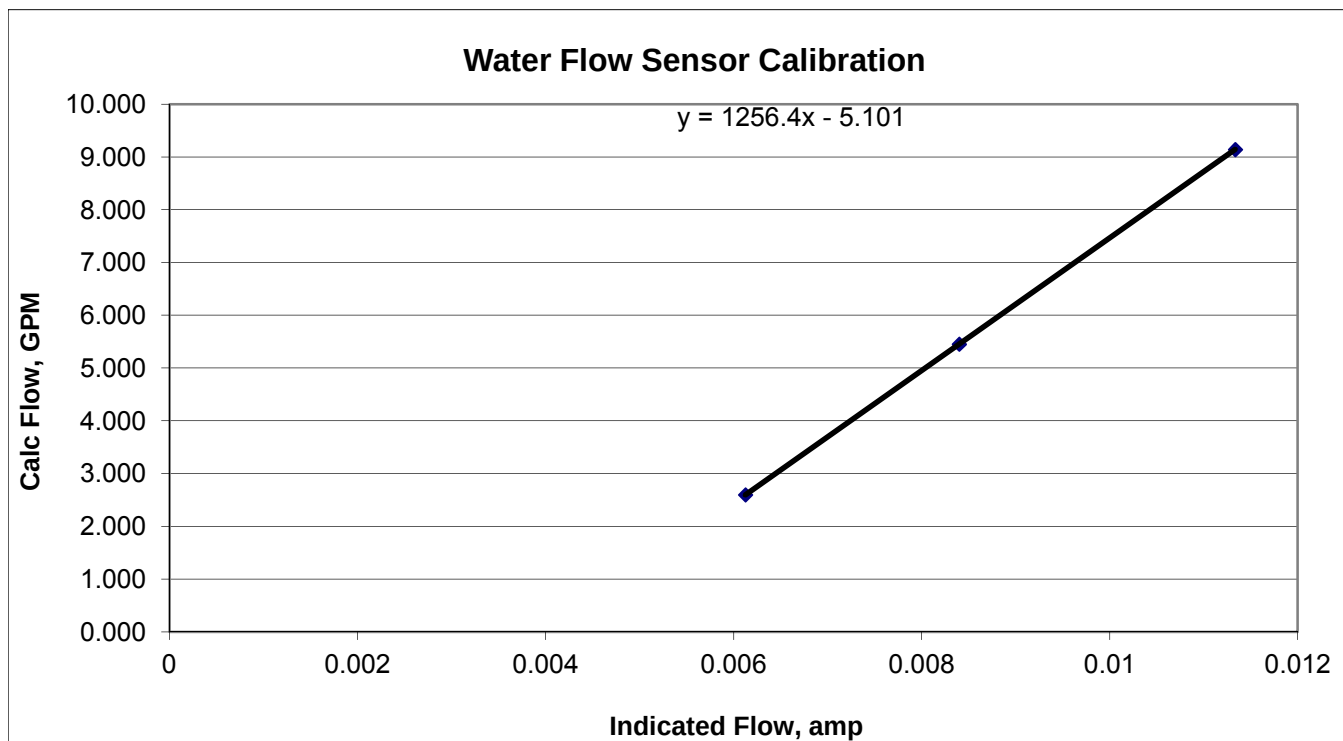
Rev # 14


Inspector

Density = $1000(1 - (T+288.9414)/(508929.2*(T+68.12963))*(T-3.9863)^2)$ kg/m³
 1 kg/m³ = 0.0083454 lb/gal

Heatmor 200x Run 2 9/29/2014

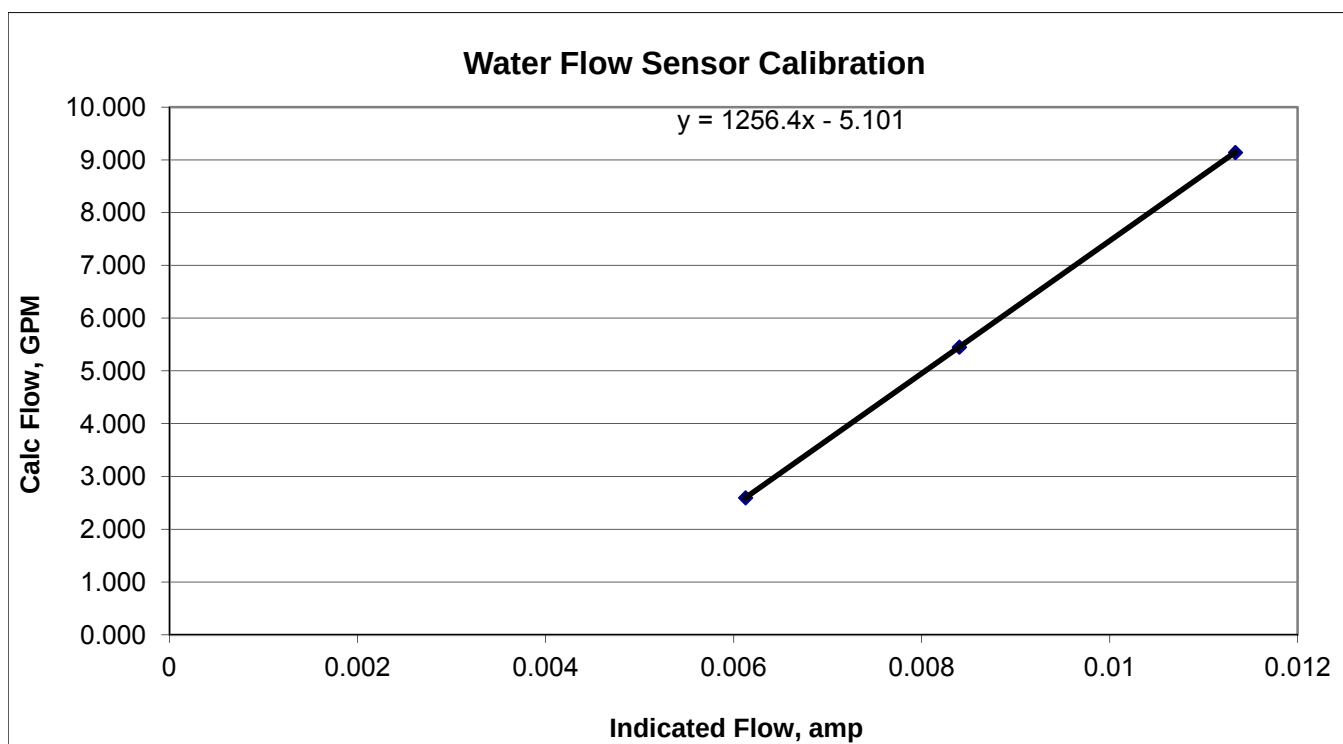
Time (min)	Water T (°F)	Water T (°C)	Density (kg/m ³)	Density (lb/gal)	Weight (kg)	Weight (lb)	Calc Flow (gpm)	Indicated Flow	
3.00	165.12	74.0	975.431	8.140	N/A	77.5	3.2	3.1	
1.50	162.5	72.5	976.294	8.148		102	8.3	8.1	



Density = $1000(1 - (T+288.9414)/(508929.2*(T+68.12963))*(T-3.9863)^2)$ kg/m³
 1 kg/m³ = 0.0083454 lb/gal

Heatmor 200x Run 6 10/2/2014

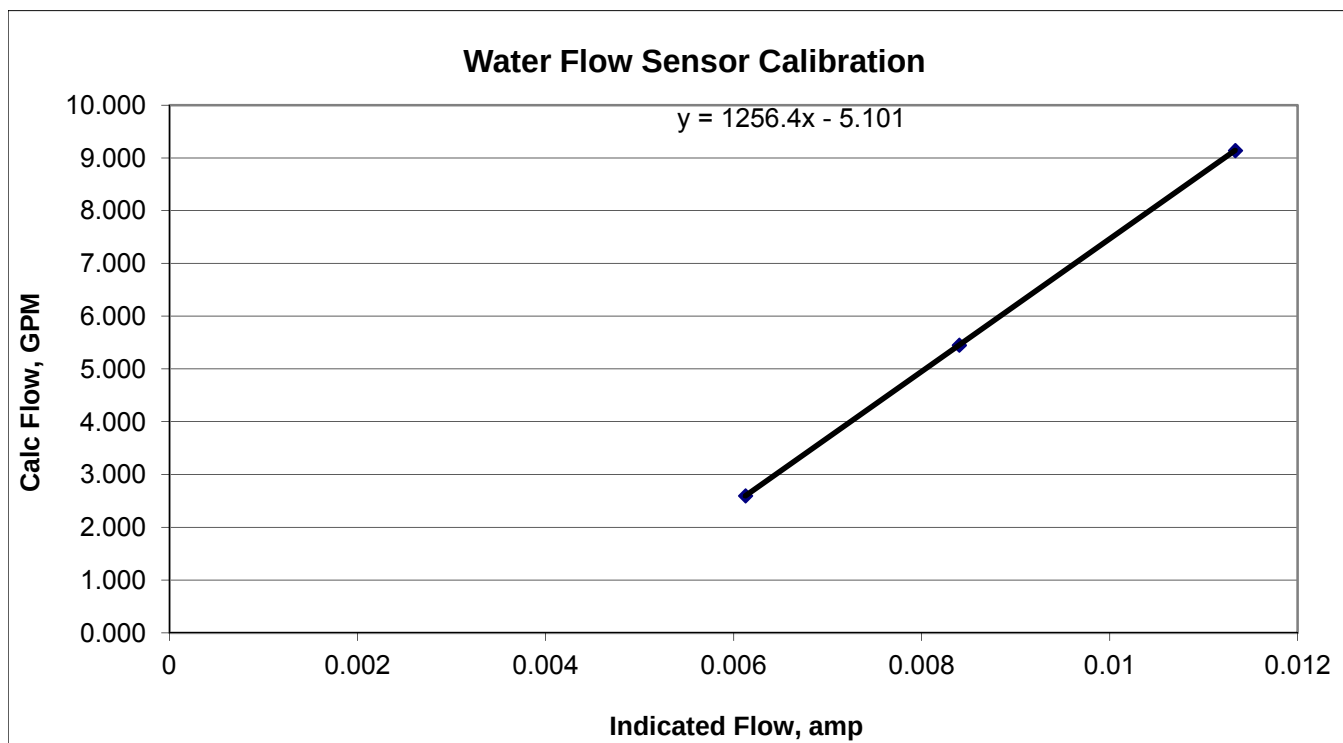
Time (min)	Water T (°F)	Water T (°C)	Density (kg/m ³)	Density (lb/gal)	Weight (kg)	Weight (lb)	Calc Flow (gpm)	Indicated Flow	Elapsed Test
2.92	68.84	20.5	998.136	8.330	N/A	27.8	1.144	1.133	Preburn
5.36	69.43	20.8	998.066	8.329		41.1	0.920	0.91	90 min
5.07	68.63	20.4	998.161	8.330		39	0.924	0.918	300 min
6.31	68.65	20.4	998.158	8.330		56.5	1.076	1.07	470 min



Density = $1000(1 - (T+288.9414)/(508929.2*(T+68.12963))*(T-3.9863)^2)$ kg/m³
 1 kg/m³ = 0.0083454 lb/gal

Heatmor 200x Run 7 10/3/2014

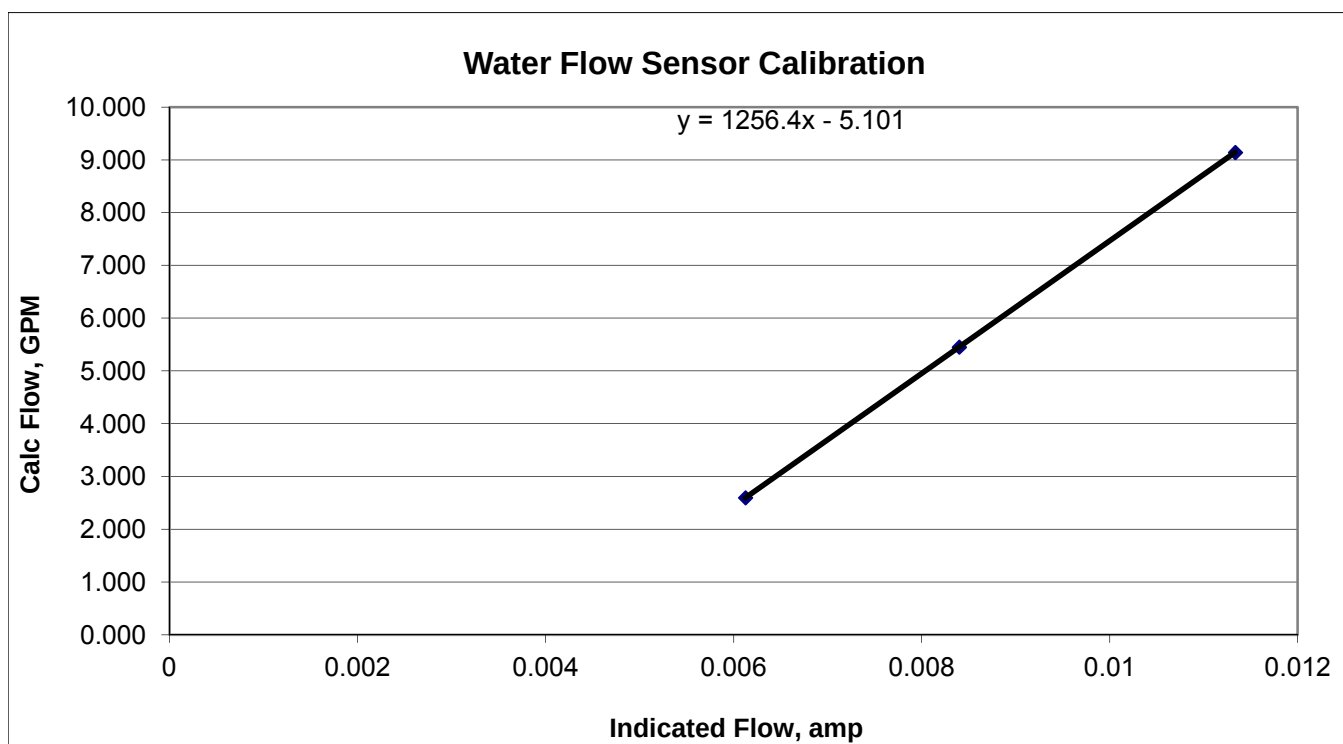
Time (min)	Water T (°F)	Water T (°C)	Density (kg/m ³)	Density (lb/gal)	Weight (kg)	Weight (lb)	Calc Flow (gpm)	Indicated Flow	Elapsed Test Tin
3.00	68.15	20.1	998.216	8.331	N/A	29.9	1.196	1.210	195
3.00	68.57	20.3	998.168	8.330		23.3	0.932	0.923	256
3.00	68.31	20.2	998.198	8.330		32.2	1.288	1.27	466



Density = $1000(1 - (T+288.9414)/(508929.2*(T+68.12963))*(T-3.9863)^2)$ kg/m³
 1 kg/m³ = 0.0083454 lb/gal

Heatmor 200x Run 8 10/6/2014

Time (min)	Water T (°F)	Water T (°C)	Density (kg/m ³)	Density (lb/gal)	Weight (kg)	Weight (lb)	Calc Flow (gpm)	Indicated Flow	Elapsed Test Time
2.76	68.84	20.5	998.136	8.330	N/A	41.3	1.80	1.79	Preburn
2.05	68.55	20.3	998.170	8.330		41.7	2.441	2.42	14 min
1.50	69.28	20.7	998.084	8.329		36	2.881	2.8	131
2.50	69.4	20.8	998.070	8.329		26.5	1.273	1.23	172



Section 3

Owner's Manual

Go To
Heatmor.com
for the most recent
Owners Manual

*Model: 200X
Heatmor
105 Industrial Park Ct. NE, P.O. Box 787
Warroad, MN 56763*

Section 4

Test Data by Run

EPA Method 28 WHH Test Standard

Manufacturer: Heatmor
 Model: 200X
 Tracking No.: 1997
 Project No.: 0275WB011E
 Technician: A. Kravitz, S. Button
 Comments: _____

Adjustable Parameters:	Category II A	Category II B	Category III	Category IV
Run Number:	6	7	8	2
Test Date:	10/2/14	10/3/14	10/6/14	9/29/14
Total Fuel Weight (lb):	94.2	93.6	93.8	96.1
Average Moisture of Fuel (% dry):	22.7	22.1	21.7	22.1
Average Temperature of Appliance Water at Start of Test:	132.6	133.1	130.8	136.7
Average Temperature of Appliance Water at End of Test:	140.4	154.2	130.7	144.4
Average Thermopile Reading:	81.1	84.5	83.6	86.4
Average Load Side Liquid Flow Rate (gal/min):	1.1	1.0	2.0	4.1
Time Interval (min):	549	516	304	138
Burn Rate (kg/hr):	3.81	4.04	6.90	15.53
Emissions (g):	55.3	64.0	52.8	33.4

Constant Parameters:	Fuel Heating Value: <u>8600</u>	Btu/lb	Higher Heating Value
	Heating Season Weighting		
	Category I Weighting Factor: <u>0.225</u>		
	Category II Weighting Factor: <u>0.225</u>		
	Category III Weighting Factor: <u>0.450</u>		
	Category IV Weighting Factor: <u>0.100</u>		
	Year Round Use Weighting		
	Category I Weighting Factor: <u>0.338</u>		
	Category II Weighting Factor: <u>0.338</u>		
	Category III Weighting Factor: <u>0.275</u>		
	Category IV Weighting Factor: <u>0.050</u>		

Calculations:	Category II A	Category II B	Category III	Category IV	Totals
Heat Input (Btu):	660225	659512	662805	677053	
Heat Input Rate (Btu/hr):	72156	76687	130817	294371	
Appliance Water Specific Heat (Btu/lb°F):	1.001	1.001	1.001	1.001	
Heat Output (Btu):	402159	418630	405982	424256	
Heat Output Rate (Btu/hr):	43952	48678	80128	184459	
Total Particulate Emissions (g):	55.3	64.0	52.8	33.4	
Time Interval (hr):	9.2	8.6	5.1	2.3	
Emissions (g/kg):	1.6	1.8	1.5	0.9	
Heating Season Weighting:	0.357	0.414	0.680	0.094	1.5
Year Round Use Weighting:	0.536	0.621	0.416	0.047	1.6
Total Particulate Emissions Rate (g/MJ):	0.13	0.14	0.12	0.07	
Heating Season Weighting:	0.029	0.033	0.056	0.007	0.12
Year Round Use Weighting:	0.044	0.049	0.034	0.004	0.13
Total Particulate Emissions Rate (lbs/mmbtu input):	0.18	0.21	0.18	0.11	
Heating Season Weighting:	0.042	0.048	0.079	0.011	0.18
Year Round Use Weighting:	0.062	0.072	0.048	0.005	0.19
Total Particulate Emissions Rate (lbs/mmbtu output):	0.30	0.34	0.29	0.17	
Heating Season Weighting:	0.068	0.076	0.129	0.017	0.29
Year Round Use Weighting:	0.102	0.114	0.079	0.009	0.30
Total Particulate Emissions Rate (g/hr 10,000BTU):	0.15	0.18	0.26	0.34	
Heating Season Weighting:	0.034	0.040	0.116	0.034	0.22
Year Round Use Weighting:	0.051	0.060	0.071	0.017	0.20
Emissions (g/hr):	6.0	7.4	10.4	14.5	
Heating Season Weighting:	1.36	1.67	4.69	1.45	9.2
Year Round Use Weighting:	2.04	2.51	2.87	0.73	8.1
Efficiency (%):	60.9	63.5	61.3	62.7	
Heating Season Weighting:	13.7	14.3	27.6	6.3	61.8
Year Round Use Weighting:	20.6	21.4	16.8	3.1	62.0
Target Load High:	27669	44270	92230	184459	
Target Load Low:	NA	29513	46115	NA	

Weighted Emissions		8 Hr Burn Load	8 Hr Efficiency Rating
Heating Season Use:	0.18 lbs/mmbtu input	X1 = 48678	X1 = 63.5
Year Round Use:	0.19 lbs/mmbtu input	Y1 = 8.6	Y1 = 8.6
Heating Season Use:	0.29 lbs/mmbtu output	X2 = 80128	X2 = 61.3
Year Round Use:	0.30 lbs/mmbtu output	Y2 = 5.1	Y2 = 5.1

Weighted Efficiency		8 Hr Burn Load =	54019	Btu/hr
Heating Season Use:	61.8 %	8 Hr Efficiency =	63.1	%
Year Round Use:	62.0 %			

EPA Method 28 WHH Test Standard

Manufacturer: Heatmor
 Model: 200X
 Tracking No.: 1997
 Project No.: 0275WB011E
 Technician: A. Kravitz, S. Button
 Comments: _____

Adjustable Parameters:	Category II A	Category II B	Category III	Category IV
Run Number:	6	7	8	2
Test Date:	10/2/14	10/3/14	10/6/14	9/29/14
Total Fuel Weight (lb):	94.2	93.6	93.8	96.1
Average Moisture of Fuel (% dry):	22.7	22.1	21.7	22.1
Average Temperature of Appliance Water at Start of Test:	132.6	133.1	130.8	136.7
Average Temperature of Appliance Water at End of Test:	140.4	154.2	130.7	144.4
Average Thermopile Reading:	81.1	84.5	83.6	86.4
Average Load Side Liquid Flow Rate (gal/min):	1.1	1.0	2.0	4.1
Time Interval (min):	549	516	304	138
Burn Rate (kg/hr):	3.81	4.04	6.90	15.53
Emissions (g):	55.3	64.0	52.8	33.4

Constant Parameters:	Fuel Heating Value: <u>7988</u> Btu/lb	Lower Heating Value
	Heating Season Weighting	
	Category I Weighting Factor: <u>0.225</u>	
	Category II Weighting Factor: <u>0.225</u>	
	Category III Weighting Factor: <u>0.450</u>	
	Category IV Weighting Factor: <u>0.100</u>	
	Year Round Use Weighting	
	Category I Weighting Factor: <u>0.338</u>	
	Category II Weighting Factor: <u>0.338</u>	
	Category III Weighting Factor: <u>0.275</u>	
	Category IV Weighting Factor: <u>0.050</u>	

Calculations:	Category II A	Category II B	Category III	Category IV	Totals
Heat Input (Btu):	613242	612579	615638	628872	
Heat Input Rate (Btu/hr):	67021	71230	121508	273423	
Appliance Water Specific Heat (Btu/lb°F):	1.001	1.001	1.001	1.001	
Heat Output (Btu):	402159	418630	405982	424256	
Heat Output Rate (Btu/hr):	43952	48678	80128	184459	
Total Particulate Emissions (g):	55.3	64.0	52.8	33.4	
Time Interval (hr):	9.2	8.6	5.1	2.3	
Emissions (g/kg):	1.6	1.8	1.5	0.9	
Heating Season Weighting:	0.357	0.414	0.680	0.094	1.5
Year Round Use Weighting:	0.536	0.621	0.416	0.047	1.6
Total Particulate Emissions Rate (g/MJ):	0.13	0.14	0.12	0.07	
Heating Season Weighting:	0.029	0.033	0.056	0.007	0.12
Year Round Use Weighting:	0.044	0.049	0.034	0.004	0.13
Total Particulate Emissions Rate (lbs/mmbtu input):	0.20	0.23	0.19	0.12	
Heating Season Weighting:	0.045	0.052	0.085	0.012	0.19
Year Round Use Weighting:	0.067	0.078	0.052	0.006	0.20
Total Particulate Emissions Rate (lbs/mmbtu output):	0.30	0.34	0.29	0.17	
Heating Season Weighting:	0.068	0.076	0.129	0.017	0.2905
Year Round Use Weighting:	0.102	0.114	0.079	0.009	0.3036
Total Particulate Emissions Rate (g/hr 10,000BTU):	0.15	0.18	0.26	0.34	
Heating Season Weighting:	0.034	0.040	0.116	0.034	0.22
Year Round Use Weighting:	0.051	0.060	0.071	0.017	0.20
Emissions (g/hr):	6.0	7.4	10.4	14.5	
Heating Season Weighting:	1.36	1.67	4.69	1.45	9.2
Year Round Use Weighting:	2.04	2.51	2.87	0.73	8.1
Efficiency (%):	65.6	68.3	65.9	67.5	
Heating Season Weighting:	14.8	15.4	29.7	6.7	66.6
Year Round Use Weighting:	22.1	23.1	18.1	3.4	66.7
Target Load High:	27669	44270	92230	184459	
Target Load Low:	NA	29513	46115	NA	

Weighted Emissions	
Heating Season Use:	0.19 lbs/mmbtu input
Year Round Use:	0.20 lbs/mmbtu input
Heating Season Use:	0.29 lbs/mmbtu output
Year Round Use:	0.30 lbs/mmbtu output

8 Hr Efficiency Rating	
X1 =	68.3
Y1 =	8.6
X2 =	65.9
Y2 =	5.1

Weighted Efficiency %		8 Hr Efficiency =	
Heating Season Use:	66.6 %		67.9 %
Year Round Use:	66.7		

Hydronic Heating Appliances - Test Method 28 WHH Conditioning

Manufacturer: Heatmor
 Model: 200X
 Tracking No.: 1997
 Project No.: 0275WB011E
 Test Date: September 25, 2014
 Technician: A. Kravitz, S. Button
 Operation Category: II

 Stove Weight (lb): 2752
 Water Weight (lb): 2568

Elapsed Time (hr)	Flue Gas Temp (degrees F)
0	207.8
1	328.4
2	106.8
3	105.5
4	445.7
5	316.0
6	424.0
7	358.0
8	361.0
9	460.0
10	367.0

Equipment Numbers:

428A, 428B

*Model: 200X
Heatmor
105 Industrial Park Ct. NE, P.O. Box 787
Warroad, MN 56763*

Run 2

Hydronic Heating Appliances - Test Method 28 WHH Results

Manufacturer: Heatmor
 Model: 200X
 Tracking No.: 1997
 Project No.: 0275WB011E
 Run: 2
 Test Date: September 29, 2014

Burn Rate	15.53 kg/hr dry
Average Tunnel Temperature	169 degrees Fahrenheit
Average Gas Velocity in Dilution Tunnel - vs	10.2 feet/second
Average Gas Flow Rate in Dilution Tunnel - Qsd	23805 dscf/hour
Average Delta p	0.020 inches H2O
Average Delta H	1.06 inches H2O
Total Time of Test	138 minutes

	SAMPLE TRAIN 1	SAMPLE TRAIN 2	AMBIENT SAMPLE TRAIN
Total Sample Volume - Vm	15.43 cubic feet	14.00 cubic feet	53.81 cubic feet
Average Gas Meter Temperature	79 degrees Fahrenheit	79 degrees Fahrenheit	74 degrees Fahrenheit
Total Sample Volume (Standard Conditions) - Vmstd	15.3 dscf	14.0 dscf	52.8 dscf
Total Particulates - mn	8.9 mg	9.2 mg	0.5 mg
Particulate Concentration (dry-standard)	0.00058 grams/dscf	0.00066 grams/dscf	0.000009 grams/dscf
Particulate Emission Rate	31.29 grams	35.53 grams	
Difference from Average	2.12 grams	2.12 grams	
Results Are Acceptable			

AVERAGE	
Total Sample Volume - Vm	14.72 cubic feet
Average Gas Meter Temperature	79 degrees Fahrenheit
Total Sample Volume (Standard Conditions) - Vmstd	14.6 dscf
Total Particulates - mn	
Particulate Concentration (dry-standard)	0.00061 grams/dscf
Particulate Emission Rate	33.41 grams
7.5% of the average emission rate	2.51 grams

Hydronic Heating Appliances - Test Method 28 WHH
Test Data

Run: 2

Manufacturer: Heatmor
Model: 200X
Tracking No.: 1997
Project No.: 0275WB011E
Test Date: September 29, 2014
Technician: A. Kravitz, S. Button
Beginning Clock Time: 12:23
Recording Interval: 1 min.
Total Sampling Time: 138 min.

Velocity Traverse Data												
	Pt.1	Pt.2	Pt.3	Pt.4	Pt.5	Pt.6	Pt.7	Pt.8	Pt.9	Pt.10	Pt.11	Pt.12
Initial dP	0.018	0.022	0.024	0.024	0.022	0.008	0.014	0.020	0.024	0.024	0.024	0.012
Initial Temp.	152	152	152	152	152	152	152	152	152	152	152	152
oF												
Air Velocity: Initial: <50 Final: <50												
Scale Audit: Pre: 10 Post: 10 Induced Draft: 0												
Pitot Tube Leak Test: Pre: 0 Post: 0 % Smoke Capture: 100												
Flue Pipe Cleaned Prior to First Test in Series: Date: 9/23/2014												

PM Control Module:	428A/428B
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:	-0.270 "H2O
Pitot Tube Cp:	0.99
	(1) (2) (amb)
Meter Box Y Factor:	1.007 1.012 0.989
Barometric Pressure:	Begin Middle End
	30.03 30.02 30.02

Signature/Date:	
Tunnel Velocity:	10.22 ft/sec.
Initial Tunnel Flow:	387.6 scfm
Average Tunnel Flow:	396.8 scfm
Tunnel Area:	0.785 ft2
Post-Test Leak Check (1):	0.003 cfm@"Hg
Post-Test Leak Check (2):	0.007 cfm@"Hg
Fuel Moisture (dry basis %):	22.1
Total Particulate (1):	8.9
Total Particulate (2):	9.2

Elapsed Time	Particulate Sampling Data																Fuel Weight, lb		Flow, gpm		Temperature Data, oF										Stack		Specific Heat of Inlet Water (BTU/lb-°F)	Mass Flow Rate of Inlet Water (lb/min)	Heat Output, Btu
	Gas Meter Cubic Feet (1)	Gas Meter Cubic Feet (2)	Gas Meter Cubic Feet (amb)	Sample Rate, cfm (1)	Sample Rate, cfm (2)	Orifice dH (1)	Orifice dH (2)	Orifice dH (amb)	Meter oF (1)	Meter oF (2)	Meter oF (amb)	Meter Vac. In. Hg. (1)	Meter Vac. In. Hg. (2)	Dilution Tunnel Temp.	Dilution Tunnel dP	Pro. Rate (%) (1)	Pro. Rate (%) (2)	Scale Reading	Weight Change	Load Side Liquid Flow Rate	Boiler Side Liquid Flow Rate (optional)	Thermopile ΔT	Boiler to Heat Exch. Temp.	Heat Exch to Boiler Temp.	Inlet Load Temp.	Outlet Load Temp.	Stack	Filter (1)	Filter (2)	Ambient	Draft In. H2O				
0	0.000	0.000	0.000			0.01	0.02	0.50	75	75	74	1.62	1.00	152	0.020			96.1		4.15		75.0	145.2	128.2	68.4	143.4	409	75	75	74	0.000	1.001	34.537		
1	0.110	0.093	0.390	0.11	0.09	1.04	1.19	0.50	75	75	74	1.09	0.40	152	0.020	98	91	95.7	0.40	4.19		74.5	144.9	127.6	68.4	142.9	307	76	77	74	0.000	1.001	34.870	2602	
2	0.220	0.192	0.780	0.11	0.10	1.04	1.20	0.50	75	75	74	1.09	0.40	147	0.020	97	96	95.3	0.40	4.19		74.0	144.2	127.8	68.4	142.3	329	76	78	74	0.000	1.001	34.870	2582	
3	0.330	0.292	1.170	0.11	0.10	1.05	1.20	0.50	75	75	74	1.08	0.40	158	0.020	98	98	94.5	0.80	6.75		69.2	143.9	123.4	68.4	137.6	451	76	78	74	0.000	1.001	56.175	3892	
4	0.440	0.391	1.560	0.11	0.10	1.04	1.21	0.50	75	75	74	1.08	0.40	166	0.020	99	98	93.7	0.80	5.44		71.9	143.2	121.6	67.8	139.7	495	72	76	74	0.000	1.001	45.277	3259	
5	0.550	0.491	1.950	0.11	0.10	1.05	1.20	0.50	75	75	74	1.08	0.40	171	0.020	99	99	92.9	0.80	5.42		71.8	143.4	123.2	67.8	139.6	507	71	74	74	0.000	1.001	45.111	3244	
6	0.660	0.591	2.340	0.11	0.10	1.04	1.21	0.50	75	75	74	1.08	0.40	169	0.020	99	99	91.9	1.00	5.38		71.8	143.4	122.5	67.8	139.6	496	70	74	74	0.000	1.001	44.777	3220	
7	0.770	0.692	2.730	0.11	0.10	1.06	1.20	0.50	75	75	74	1.08	0.40	164	0.020	99	100	90.7	1.20	5.23		71.6	143.4	123.0	67.8	139.4	486	70	73	74	0.000	1.001	43.529	3121	
8	0.880	0.792	3.120	0.11	0.10	1.05	1.21	0.50	75	75	74	1.07	0.40	165	0.020	99	99	90.0	0.70	5.40		72.2	143.4	122.5	67.9	140.0	502	70	74	74	0.000	1.001	44.943	3247	
9	0.990	0.892	3.510	0.11	0.10	1.04	1.21	0.50	75	75	74	1.07	0.40	163	0.020	99	99	88.8	1.20	5.29		72.0	143.6	122.8	67.7	139.7	497	71	73	74	0.000	1.001	44.029	3172	
10	1.100	0.992	3.900	0.11	0.10	1.05	1.21	0.50	75	75	74	1.08	0.40	161	0.020	98	99	87.9	0.90	5.01		73.9	143.7	124.5	67.7	141.6	485	71	73	74	0.000	1.001	41.698	3086	
11	1.210	1.092	4.290	0.11	0.10	1.03	1.21	0.50	75	75	74	1.08	0.40	162	0.020	98	99	86.6	1.30	4.03		74.6	143.9	127.6	67.6	142.2	489	71	74	74	0.000	1.001	33.542	2506	
12	1.320	1.193	4.679	0.11	0.10	1.04	1.20	0.50	75	75	74	1.07	0.40	162	0.020	98	100	85.5	1.10	4.01		74.7	144.0	127.6	67.7	142.3	490	71	74	74	0.000	1.001	33.376	2495	
13	1.429	1.293	5.069	0.11	0.10	1.03	1.20	0.50	76	75	74	1.07	0.40	162	0.020	97	99	84.5	1.00	4.03		75.1	144.6	128.1	67.7	142.8	488	71	74	74	0.000	1.001	33.542	2522	
14	1.538	1.393	5.459	0.11	0.10	1.03	1.21	0.50	76	76	74	1.07	0.40	162	0.020	97	98	83.7	0.80	4.03		75.5	144.9	128.3	67.7	143.2	492	72	75	74	0.000	1.001	33.542	2535	
15	1.647	1.492	5.849	0.11	0.10	1.04	1.20	0.50	76	76	74	1.07	0.40	164	0.020	98	98	82.7	1.00	4.03		75.8	145.2	129.0	67.6	143.4	497	72	75	74	0.000	1.001	33.542	2547	
16	1.756	1.591	6.239	0.11	0.10	1.03	1.20	0.50	76	76	74	1.07	0.40	166	0.020	98	98	81.3	1.40	4.03		76.1	145.4	129.0	67.6	143.7	505	71	76	74	0.000	1.001	33.542	2555	
17	1.865	1.691	6.629	0.11	0.10	1.03	1.21	0.50	76	76	74	1.06	0.40	167	0.020	98	99	80.3	1.00	4.03		76.7	146.0	129.1	67.5	144.2	510	71	76	74	0.000	1.001	33.543	2576	
18	1.973	1.791	7.019	0.11	0.10	1.03	1.20	0.50	76	76	74	1.07	0.40	169	0.020	97	99	79.3	1.00	4.01		77.3	146.3	129.6	67.5	144.8	515	72	76	74	0.000	1.001	33.376	2582	
19	2.081	1.891	7.409	0.11	0.10	1.04	1.20	0.50	76	76	74	1.06	0.40	171	0.020	97	99	78.5	0.80	4.02		77.7	146.8	130.0	67.5	145.2	520	72	77	74	0.000	1.001	33.459	2601	
20	2.189	1.991	7.799	0.11	0.10	1.03	1.21	0.50	76	76	74	1.06	0.40	174	0.020	97	99	78.0	0.50	3.99		78.0	147.4	130.5	67.6	145.6	528	73	77	74	0.000	1.001	33.210	2595	
21	2.296	2.090	8.189	0.11	0.10	1.00	1.21	0.50	76	76	74	1.03	0.40	175	0.020	97	98	76.3	1.70	4.03		78.6	147.8	130.9	67.6	146.3	530	73	78	74	0.000	1.001	33.542	2641	
22	2.403	2.189	8.579	0.11	0.10	1.00	1.20	0.50	76	76	74	1.03	0.40	179	0.020	97	99	74.8	1.50	4.05		79.3	148.3	130.8	67.6	146.8	539	74	78	74	0.000	1.001	33.709	2675	
23	2.511	2.289	8.969	0.11	0.10	1.00	1.20	0.50	77	77	74	1.03	0.40	181	0.020	98	100	73.4	1.40	4.01		79.6	148.7	131.3	67.7	147.4	542	74	78	74	0.000	1.001	33.375	2661	
24	2.619	2.384	9.359	0.11	0.09	1.00	1.02	0.50	77	77	74	1.03	0.20	182	0.020	98	95	72.8	0.60	4.03		79.8	149.2	131.9	67.7	147.5	544	75	79	74	0.000	1.001	33.542	2681	
25	2.727	2.485	9.749	0.11	0.10	0.99	1.25	0.50	77	77	74	1.01	0.00	183	0.020	98	101	71.9	0.90	4.02		80.7	150.1	132.5	67.6	148.3	542	75	80	74	0.000	1.001	33.459	2704	
26	2.835	2.588	10.139	0.11	0.10	0.98	1.26	0.50	77	77	74	1.02	0.00	183	0.020	98	103	70.8	1.10	4.03		81.1	150.6	133.0	67.6	148.7	538	76	80	74	0.000	1.001	33.542	2723	
27	2.942	2.689	10.529	0.11	0.10	0.98	1.26	0.50	77	77	74	1.01	0.00	183	0.020	97	101	69.3	1.50	3.98		82.1	150.9	133.2	67.8	149.8	533	76	81	74	0.000	1.001	33.125	2721	
28	3.050	2.792	10.919	0.11	0.10	0.98	1.25	0.50	77	77	74	1.01	0.00	183	0.020	98	103	68.4	0.90	3.99		82.4	151.5	133.9	67.7	150.0	537	77	81	74	0.000	1.001	33.209	2738	
29	3.158	2.895	11.309	0.11	0.10	0.98	1.24	0.50	77	77	74	1.01	0.00	183	0.020	98	103	67.1	1.30	4.02		82.9	152.1	133.9	67.7	150.5	539	77	80	74	0.000	1.001	33.459	2776	
30	3.266	2.994	11.699	0.11	0.10	0.99	1.08	0.50	77	77	74	1.01	-0.20	186	0.020	98	99	66.2	0.90	4.00		83.4	152.5	134.6	67.6	150.9	543	77	81	74	0.000	1.001	33.293	2779	
31	3.375	3.085	12.089	0.11	0.09	0.96	1.03	0.50	77	77	74	1.00	-0.20	188	0.020	99	91	64.9																	

Elapsed Time	Particulate Sampling Data																Fuel Weight, lb		Flow, gpm		Temperature Data, oF											Stack	Specific Heat of Inlet Water (BTU/lb-°F)	Mass Flow Rate of Inlet Water (lb/min)	Heat Output, Btu
	Gas Meter Cubic Feet (1)	Gas Meter Cubic Feet (2)	Gas Meter Cubic Feet (amb)	Sample Rate, cfm (1)	Sample Rate, cfm (2)	Orifice dH (1)	Orifice dH (2)	Orifice dH (amb)	Meter oF (1)	Meter oF (2)	Meter oF (amb)	Meter Vac. In. Hg. (1)	Meter Vac. In. Hg. (2)	Dilution Tunnel Temp.	Dilution Tunnel dP	Pro. Rate (%) (1)	Pro. Rate (%) (2)	Scale Reading	Weight Change	Load Side Liquid Flow Rate	Boiler Side Liquid Flow Rate (optional)	Thermopile ΔT	Boiler to Heat Exch. Temp.	Heat Exch to Boiler Temp.	Inlet Load Temp.	Outlet Load Temp.	Stack	Filter (1)	Filter (2)	Ambient	Draft In. H2O				
34	3.699	3.381	13.259	0.11	0.10	1.00	1.18	0.50	78	78	74	0.96	-0.30	193	0.020	98	99	61.4	0.90	3.84		85.2	154.9	137.2	67.8	153.0	555	79	82	74	0.000	1.001	31.960	2728	
35	3.807	3.479	13.648	0.11	0.10	0.98	1.13	0.50	78	78	74	0.95	-0.40	192	0.020	98	98	60.1	1.30	4.01		86.1	155.2	137.0	67.7	153.9	546	79	82	74	0.000	1.001	33.375	2878	
36	3.915	3.576	14.038	0.11	0.10	0.99	1.23	0.50	78	78	74	0.94	-7.80	194	0.020	99	98	58.7	1.40	3.98		86.5	156.2	137.3	67.9	154.3	548	79	79	74	0.000	1.001	33.125	2867	
37	4.024	3.678	14.428	0.11	0.10	0.99	1.25	0.50	78	78	74	0.94	-7.70	197	0.020	100	103	57.9	0.80	4.01		87.1	156.4	137.6	67.8	154.9	555	80	79	74	0.000	1.001	33.375	2911	
38	4.132	3.780	14.818	0.11	0.10	0.97	1.20	0.50	78	78	74	0.93	-7.40	195	0.020	99	103	56.8	1.10	4.00		87.2	156.7	137.6	68.0	155.2	548	80	79	74	0.000	1.001	33.291	2906	
39	4.240	3.880	15.208	0.11	0.10	1.00	1.22	0.50	78	78	74	0.91	-7.40	193	0.020	98	100	55.7	1.10	4.01		88.1	157.6	138.3	67.8	156.0	544	80	79	74	0.000	1.001	33.375	2945	
40	4.348	3.981	15.598	0.11	0.10	1.01	1.23	0.50	78	78	74	0.90	-7.10	192	0.020	98	101	54.5	1.20	4.00		88.9	157.9	138.6	67.8	156.6	539	80	79	74	0.000	1.001	33.292	2962	
41	4.456	4.091	15.988	0.11	0.11	1.00	1.15	0.50	78	78	74	0.90	0.30	192	0.020	98	110	53.4	1.10	4.03		88.9	158.5	139.7	68.0	156.9	535	80	79	74	0.000	1.001	33.540	2986	
42	4.565	4.191	16.378	0.11	0.10	1.01	1.21	0.50	78	78	74	0.90	0.30	191	0.020	99	100	52.4	1.00	3.99		89.4	158.9	139.5	67.9	157.3	531	81	79	74	0.000	1.001	33.208	2973	
43	4.673	4.292	16.768	0.11	0.10	0.98	1.21	0.50	78	78	74	0.90	0.30	191	0.020	98	101	51.3	1.10	3.98		89.6	159.3	140.0	67.8	157.4	528	81	79	74	0.000	1.001	33.125	2973	
44	4.781	4.391	17.158	0.11	0.10	1.00	1.20	0.50	78	78	74	0.89	0.30	190	0.020	98	99	50.4	0.90	4.02		90.0	159.5	139.8	67.8	157.8	527	81	79	74	0.000	1.001	33.458	3014	
45	4.889	4.492	17.548	0.11	0.10	0.99	1.21	0.50	78	79	74	0.89	0.30	190	0.020	98	101	49.2	1.20	4.05		90.2	159.8	139.9	67.8	158.0	525	81	80	74	0.000	1.001	33.708	3044	
46	4.997	4.593	17.938	0.11	0.10	1.00	1.20	0.50	78	79	74	0.89	0.30	191	0.020	98	101	48.2	1.00	3.96		90.4	159.9	140.3	67.8	158.2	526	81	80	74	0.000	1.001	32.959	2984	
47	5.105	4.693	18.328	0.11	0.10	0.99	1.20	0.50	79	79	74	0.89	0.30	191	0.020	98	100	47.2	1.00	4.00		90.4	160.2	140.4	67.8	158.2	525	81	80	74	0.000	1.001	33.292	3013	
48	5.214	4.794	18.718	0.11	0.10	1.00	1.23	0.50	79	79	74	0.89	0.30	192	0.020	99	101	46.2	1.00	4.00		90.6	160.3	140.4	67.7	158.3	530	81	81	74	0.000	1.001	33.292	3021	
49	5.322	4.893	19.108	0.11	0.10	0.99	1.21	0.50	79	79	74	0.89	0.30	194	0.020	98	99	45.1	1.10	4.00		91.1	160.8	141.0	67.7	158.9	536	81	81	74	0.000	1.001	33.292	3037	
50	5.430	4.994	19.498	0.11	0.10	1.00	1.21	0.50	79	79	74	0.89	0.30	195	0.020	98	101	44.1	1.00	4.03		91.3	161.0	141.5	67.9	159.1	536	81	81	74	0.000	1.001	33.541	3065	
51	5.538	5.094	19.888	0.11	0.10	0.99	1.21	0.50	79	79	74	0.89	0.30	194	0.020	98	100	43.1	1.00	4.00		91.7	161.4	141.4	67.8	159.4	532	81	81	74	0.000	1.001	33.292	3055	
52	5.646	5.195	20.278	0.11	0.10	1.00	1.21	0.50	79	79	74	0.88	0.30	193	0.020	98	101	42.2	0.90	4.00		91.9	161.7	141.6	67.8	159.6	526	82	82	74	0.000	1.001	33.292	3061	
53	5.755	5.296	20.668	0.11	0.10	0.98	1.20	0.50	79	79	74	0.89	0.30	192	0.020	99	101	41.2	1.00	4.01		92.0	161.9	141.6	67.8	159.8	520	82	82	74	0.000	1.001	33.375	3075	
54	5.864	5.395	21.058	0.11	0.10	0.99	1.21	0.50	79	79	74	0.88	0.30	189	0.020	99	99	40.3	0.90	3.64		91.9	161.8	142.7	67.8	159.7	511	81	82	74	0.000	1.001	30.295	2788	
55	5.973	5.496	21.448	0.11	0.10	0.98	1.21	0.50	79	79	74	0.89	0.30	187	0.020	99	101	39.3	1.00	4.03		91.7	162.0	141.8	67.9	159.5	500	82	82	74	0.000	1.001	33.541	3079	
56	6.082	5.596	21.838	0.11	0.10	0.99	1.21	0.50	79	79	75	0.89	0.30	185	0.020	99	100	38.5	0.80	4.00		91.9	161.8	141.8	67.8	159.7	496	82	82	75	0.000	1.001	33.292	3064	
57	6.191	5.697	22.228	0.11	0.10	0.98	1.21	0.50	79	79	74	0.88	0.30	184	0.020	99	101	37.6	0.90	4.03		92.2	162.0	142.0	67.6	159.8	492	82	82	74	0.000	1.001	33.542	3095	
58	6.300	5.798	22.617	0.11	0.10	0.99	1.22	0.50	79	79	74	0.89	0.30	183	0.020	98	101	36.7	0.90	4.00		92.1	162.0	142.6	67.8	160.0	492	82	82	74	0.000	1.001	33.292	3071	
59	6.411	5.898	23.007	0.11	0.10	0.99	1.23	0.50	79	79	74	0.89	0.30	182	0.020	100	99	35.9	0.80	4.01		92.2	162.1	142.0	67.8	160.0	491	81	82	74	0.000	1.001	33.375	3081	
60	6.522	5.999	23.397	0.11	0.10	1.00	1.21	0.50	79	79	74	0.90	0.30	182	0.020	100	100	35.1	0.80	4.02		92.1	162.1	142.0	67.8	159.8	490	81	82	74	0.000	1.001	33.458	3083	
61	6.633	6.099																																	

Elapsed Time	Particulate Sampling Data																Fuel Weight, lb		Flow, gpm		Temperature Data, oF												Stack	Specific Heat of Inlet Water (BTU/lb-°F)	Mass Flow Rate of Inlet Water (lb/min)	Heat Output, Btu
	Gas Meter Cubic Feet (1)	Gas Meter Cubic Feet (2)	Gas Meter Cubic Feet (amb)	Sample Rate, cfm (1)	Sample Rate, cfm (2)	Orifice dH (1)	Orifice dH (2)	Orifice dH (amb)	Meter oF (1)	Meter oF (2)	Meter oF (amb)	Meter Vac. In. Hg. (1)	Meter Vac. In. Hg. (2)	Dilution Tunnel Temp.	Dilution Tunnel dP	Pro. Rate (%) (1)	Pro. Rate (%) (2)	Scale Reading	Weight Change	Load Side Liquid Flow Rate	Boiler Side Liquid Flow Rate (optional)	Thermopile ΔT	Boiler to Heat Exch. Temp.	Heat Exch to Boiler Temp.	Inlet Load Temp.	Outlet Load Temp.	Stack	Filter (1)	Filter (2)	Ambient	Draft In. H2O					
80	8.796	8.018	31.197	0.12	0.10	1.12	1.23	0.50	80	80	74	1.00	0.30	172	0.020	103	101	20.0	0.70	4.00		91.7	161.9	141.8	67.8	159.5	469	80	81	74	0.000	1.001	33.292	3057		
81	8.908	8.120	31.586	0.11	0.10	1.13	1.23	0.50	80	80	74	1.01	0.30	171	0.020	100	100	19.5	0.50	4.03		91.6	161.8	141.4	67.8	159.4	466	80	81	74	0.000	1.001	33.541	3077		
82	9.019	8.221	31.976	0.11	0.10	1.11	1.24	0.50	80	80	74	1.00	0.30	170	0.020	99	99	18.8	0.70	4.17		91.3	161.6	141.2	67.8	159.1	464	80	80	74	0.000	1.001	34.707	3173		
83	9.129	8.323	32.366	0.11	0.10	1.11	1.24	0.50	80	80	74	1.00	0.30	170	0.020	98	100	18.2	0.60	4.19		91.2	161.5	140.3	67.7	158.9	463	80	80	74	0.000	1.001	34.873	3183		
84	9.237	8.425	32.756	0.11	0.10	1.11	1.23	0.50	80	80	74	1.00	0.30	169	0.020	96	100	17.5	0.70	4.23		90.9	161.5	140.7	67.7	158.7	461	80	80	74	0.000	1.001	35.206	3205		
85	9.344	8.528	33.146	0.11	0.10	1.12	1.23	0.50	80	80	74	1.00	0.30	169	0.020	95	101	16.9	0.60	4.21		91.0	161.3	140.4	67.7	158.7	461	80	80	74	0.000	1.001	35.040	3191		
86	9.449	8.629	33.536	0.11	0.10	1.10	1.24	0.50	80	80	74	1.00	0.30	168	0.020	94	99	16.5	0.40	4.37		90.8	161.1	139.5	67.7	158.5	459	80	80	74	0.000	1.001	36.372	3308		
87	9.563	8.731	33.926	0.11	0.10	1.12	1.24	0.50	80	80	74	1.00	0.30	167	0.020	101	100	15.8	0.70	3.96		90.0	160.8	140.9	67.7	157.8	458	79	80	74	0.000	1.001	32.959	2971		
88	9.675	8.833	34.316	0.11	0.10	1.11	1.23	0.50	80	80	75	1.00	0.30	168	0.020	100	100	15.4	0.40	4.07		90.6	160.8	140.8	67.6	158.3	461	79	80	75	0.000	1.001	33.875	3074		
89	9.786	8.935	34.706	0.11	0.10	1.11	1.23	0.50	80	80	75	1.00	0.30	168	0.020	99	100	14.7	0.70	4.11		90.6	160.7	140.6	67.7	158.3	461	79	80	75	0.000	1.001	34.208	3103		
90	9.895	9.036	35.096	0.11	0.10	1.11	1.24	0.50	80	80	75	1.00	0.30	167	0.020	97	99	14.1	0.60	4.09		90.5	160.6	140.6	67.7	158.2	460	79	80	75	0.000	1.001	34.041	3083		
91	10.005	9.139	35.486	0.11	0.10	1.11	1.24	0.50	80	80	75	1.00	0.30	167	0.020	98	101	13.7	0.40	4.06		90.5	160.7	140.5	67.6	158.1	460	79	79	75	0.000	1.001	33.792	3062		
92	10.115	9.241	35.876	0.11	0.10	1.11	1.23	0.50	80	80	74	1.00	0.30	166	0.020	98	100	13.1	0.60	3.96		90.7	160.6	141.0	67.7	158.4	458	79	79	74	0.000	1.001	32.959	2993		
93	10.235	9.343	36.266	0.12	0.10	1.11	1.24	0.50	80	80	74	1.00	0.30	166	0.020	107	100	12.6	0.50	4.01		90.7	160.5	140.8	67.6	158.3	460	79	79	74	0.000	1.001	33.376	3030		
94	10.355	9.445	36.656	0.12	0.10	1.10	1.23	0.50	80	80	75	1.00	0.30	166	0.020	107	100	12.2	0.40	3.96		90.6	160.3	140.4	67.6	158.2	458	79	79	75	0.000	1.001	32.960	2991		
95	10.475	9.547	37.046	0.12	0.10	1.11	1.25	0.50	80	80	75	1.00	0.30	165	0.020	107	100	11.7	0.50	3.94		63.8	160.6	141.3	94.4	158.2	459	78	79	75	0.000	1.001	32.646	2084		
96	10.595	9.650	37.436	0.12	0.10	1.11	1.26	0.50	80	80	75	1.01	0.30	165	0.020	107	101	11.2	0.50	3.51		68.9	160.9	144.4	90.6	159.5	460	78	79	75	0.000	1.001	29.104	2009		
97	10.705	9.751	37.826	0.11	0.10	1.12	1.26	0.50	80	80	75	1.01	0.30	165	0.020	98	99	10.8	0.40	-0.01		80.5	161.3	161.7	67.9	148.3	462	78	79	75	0.000	1.001	-0.083	-7		
98	10.815	9.854	38.216	0.11	0.10	1.11	1.27	0.50	80	80	75	1.01	0.30	165	0.020	98	101	10.3	0.50	3.70		91.4	162.1	143.6	67.9	159.3	459	78	79	75	0.000	1.001	30.794	2819		
99	10.925	9.957	38.606	0.11	0.10	1.12	1.26	0.50	80	80	74	1.01	0.30	164	0.020	98	101	9.8	0.50	4.45		91.7	162.1	139.8	67.7	159.4	460	78	78	74	0.000	1.001	37.037	3399		
100	11.045	10.060	38.996	0.12	0.10	1.12	1.27	0.50	80	80	74	1.01	0.30	164	0.020	107	101	9.4	0.40	4.00		92.3	161.8	141.8	67.6	159.8	457	78	78	74	0.000	1.001	33.293	3076		
101	11.165	10.162	39.386	0.12	0.10	1.12	1.26	0.50	80	80	74	1.01	0.30	163	0.020	106	100	9.0	0.40	3.99		92.3	161.8	141.7	67.6	159.9	451	78	78	74	0.000	1.001	33.209	3068		
102	11.285	10.265	39.776	0.12	0.10	1.10	1.27	0.50	80	80	75	1.01	0.30	161	0.020	106	101	8.7	0.30	4.02		91.9	161.8	141.9	67.7	159.6	446	77	78	75	0.000	1.001	33.458	3077		
103	11.395	10.369	40.166	0.11	0.10	1.12	1.28	0.50	80	80	75	1.01	0.30	160	0.020	97	101	8.3	0.40	3.96		91.9	161.5	142.1	67.7	159.6	444	77	78	75	0.000	1.001	32.959	3032		
104	11.505	10.471	40.555	0.11	0.10	1.11	1.28	0.50	80	80	74	1.01	0.30	160	0.020	97	100	8.0	0.30	4.00		91.5	161.2	141.5	67.5	159.1	445	77	78	74	0.000	1.001	33.293	3051		
105	11.615	10.575	40.945	0.11	0.10	1.12	1.28	0.50	80	80	75	1.01	0.30	159	0.020	97	101	7.6	0.40	3.98		91.4	161.1	141.2	67.7	159.1	442	77	78	75	0.000	1.001	33.126	3030		
106	11.725	10.679	41.335	0.11	0.10	1.13	1.28	0.50	80	80	74	1.01	0.30	158	0.020	97	101	7.2	0.40	3.96		91.1	161.1	141.3	67.6	158.6	439	77	78	74	0.000	1.001	32.960	3005		
107	11.845	10.782																																		

Elapsed Time	Particulate Sampling Data																Fuel Weight, lb		Flow, gpm		Temperature Data, oF											Stack			
	Gas Meter Cubic Feet (1)	Gas Meter Cubic Feet (2)	Gas Meter Cubic Feet (amb)	Sample Rate, cfm (1)	Sample Rate, cfm (2)	Orifice dH (1)	Orifice dH (2)	Orifice dH (amb)	Meter oF (1)	Meter oF (2)	Meter oF (amb)	Meter Vac. In. Hg. (1)	Meter Vac. In. Hg. (2)	Dilution Tunnel Temp.	Dilution Tunnel dP	Pro. Rate (%) (1)	Pro. Rate (%) (2)	Scale Reading	Weight Change	Load Side Liquid Flow Rate	Boiler Side Liquid Flow Rate (optional)	Thermopile ΔT	Boiler to Heat Exch. Temp.	Heat Exch to Boiler Temp.	Inlet Load Temp.	Outlet Load Temp.	Stack	Filter (1)	Filter (2)	Ambient	Draft In. H2O	Specific Heat of Inlet Water (BTU/lb-°F)	Mass Flow Rate of Inlet Water (lb/min)	Heat Output, Btu	
126	14.035	12.756	49.135	0.12	0.10	1.13	1.28	0.50	80	80	74	1.01	0.30	147	0.020	105	100	2.4	0.20	3.96		86.6	156.4	138.4	67.5	154.1	403	75	76	74	0.000	1.001	32.960	2857	
127	14.155	12.861	49.524	0.12	0.11	1.13	1.30	0.50	80	80	74	1.01	0.30	147	0.020	105	101	2.1	0.30	4.00		86.4	156.1	137.6	67.7	154.0	404	75	76	74	0.000	1.001	33.292	2878	
128	14.275	12.964	49.914	0.12	0.10	1.12	1.29	0.50	80	80	74	1.01	0.30	146	0.020	105	99	1.9	0.20	3.98		86.3	155.9	137.1	67.6	153.9	402	75	76	74	0.000	1.001	33.126	2861	
129	14.385	13.068	50.304	0.11	0.10	1.12	1.28	0.50	80	80	74	1.01	0.30	146	0.020	96	100	1.8	0.10	4.00		85.9	155.7	137.2	67.5	153.4	400	75	76	74	0.000	1.001	33.293	2864	
130	14.505	13.172	50.694	0.12	0.10	1.12	1.29	0.50	80	80	74	1.02	0.30	146	0.020	105	100	1.5	0.30	4.00		85.9	155.4	136.5	67.5	153.5	399	75	76	74	0.000	1.001	33.293	2864	
131	14.625	13.275	51.084	0.12	0.10	1.13	1.28	0.50	80	80	74	1.01	0.30	146	0.020	105	99	1.4	0.10	3.88		85.4	155.2	137.2	67.5	152.9	400	74	76	74	0.000	1.001	32.294	2761	
132	14.745	13.380	51.474	0.12	0.11	1.12	1.28	0.50	80	80	74	1.01	0.30	145	0.020	105	101	1.1	0.30	3.99		85.3	155.0	136.3	67.6	152.9	395	74	76	74	0.000	1.001	33.209	2835	
133	14.855	13.484	51.864	0.11	0.10	1.11	1.28	0.50	80	80	74	1.01	0.30	144	0.020	96	100	0.9	0.20	3.96		84.7	154.6	136.3	67.7	152.4	394	74	76	74	0.000	1.001	32.959	2795	
134	14.965	13.587	52.254	0.11	0.10	1.12	1.28	0.50	80	80	74	1.01	0.30	144	0.020	96	99	0.8	0.10	4.00		84.4	154.3	136.1	67.6	152.0	392	74	76	74	0.000	1.001	33.293	2814	
135	15.075	13.692	52.644	0.11	0.11	1.13	1.29	0.50	80	80	74	1.01	0.30	143	0.020	96	101	0.5	0.30	4.00		84.5	154.2	135.8	67.6	152.1	389	74	76	74	0.000	1.001	33.292	2817	
136	15.195	13.796	53.034	0.12	0.10	1.13	1.29	0.50	80	80	74	1.01	0.30	143	0.020	105	100	0.4	0.10	3.76		84.3	153.8	136.0	67.6	151.9	386	74	75	74	0.000	1.001	31.295	2643	
137	15.315	13.900	53.424	0.12	0.10	1.12	1.29	0.50	80	80	74	1.01	0.30	142	0.020	105	100	0.2	0.20	3.99		83.9	153.5	135.5	67.5	151.4	384	74	75	74	0.000	1.001	33.210	2788	
138	15.435	14.004	53.814	0.12	0.10	1.12	1.29	0.50	80	80	74	1.01	0.30	142	0.020	105	100	0.0	0.20	3.99		83.6	153.3	135.5	67.6	151.2	381	74	75	74	0.000	1.001	33.210	2780	

Elapsed Time	Particulate Sampling Data																Fuel Weight, lb		Flow, gpm		Temperature Data, oF										Stack				
	Gas Meter Cubic Feet (1)	Gas Meter Cubic Feet (2)	Gas Meter Cubic Feet (amb)	Sample Rate, cfm (1)	Sample Rate, cfm (2)	Orifice dH (1)	Orifice dH (2)	Orifice dH (amb)	Meter oF (1)	Meter oF (2)	Meter oF (amb)	Meter Vac. In. Hg. (1)	Meter Vac. In. Hg. (2)	Dilution Tunnel Temp.	Dilution Tunnel dP	Pro. Rate (%) (1)	Pro. Rate (%) (2)	Scale Reading	Weight Change	Load Side Liquid Flow Rate	Boiler Side Liquid Flow Rate (optional)	Thermopile ΔT	Boiler to Heat Exch. Temp.	Heat Exch to Boiler Temp.	Inlet Load Temp.	Outlet Load Temp.	Stack	Filter (1)	Filter (2)	Ambient	Draft In. H2O	Specific Heat of Inlet Water (BTU/lb-°F)	Mass Flow Rate of Inlet Water (lb/min)	Heat Output, Btu	
	15.435	14.004	53.814	0.11	0.10	1.06	1.22	0.50	78.65	78.70	74.12			169.43	0.02	99.96	99.98			4.06	#DIV/0!	86.4	156.6	137.7	68.1	154.4		77.35	78.56		0.00			2915.96	

Hydronic Heating Appliances - Test Method 28 WHH Fuel Moisture

Manufacturer:	Heatmor
Model:	200X
Tracking No.:	1997
Project No.:	0275WB011E
Technician:	A. Kravitz, S. Button
Run #:	2
Test Date:	September 29, 2014

[illegible]

Total Weight of Load (lb): 90.5

Total Moisture of Load (%): 22.1

Equipment Numbers:
340, 431, 353

Run Notes

Client: HeatmorModel: 200XProject #: 0275WB011ETracking #: 1997Run #: 2 Date: 9/29/14Test Crew: A. Kravitz, J. Clark, S. ButtonOMNI Equipment ID #(s): 428A, 428B, 356PREBURNDESCRIBE OR SKETCH AIR OR THERMOMSTAT SETTINGS BELOW:
(SETTINGS MUST BE ACCURATE AND REPRODUCIBLE)

PRIMARY:

Target Output: 100%

SECONDARY: N/ATERTIARY: N/AFAN: AutoPREBURN SETTINGS AND ACTIVITIES

TIME	AIR (THERMO) CHANGES PRIMARY/SECONDARY/TERTIARY	FAN SETTING CHANGE	ADD FUEL + WT.	ADD FUEL - WT.	RAKE COAL	COMMENT
	<u>None</u>					

TESTTEST FUEL CONFIGURATION SKETCH
(INDICATE VIEW ANGLE)

See fuel photographs

START UP PROCEDURES

BYPASS: N/AFUEL LOADING: Done @ 1:30DOOR: Closed @ 1:40PRIMARY AIR: Set @ 1:40

OTHER:

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

PRIMARY:

Target Output: 100%

SECONDARY: N/ATERTIARY: N/AFAN: AutoTechnician signature: [Signature]Date: 9/29/14

Supplemental Data EPA 5G/5H

Client: Heatmor

Model: 200X

Project #: 0275WB011E

Tracking #: 1997

Date: 9/29/14 Run #: 2 Booth: E3

Test Crew: A. Krawitz, J. Clark, S. Bottom Start Time: _____ Stop Time: _____

OMNI Equipment #(s): 132, 204, 410, 417, 419, 559, 513, 533

Stack Gas Leak Check:

Initial: Ø

Final: Ø

Dilution Tunnel Gas Leak Check (5H only):

Initial: N/A

Final: N/A

Calibrations: Span Gas CO₂: 16.80 O₂: N/A CO: 4.245 CO₂(DT): N/A
Mid Gas CO₂: 9.87 O₂: N/A CO: 2.493 CO₂(DT): N/A

Time	Pre Test		
	Zero	Span	Mid
	<u>11:00</u>	<u>11:01</u>	<u>11:02</u>
O ₂	<u>N/A</u>		
CO ₂	<u>0.12</u>	<u>16.90</u>	<u>10.23</u>
CO	<u>0.024</u>	<u>4.327</u>	<u>2.538</u>
CO ₂ (DT)	<u>N/A</u>		

Post Test		
Zero	Span	Mid
<u>1615</u>	<u>1617</u>	<u>16:19</u>
<u>N/A</u>		
<u>0.16</u>	<u>16.87</u>	<u>10.27</u>
<u>0.031</u>	<u>4.337</u>	<u>2.509</u>
<u>N/A</u>		

Air Velocity (ft/min): Initial: 450 Final: 456

Scale Audit (lbs): Initial: 10.0 Final: 10.0

Pitot Tube Leak Test: Initial: Ø Final: Ø

Stack Diameter (inches): 8

Induced Draft: Ø

% Smoke Capture: 100

Flue Pipe Cleaned Prior to First Test in Series:

Date: 9/23/14 Initials: AK

	Initial	Middle	Ending
P _b (in/Hg)	<u>30.63</u>	<u>30.02</u>	<u>30.02</u>
Ambient (°F)	<u>74</u>	<u>74</u>	<u>71</u>

Tunnel Traverse	
dP (in H ₂ O)	T(°F)
<u>0.018</u>	<u>152</u>
<u>0.022</u>	
<u>0.024</u>	
<u>0.024</u>	
<u>0.022</u>	
<u>0.008</u>	
<u>0.014</u>	
<u>0.020</u>	
<u>0.024</u>	
<u>0.024</u>	
<u>0.024</u>	
<u>0.012</u>	
Static P:	<u>-0.27</u>

Technician signature: [Signature]

Date: 10/2/14

OMNI-Test Laboratories, Inc.

Manufacturer:	Heatmor
Model:	200X
Date:	09/29/14
Run:	2
Control #:	0275WB011E
Test Duration:	138
Output Category:	IV

Technicians: A. Kravitz
S. Button

Test Results in Accordance with CSA B415.1-09

	HHV Basis	LHV Basis
Overall Efficiency	72.1%	77.6%
Combustion Efficiency	94.3%	94.3%
Heat Transfer Efficiency	76%	82.3%

Output Rate (kJ/h)	222,602	211,162	(Btu/h)
Burn Rate (kg/h)	15.53	34.22	(lb/h)
Input (kJ/h)	308,771	292,903	(Btu/h)

Test Load Weight (dry kg)	35.71	78.71	dry lb
MC wet (%)	18.1		
MC dry (%)	22.10		
Particulate (g)	0		
CO (g)	2,793		
Test Duration (h)	2.30		

Emissions	Particulate	CO
g/MJ Output	0.00	5.46
g/kg Dry Fuel	0.00	78.21
g/h	0.00	1214.33
lb/MM Btu Output	0.00	12.68

Air/Fuel Ratio (A/F)	8.25
----------------------	------

VERSION:

2.3

3/23/2010

*Model: 200X
Heatmor
105 Industrial Park Ct. NE, P.O. Box 787
Warroad, MN 56763*

Run 3

Run Notes

Client: HeatmorModel: 200XProject #: 0275WB011ETracking #: 1997Run #: 3Date: 9/30/14Test Crew: A. Kravitz, J. Clark, S. ButtonOMNI Equipment ID #(s): 428A, 428B, 356PREBURNDESCRIBE OR SKETCH AIR OR THERMOMSTAT SETTINGS BELOW:
(SETTINGS MUST BE ACCURATE AND REPRODUCIBLE)

PRIMARY:

Target Output: under 15%
= 27806 BTU/hr

SECONDARY: N/ATERTIARY: N/AFAN: AutoPREBURN SETTINGS AND ACTIVITIES

TIME	AIR (THERMO) CHANGES PRIMARY/SECONDARY/TERTIARY	FAN SETTING CHANGE	ADD FUEL + WT.	ADD FUEL - WT.	RAKE COAL	COMMENT
49:00	relit PB				raided	
15:00						PB End

TESTTEST FUEL CONFIGURATION SKETCH
(INDICATE VIEW ANGLE)

See fuel photographs

START UP PROCEDURES

BYPASS: N/AFUEL LOADING: Done @ 1:00DOOR: Closed @ 1:20PRIMARY AIR: set @ 1:30

OTHER:

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

PRIMARY:

Target Output: under 15%
= 27806 BTU/hr

SECONDARY: N/ATERTIARY: N/A*FAN: AutoTechnician signature: [Signature]Date: 9/30/14

Unit cycled on @ 328 min ET.

Test run ended @ 396 min ET (<1.0 lb weight drop in 60 min)

Supplemental Data EPA 5G/5H

Client: Heatmor

Model: 200X

Project #: 0275WB011E

Tracking #: 1997

Date: 9/30/14

Run #: 3

Booth: E3

Test Crew: A. Krawitz, J. Clark, S. Botton

Start Time: 13:26

Stop Time:

OMNI Equipment #(s): 132, wa, 410, 417, 419, 559, 513, 533

Stack Gas Leak Check:

Initial: 0

Final:

Dilution Tunnel Gas Leak Check (5H only):

Initial: N/A

Final: N/A

Calibrations: Span Gas CO₂: 16.80 O₂: N/A CO: 4.295 CO₂(DT): N/A
Mid Gas CO₂: 9.87 O₂: N/A CO: 2.493 CO₂(DT): N/A

Time
O ₂
CO ₂
CO
CO ₂ (DT)

Pre Test		
Zero	Span	Mid
<u>10:51</u>	<u>10:52</u>	<u>10:53</u>
<u>N/A</u>	<u></u>	<u></u>
<u>0.00</u>	<u>16.82</u>	<u>10.18</u>
<u>0.00</u>	<u>4.296</u>	<u>2.516</u>
<u>N/A</u>	<u></u>	<u></u>

Post Test		
Zero	Span	Mid
<u>N/A</u>	<u></u>	<u></u>
<u></u>	<u></u>	<u></u>
<u></u>	<u></u>	<u></u>
<u>N/A</u>	<u></u>	<u></u>

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

Scale Audit (lbs): Initial: 10.0 Final:

Pitot Tube Leak Test: Initial: 0 Final:

Stack Diameter (inches): 8

Induced Draft: 0

% Smoke Capture: 100

Flue Pipe Cleaned Prior to First Test in Series:

Date: 9/23/14 Initials: AK

	Initial	Middle	Ending
P _b (in/Hg)			
Ambient (°F)			

Technician signature: AK

Date: 12/4/14

Tunnel Traverse	
dP (in H ₂ O)	T(°F)
<u>0.018</u>	<u>73</u>
<u>0.028</u>	<u>73</u>
<u>0.028</u>	<u>73</u>
<u>0.030</u>	<u>73</u>
<u>0.022</u>	<u>73</u>
<u>0.014</u>	<u>73</u>
<u>0.018</u>	<u>73</u>
<u>0.026</u>	<u>73</u>
<u>0.030</u>	<u>73</u>
<u>0.030</u>	<u>73</u>
<u>0.022</u>	<u>73</u>
<u>0.008</u>	<u>73</u>
Static P:	<u>-0.25</u>

*Model: 200X
Heatmor
105 Industrial Park Ct. NE, P.O. Box 787
Warroad, MN 56763*

Run 5

Run Notes

Unit on @ ET=316 min

Client: HeatmorModel: 200XProject #: 0275WB011ETracking #: 1997Run #: 5Date: 10/2/14Test Crew: A. Kravitz, J. Clark, S. ButtonOMNI Equipment ID #(s): 428A, 428B, 356* No measurable (± 1.0 lb) weight drop from
330 min ET to 390 min ET *

PREBURN

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

PRIMARY:

Target Output: 15%

SECONDARY: N/ATERTIARY: N/AFAN: Auto

PREBURN SETTINGS AND ACTIVITIES

TIME	AIR (THERMO) CHANGES PRIMARY/SECONDARY/TERTIARY	FAN SETTING CHANGE	ADD FUEL + WT.	ADD FUEL - WT.	RAKE COAL	COMMENT
	None					

TEST

TEST FUEL CONFIGURATION SKETCH
(INDICATE VIEW ANGLE)

See fuel photographs

START UP PROCEDURES

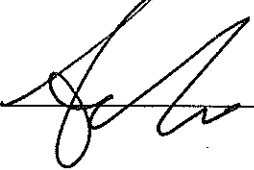
BYPASS: N/AFUEL LOADING: Done @ 0:57DOOR: Closed @ 1:02PRIMARY AIR: Set @ 1:02

OTHER:

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

PRIMARY:

Target Output: 15%

SECONDARY: N/ATERTIARY: N/AFAN: AutoTechnician signature: Date: 10/2/14

Supplemental Data EPA 5G/5H

Client: Heatmor

Model: 200X

Project #: 0275WB011E

Tracking #: 1997

Date: 10/2/14 Run #: 5 Booth: E3

Test Crew: A. Krawitz, J. Clark, S. Bottom Start Time: _____ Stop Time: _____

OMNI Equipment #(s): 132, 20d, 410, 417, 419, 559, 513, 533

Stack Gas Leak Check:

Initial: Ø

Final: _____

Dilution Tunnel Gas Leak Check (5H only):

Initial: N/A

Final: N/A

Calibrations: Span Gas CO₂: 16.80 O₂: N/A CO: 4.245 CO₂(DT): N/A
Mid Gas CO₂: 9.87 O₂: N/A CO: 2.493 CO₂(DT): N/A

Time	Pre Test			Post Test		
	Zero	Span	Mid	Zero	Span	Mid
O ₂	<u>10:15</u>	<u>10:16</u>	<u>10:18</u>	<u>N/A</u>		
CO ₂	<u>0.00</u>	<u>16.81</u>	<u>10.05</u>			
CO	<u>0.000</u>	<u>4.245</u>	<u>2.510</u>			
CO ₂ (DT)	<u>N/A</u>			<u>N/A</u>		

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

Scale Audit (lbs): Initial: 10.0 Final: 10.0

Pitot Tube Leak Test: Initial: Ø Final: Ø

Stack Diameter (inches): 8

Induced Draft: Ø

% Smoke Capture: 100

Flue Pipe Cleaned Prior to First Test in Series:

Date: 9/23/14 Initials: Am

	Initial	Middle	Ending
P _b (in/Hg)	<u>30.32</u>		
Ambient (°F)			

Technician signature: [Signature]

Date: 12/4/14

Tunnel Traverse	
dP (in H ₂ O)	T(°F)
<u>0.016</u>	<u>70</u>
<u>0.022</u>	
<u>0.022</u>	
<u>0.014</u>	
<u>0.020</u>	
<u>0.014</u>	
<u>0.012</u>	
<u>0.022</u>	
<u>0.024</u>	
<u>0.022</u>	
<u>0.020</u>	
<u>0.012</u>	
Static P:	<u>-0.25</u>

*Model: 200X
Heatmor
105 Industrial Park Ct. NE, P.O. Box 787
Warroad, MN 56763*

Run 6

Hydronic Heating Appliances - Test Method 28 WHH Results

Manufacturer: Heatmor
 Model: 200X
 Tracking No.: 1997
 Project No.: 0275WB011E
 Run: 6
 Test Date: October 2, 2014

Burn Rate	3.81 kg/hr dry
Average Tunnel Temperature	95 degrees Fahrenheit
Average Gas Velocity in Dilution Tunnel - vs	9.6 feet/second
Average Gas Flow Rate in Dilution Tunnel - Qsd	25617 dscf/hour
Average Delta p	0.020 inches H2O
Average Delta H	0.93 inches H2O
Total Time of Test	549 minutes

	SAMPLE TRAIN 1	SAMPLE TRAIN 2	AMBIENT SAMPLE TRAIN
Total Sample Volume - Vm	57.05 cubic feet	54.99 cubic feet	213.05 cubic feet
Average Gas Meter Temperature	76 degrees Fahrenheit	76 degrees Fahrenheit	70 degrees Fahrenheit
Total Sample Volume (Standard Conditions) - Vmstd	57.4 dscf	55.7 dscf	212.3 dscf
Total Particulates - mn	14.2 mg	12.8 mg	0.6 mg
Particulate Concentration (dry-standard)	0.00025 grams/dscf	0.00023 grams/dscf	0.000003 grams/dscf
Particulate Emissions	57.35 grams	53.25 grams	
Difference from Average	2.05 grams	2.05 grams	
Results Are Acceptable			

AVERAGE	
Total Sample Volume - Vm	56.02 cubic feet
Average Gas Meter Temperature	76 degrees Fahrenheit
Total Sample Volume (Standard Conditions) - Vmstd	56.5 dscf
Total Particulates - mn	
Particulate Concentration (dry-standard)	0.00024 grams/dscf
Particulate Emission Rate	55.30 grams
7.5% of the average emission rate	4.15 grams

Hydronic Heating Appliances - Test Method 28 WHH
Test Data

Run: 6

Manufacturer: Heatmor
Model: 200X
Tracking No.: 1997
Project No.: 0275WB011E
Test Date: October 2, 2014
Technician: A. Kravitz, S. Button
Beginning Clock Time: 21:59
Recording Interval: 1 min.
Total Sampling Time: 549 min.

Velocity Traverse Data												
	Pt.1	Pt.2	Pt.3	Pt.4	Pt.5	Pt.6	Pt.7	Pt.8	Pt.9	Pt.10	Pt.11	Pt.12
Initial dP	0.020	0.024	0.026	0.026	0.018	0.006	0.014	0.021	0.024	0.026	0.024	0.014
Initial Temp.	76	76	76	76	76	76	76	76	76	76	76	76
Air Velocity: Initial: <50					Final: <50							
Scale Audit: Pre: 10					Post: 10							
Pitot Tube Leak Test: Pre: 0					Post: 0							
Flue Pipe Cleaned Prior to First Test in Series:												
Date: 9/23/2014												

PM Control Module: 428A/428B
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: -0.260 "H2O
Pitot Tube Cp: 0.99
Meter Box Y Factor: 1.007 1.012 0.989
Barometric Pressure: Begin Middle End
30.29 30.29 30.30

Signature/Date:
Tunnel Velocity: 9.62 ft/sec.
Initial Tunnel Flow: 417.5 scfm
Average Tunnel Flow: 427.0 scfm
Tunnel Area: 0.785 ft2
Post-Test Leak Check (1): .004@1 cfm@"Hg
Post-Test Leak Check (2): .009@1 cfm@"Hg
Fuel Moisture (dry basis %): 22.7
Total Particulate (1): 14.2
Total Particulate (2): 12.8

Elapsed Time	Particulate Sampling Data																	Fuel Weight, lb		Flow, gpm		Temperature Data, oF										Stack					
	Gas Meter Cubic Feet (1)	Gas Meter Cubic Feet (2)	Gas Meter Cubic Feet (amb)	Sample Rate, cfm (1)	Sample Rate, cfm (2)	Orifice dH (1)	Orifice dH (2)	Orifice dH (amb)	Meter oF (1)	Meter oF (2)	Meter oF (amb)	Meter Vac. In. Hg. (1)	Meter Vac. In. Hg. (2)	Dilution Tunnel Temp.	Dilution Tunnel dP	Pro. Rate (%) (1)	Pro. Rate (%) (2)	Scale Reading	Weight Change	Load Side Liquid Flow Rate	Boiler Side Liquid Flow Rate (optional)	Thermopile ΔT	Boiler to Heat Exch. Temp.	Heat Exch to Boiler Temp.	Inlet Load Temp.	Outlet Load Temp.	Stack	Filter (1)	Filter (2)	Ambient	Draft In. H2O	Specific Heat of Inlet Water (BTU/lb-°F)	Mass Flow Rate of Inlet Water (lb/min)	Heat Output, Btu			
0	0.000	0.000	0.000			0.01	0.03	0.00	75	75	73	1.62	1.00	76	0.020			94.2		1.30		67.5	137.2	128.1	69.1	136.9	338	73	73	73	0.000	1.001	10.818				
1	0.105	0.090	0.388	0.10	0.09	0.95	1.22	0.00	75	75	73	0.97	0.40	152	0.020	106	94	93.8	0.40	1.30		67.7	137.5	128.2	69.1	137.2	379	73	75	73	0.000	1.001	10.818	734			
2	0.210	0.191	0.776	0.11	0.10	0.97	1.23	0.00	75	75	73	0.97	0.40	138	0.020	105	105	93.4	0.40	1.30		67.9	137.7	128.3	69.1	137.3	284	73	76	73	0.000	1.001	10.818	736			
3	0.315	0.291	1.164	0.11	0.10	0.96	1.23	0.00	75	75	73	0.96	0.40	134	0.020	105	103	93.0	0.40	1.31		68.2	138.1	128.6	69.1	137.7	283	74	76	73	0.000	1.001	10.901	744			
4	0.420	0.392	1.552	0.11	0.10	0.96	1.23	0.00	75	75	73	0.96	0.40	151	0.020	106	106	92.2	0.80	1.30		68.5	138.4	128.8	69.1	138.1	405	75	78	73	0.000	1.001	10.818	742			
5	0.525	0.493	1.940	0.11	0.10	0.96	1.23	0.00	75	75	73	0.96	0.40	165	0.020	107	107	91.2	1.00	1.29		68.8	138.4	128.7	69.1	138.1	491	76	79	73	0.000	1.001	10.735	739			
6	0.630	0.593	2.328	0.11	0.10	0.96	1.23	0.00	75	75	73	0.96	0.40	172	0.020	108	107	90.2	1.00	1.25		68.8	138.6	129.5	69.1	138.2	512	77	80	73	0.000	1.001	10.402	716			
7	0.734	0.694	2.717	0.10	0.10	0.96	1.23	0.00	75	75	73	0.96	0.40	178	0.020	108	108	89.2	1.00	1.24		68.9	138.6	129.5	69.1	138.4	531	78	81	73	0.000	1.001	10.318	711			
8	0.839	0.794	3.105	0.11	0.10	0.95	1.23	0.00	75	75	73	0.95	0.40	183	0.020	109	108	88.1	1.10	1.24		69.0	139.0	129.8	69.1	138.7	546	79	82	73	0.000	1.001	10.318	712			
9	0.943	0.893	3.493	0.10	0.10	0.95	1.23	0.00	75	75	73	0.95	0.40	188	0.020	108	107	86.9	1.20	1.24		69.5	139.6	130.2	69.1	139.2	558	80	84	73	0.000	1.001	10.319	717			
10	1.047	0.994	3.881	0.10	0.10	0.95	1.23	0.00	75	75	73	0.95	0.40	190	0.020	109	109	85.8	1.10	1.25		70.1	140.2	130.7	69.1	139.8	566	81	84	73	0.000	1.001	10.402	730			
11	1.151	1.094	4.269	0.10	0.10	0.95	1.23	0.00	75	75	73	0.95	0.40	192	0.020	109	108	84.9	0.90	1.25		70.2	140.9	131.2	69.1	140.5	573	75	84	73	0.000	1.001	10.402	731			
12	1.255	1.194	4.657	0.10	0.10	0.95	1.21	0.00	76	75	73	0.95	0.40	194	0.020	109	109	83.4	1.50	1.24		71.3	141.9	132.2	69.1	141.4	577	73	82	73	0.000	1.001	10.318	736			
13	1.358	1.294	5.045	0.10	0.10	0.95	1.21	0.00	76	75	73	0.96	0.40	196	0.020	108	109	82.3	1.10	1.23		71.8	142.7	132.8	69.1	142.3	581	73	82	73	0.000	1.001	10.235	736			
14	1.461	1.393	5.433	0.10	0.10	0.95	1.22	0.00	76	76	73	0.95	0.40	198	0.020	108	108	81.1	1.20	1.19		72.6	144.1	134.3	69.1	143.5	588	72	81	73	0.000	1.001	9.902	720			
15	1.561	1.492	5.821	0.10	0.10	0.94	1.23	0.00	76	76	73	0.95	0.40	199	0.020	105	108	79.9	1.20	1.16		74.0	145.0	135.4	69.1	144.5	592	72	81	73	0.000	1.001	9.653	715			
16	1.660	1.592	6.209	0.10	0.10	0.94	1.22	0.00	76	76	73	0.95	0.40	203	0.020	104	109	78.4	1.50	1.18		74.6	146.1	136.4	69.1	145.6	596	72	82	73	0.000	1.001	9.819	734			
17	1.758	1.691	6.597	0.10	0.10	0.93	1.21	0.00	76	76	73	0.93	0.30	205	0.020	103	108	77.2	1.20	1.13		76.2	147.3	137.6	69.1	146.7	602	72	82	73	0.000	1.001	9.403	718			
18	1.854	1.790	6.985	0.10	0.10	0.92	1.20	0.00	76	76	73	0.93	0.30	208	0.020	101	108	75.8	1.40	1.15		77.5	148.6	138.7	69.1	148.0	608	72	83	73	0.000	1.001	9.570	743			
19	1.948	1.888	7.373	0.09	0.10	0.92	1.20	0.00	76	76	73	0.93	0.30	208	0.020	99	107	74.6	1.20	1.14		78.9	149.9	139.4	69.1	149.2	607	73	83	73	0.000	1.001	9.486	749			
20	2.036	1.986	7.762	0.09	0.10	0.92	1.20	0.00	76	76	73	0.93	0.30	211	0.020	93	108	73.5	1.10	1.06		79.9	151.0	141.4	69.1	150.5	610	73	84	73	0.000	1.001	8.821	705			
21	2.124	2.085	8.150	0.09	0.10	0.92	1.18	0.00	76	76	73	0.93	0.30	213	0.020	93	109	72.0	1.50	1.06		81.3	152.6	143.0	69.2	152.0	614	73	84	73	0.000	1.001	8.821	718			
22	2.212	2.182	8.538	0.09	0.10	0.91	1.18	0.00	76	76	73	0.92	0.30	213	0.020	93	107	70.9	1.10	1.06		82.9	153.9	144.0	69.2	153.3	613	74	84	73	0.000	1.001	8.821	732			
23	2.300	2.280	8.926	0.09	0.10	0.91	1.22	0.00	76	76	73	0.91	0.30	216	0.020	93	108	69.6	1.30	1.05		84.3	155.5	145.4	69.2	154.8	615	75	84	73	0.000	1.001	8.737	737			
24	2.388	2.380	9.314	0.09	0.10	0.73	1.23	0.00	77	76	73	0.67	0.30	218	0.020	93	110	68.4	1.20	0.94		85.3	156.8	147.5	69.2	156.0	619	74	85	73	0.000	1.001	7.822	668			
25	2.476	2.480	9.702	0.09	0.10	0.68	1.23	0.00	77	77	73	0.66	0.30	220	0.020	94	110	66.9	1.50	0.92		86.6	158.5	149.4	69.2	157.7	620	74	85	73	0.000	1.001	7.656	664			
26	2.564	2.580	10.090	0.09	0.10	0.68	1.22	0.00	77	77	73	0.66	0.30	221	0.020	94	110	65.6	1.30	0.92		88.4	160.0	150.7	69.2	159.3	622	75	86	73	0.000	1.001	7.656	678			
27	2.652	2.679	10.478	0.09	0.10	0.67	1.22	0.00	77	77	73	0.65	0.30	222	0.020	94	109	64.3	1.30	0.91		89.8	161.3	151.9	69.2	160.6	621	75	85	73	0.000	1.001	7.572	681			
28	2.740	2.779	10.866	0.09	0.10	0.66	1.19	0.00	77	77	73	0.63	0.30	221	0.020	94	110	63.2	1.10	0.92		91.4	163.2	153.5	69.2	162.3	618	75	85	73	0.000	1.001	7.656	700			
29	2.828	2.877	11.254	0.09	0.10	0.42	1.21	0.00	77	77	73	-5.90	0.30	220	0.020	94	108	61.8	1.40	0.91		93.1	164.6	155.1	69.2	163.9	614	74	85	73	0.000	1.001	7.572	706			
30	2.916	2.975	11.642	0.09	0.10	0.19	1.21	0.00	77	77	73	-6.60	0.30	162	0.020	89	103	61.1	0.70	0.90		94.1	166.2	156.1	69.2	165.4	543	73	80	73	0.000	1.001	7.489	706			
31	3.002	3.075	12.030	0.09	0.10	0.07	1.20	0.00	77	77	73	1.63	0.30	124	0.020	85	102	60.7	0.40	0.91		96.1	167.6	157.8	69.3	166.9	453	73	78	73	0.000	1.001	7.572	729			
32	3.088	3.174	12.418	0.09	0.10	0.01	1.21	0.00	77	77	73	1.64																									

Elapsed Time	Particulate Sampling Data																Fuel Weight, lb		Flow, gpm		Temperature Data, oF												Stack				
	Gas Meter Cubic Feet (1)	Gas Meter Cubic Feet (2)	Gas Meter Cubic Feet (amb)	Sample Rate, cfm (1)	Sample Rate, cfm (2)	Orifice dH (1)	Orifice dH (2)	Orifice dH (amb)	Meter oF (1)	Meter oF (2)	Meter oF (amb)	Meter Vac. In. Hg. (1)	Meter Vac. In. Hg. (2)	Dilution Tunnel Temp.	Dilution Tunnel dP	Pro. Rate (%) (1)	Pro. Rate (%) (2)	Scale Reading	Weight Change	Load Side Liquid Flow Rate	Boiler Side Liquid Flow Rate (optional)	Thermopile ΔT	Boiler to Heat Exch. Temp.	Heat Exch to Boiler Temp.	Inlet Load Temp.	Outlet Load Temp.	Stack	Filter (1)	Filter (2)	Ambient	Draft In. H2O	Specific Heat of Inlet Water (BTU/lb-°F)	Mass Flow Rate of Inlet Water (lb/min)	Heat Output, Btu			
43	4.073	4.280	16.687	0.11	0.10	0.94	1.25	0.00	78	78	73	1.11	0.30	81	0.020	99	100	60.0	0.10	0.83		102.9	172.4	162.9	69.3	172.1	325	69	67	73	0.000	1.001	6.907	711			
44	4.179	4.382	17.075	0.11	0.10	0.94	1.25	0.00	78	78	73	1.11	0.30	81	0.020	100	100	60.0	0.00	0.83		102.8	172.2	162.8	69.3	171.9	317	69	67	73	0.000	1.001	6.907	711			
45	4.284	4.483	17.463	0.11	0.10	0.93	1.26	0.00	78	78	73	1.11	0.30	81	0.020	99	99	60.0	0.00	0.83		102.3	172.1	162.5	69.3	171.7	310	69	67	73	0.000	1.001	6.907	708			
46	4.389	4.585	17.852	0.11	0.10	0.94	1.26	0.00	78	78	73	1.11	0.30	81	0.020	99	100	60.0	0.00	0.83		102.3	171.9	162.5	69.3	171.6	303	68	66	73	0.000	1.001	6.907	708			
47	4.495	4.688	18.240	0.11	0.10	0.94	1.26	0.00	78	78	73	1.11	0.30	80	0.020	100	101	60.0	0.00	0.83		102.3	171.8	162.3	69.4	171.5	296	68	66	73	0.000	1.001	6.906	707			
48	4.600	4.791	18.628	0.11	0.10	0.94	1.27	0.00	78	78	73	1.11	0.30	80	0.020	99	101	59.9	0.10	0.83		102.0	171.6	162.2	69.4	171.2	289	68	66	73	0.000	1.001	6.906	705			
49	4.706	4.893	19.016	0.11	0.10	0.94	1.28	0.00	78	78	73	1.11	0.30	79	0.020	100	100	60.0	-0.10	0.82		101.8	171.3	162.2	69.4	171.1	283	68	65	73	0.000	1.001	6.823	695			
50	4.811	4.997	19.404	0.11	0.10	0.94	1.28	0.00	78	78	73	1.11	0.40	79	0.020	99	102	59.9	0.10	0.87		101.6	171.2	161.2	69.4	170.9	277	68	65	73	0.000	1.001	7.239	736			
51	4.917	5.100	19.792	0.11	0.10	0.94	1.27	0.00	78	78	73	1.11	0.40	79	0.020	100	101	59.9	0.00	0.87		101.3	170.9	161.0	69.4	170.6	272	68	65	73	0.000	1.001	7.239	734			
52	5.023	5.203	20.180	0.11	0.10	0.95	1.29	0.00	78	78	73	1.11	0.40	79	0.020	100	101	59.9	0.00	0.89		101.2	170.7	160.9	69.4	170.4	266	68	65	73	0.000	1.001	7.406	750			
53	5.129	5.307	20.568	0.11	0.10	0.94	1.28	0.00	78	78	73	1.12	0.40	79	0.020	100	102	60.0	-0.10	0.88		100.9	170.6	160.7	69.4	170.3	261	68	65	73	0.000	1.001	7.322	739			
54	5.235	5.411	20.956	0.11	0.10	0.95	1.29	0.00	78	78	73	1.12	0.40	79	0.020	100	102	59.9	0.10	0.89		100.9	170.4	160.8	69.4	170.1	256	68	64	73	0.000	1.001	7.406	748			
55	5.342	5.513	21.344	0.11	0.10	0.95	1.29	0.00	78	78	73	1.12	0.40	78	0.020	101	100	59.9	0.00	0.87		100.5	170.2	160.5	69.4	169.9	251	67	64	73	0.000	1.001	7.239	729			
56	5.448	5.618	21.732	0.11	0.11	0.95	1.29	0.00	78	78	73	1.12	0.40	78	0.020	100	103	59.8	0.10	0.89		100.3	169.9	160.2	69.4	169.6	246	67	64	73	0.000	1.001	7.406	744			
57	5.554	5.722	22.120	0.11	0.10	0.95	1.30	0.00	78	78	73	1.12	0.40	78	0.020	100	102	59.9	-0.10	0.87		100.1	169.7	160.0	69.4	169.4	241	67	64	73	0.000	1.001	7.239	725			
58	5.660	5.825	22.508	0.11	0.10	0.95	1.29	0.00	78	78	73	1.12	0.40	78	0.020	100	101	59.9	0.00	0.89		99.7	169.6	159.7	69.4	169.3	237	67	64	73	0.000	1.001	7.406	739			
59	5.766	5.929	22.897	0.11	0.10	0.95	1.29	0.00	78	78	73	1.12	0.40	78	0.020	100	102	59.8	0.10	0.87		99.7	169.3	159.8	69.4	169.1	233	67	64	73	0.000	1.001	7.239	723			
60	5.873	6.034	23.285	0.11	0.11	0.95	1.29	0.00	78	78	73	1.12	0.40	78	0.020	101	103	59.8	0.00	0.88		99.5	169.2	159.5	69.4	168.9	228	67	64	73	0.000	1.001	7.323	730			
61	5.980	6.136	23.673	0.11	0.10	0.95	1.27	0.00	78	78	73	1.12	0.40	78	0.020	101	100	59.8	0.00	0.87		99.3	169.0	159.5	69.4	168.7	225	67	64	73	0.000	1.001	7.239	719			
62	6.086	6.236	24.061	0.11	0.10	0.95	1.22	0.00	78	78	73	1.12	0.40	77	0.020	100	98	59.7	0.10	0.87		99.3	168.8	159.2	69.4	168.5	221	67	63	73	0.000	1.001	7.239	720			
63	6.193	6.336	24.449	0.11	0.10	0.96	1.21	0.00	78	78	73	1.12	0.40	77	0.020	101	98	59.8	-0.10	0.88		99.0	168.6	159.0	69.4	168.2	217	67	63	73	0.000	1.001	7.323	726			
64	6.300	6.437	24.837	0.11	0.10	0.97	1.23	0.00	78	78	73	1.12	0.40	77	0.020	101	99	59.8	0.00	0.89		98.8	168.3	158.9	69.4	168.0	214	67	63	73	0.000	1.001	7.406	733			
65	6.406	6.537	25.225	0.11	0.10	0.96	1.22	0.00	78	78	73	1.12	0.40	77	0.020	100	98	59.8	0.00	0.88		98.2	168.1	158.5	69.4	167.8	210	67	63	73	0.000	1.001	7.323	720			
66	6.513	6.637	25.613	0.11	0.10	0.96	1.22	0.00	78	78	73	1.12	0.40	77	0.020	101	98	59.7	0.10	0.87		98.3	167.9	158.4	69.4	167.6	207	67	64	73	0.000	1.001	7.239	712			
67	6.619	6.737	26.001	0.11	0.10	0.96	1.22	0.00	78	78	73	1.12	0.40	77	0.020	100	98	59.8	-0.10	0.88		98.0	167.7	158.2	69.4	167.4	204	67	64	73	0.000	1.001	7.323	719			
68	6.726	6.838	26.389	0.11	0.10	0.96	1.22	0.00																													

Elapsed Time	Particulate Sampling Data																Fuel Weight, lb		Flow, gpm		Temperature Data, oF											Stack		Specific Heat of Inlet Water (BTU/lb-°F)	Mass Flow Rate of Inlet Water (lb/min)	Heat Output, Btu
	Gas Meter Cubic Feet (1)	Gas Meter Cubic Feet (2)	Gas Meter Cubic Feet (amb)	Sample Rate, cfm (1)	Sample Rate, cfm (2)	Orifice dH (1)	Orifice dH (2)	Orifice dH (amb)	Meter oF (1)	Meter oF (2)	Meter oF (amb)	Meter Vac. In. Hg. (1)	Meter Vac. In. Hg. (2)	Dilution Tunnel Temp.	Dilution Tunnel dP	Pro. Rate (%) (1)	Pro. Rate (%) (2)	Scale Reading	Weight Change	Load Side Liquid Flow Rate	Boiler Side Liquid Flow Rate (optional)	Thermopile ΔT	Boiler to Heat Exch. Temp.	Heat Exch to Boiler Temp.	Inlet Load Temp.	Outlet Load Temp.	Stack	Filter (1)	Filter (2)	Ambient	Draft In. H2O					
97	9.721	9.748	37.643	0.10	0.10	0.91	1.22	0.00	78	78	72	1.14	0.40	74	0.020	91	97	59.6	0.00	0.91		91.7	161.3	152.2	69.4	161.0	151	67	63	72	0.000	1.001	7.572	695		
98	9.818	9.849	38.031	0.10	0.10	0.91	1.23	0.00	78	78	72	1.13	0.40	74	0.020	91	98	59.6	0.00	0.91		91.6	161.1	152.0	69.4	160.8	150	67	63	72	0.000	1.001	7.572	695		
99	9.914	9.949	38.420	0.10	0.10	0.92	1.22	0.00	78	78	72	1.14	0.40	74	0.020	90	98	59.6	0.00	0.92		91.3	160.9	151.9	69.4	160.6	149	67	63	72	0.000	1.001	7.655	700		
100	10.014	10.050	38.808	0.10	0.10	0.92	1.22	0.00	78	78	72	1.14	0.40	74	0.020	94	98	59.6	0.00	0.93		91.1	160.7	151.7	69.4	160.4	148	67	63	72	0.000	1.001	7.739	705		
101	10.114	10.151	39.196	0.10	0.10	0.91	1.22	0.00	78	78	72	1.14	0.40	74	0.020	94	98	59.5	0.10	0.95		90.9	160.4	151.4	69.4	160.2	148	67	63	72	0.000	1.001	7.905	719		
102	10.214	10.251	39.584	0.10	0.10	0.91	1.23	0.00	78	78	72	1.14	0.40	74	0.020	94	98	59.5	0.00	0.95		90.5	160.3	150.9	69.4	160.0	146	67	63	72	0.000	1.001	7.905	716		
103	10.324	10.351	39.972	0.11	0.10	0.92	1.23	0.00	78	78	72	1.14	0.40	74	0.020	103	98	59.5	0.00	0.95		90.3	159.9	150.8	69.4	159.7	146	67	63	72	0.000	1.001	7.905	715		
104	10.434	10.452	40.360	0.11	0.10	0.92	1.23	0.00	78	78	72	1.14	0.40	74	0.020	103	98	59.5	0.00	0.94		90.0	159.7	150.5	69.4	159.5	146	67	63	72	0.000	1.001	7.822	705		
105	10.544	10.552	40.748	0.11	0.10	0.91	1.22	0.00	78	78	72	1.14	0.40	74	0.020	103	98	59.5	0.00	0.94		90.0	159.4	150.3	69.4	159.2	144	67	63	72	0.000	1.001	7.822	704		
106	10.654	10.653	41.136	0.11	0.10	0.91	1.23	0.00	78	78	72	1.14	0.40	74	0.020	103	98	59.5	0.00	0.94		89.7	159.3	150.1	69.4	159.0	144	67	63	72	0.000	1.001	7.822	702		
107	10.764	10.753	41.524	0.11	0.10	0.92	1.23	0.00	78	78	72	1.14	0.40	74	0.020	103	98	59.5	0.00	0.94		89.5	159.1	149.9	69.4	158.9	143	67	63	72	0.000	1.001	7.822	701		
108	10.874	10.853	41.912	0.11	0.10	0.91	1.23	0.00	78	78	72	1.14	0.40	74	0.020	103	98	59.4	0.10	0.96		89.2	158.9	149.7	69.4	158.6	143	67	63	72	0.000	1.001	7.988	713		
109	10.984	10.954	42.300	0.11	0.10	0.92	1.23	0.00	78	78	72	1.14	0.40	74	0.020	103	98	59.5	-0.10	0.94		89.2	158.6	149.6	69.4	158.4	143	67	63	72	0.000	1.001	7.822	698		
110	11.094	11.055	42.688	0.11	0.10	0.92	1.22	0.00	78	78	72	1.14	0.40	74	0.020	103	98	59.4	0.10	0.93		89.1	158.4	149.6	69.4	158.2	142	67	63	72	0.000	1.001	7.739	691		
111	11.204	11.156	43.076	0.11	0.10	0.92	1.23	0.00	78	78	72	1.14	0.40	74	0.020	103	98	59.6	-0.20	0.94		88.8	158.2	149.1	69.4	157.9	142	67	63	72	0.000	1.001	7.822	695		
112	11.314	11.256	43.465	0.11	0.10	0.92	1.23	0.00	78	78	72	1.14	0.40	74	0.020	103	98	59.5	0.10	0.97		88.5	158.0	148.8	69.4	157.7	141	67	63	72	0.000	1.001	8.071	715		
113	11.414	11.356	43.853	0.10	0.10	0.92	1.23	0.00	78	78	72	1.14	0.40	74	0.020	94	98	59.5	0.00	0.98		88.4	157.7	148.3	69.4	157.5	140	67	63	72	0.000	1.001	8.155	722		
114	11.514	11.457	44.241	0.10	0.10	0.92	1.23	0.00	78	78	72	1.14	0.40	74	0.020	94	98	59.5	0.00	0.99		88.2	157.5	148.3	69.4	157.3	139	67	63	72	0.000	1.001	8.238	728		
115	11.614	11.558	44.629	0.10	0.10	0.92	1.23	0.00	78	78	72	1.14	0.40	74	0.020	94	98	59.5	0.00	0.98		87.6	157.2	148.1	69.4	157.0	139	67	63	72	0.000	1.001	8.155	715		
116	11.714	11.658	45.017	0.10	0.10	0.92	1.23	0.00	78	78	72	1.14	0.40	74	0.020	94	98	59.5	0.00	0.98		87.6	157.0	147.6	69.4	156.7	138	67	63	72	0.000	1.001	8.155	715		
117	11.814	11.758	45.405	0.10	0.10	0.92	1.23	0.00	78	78	72	1.14	0.40	74	0.020	94	98	59.4	0.10	0.98		87.2	156.8	147.4	69.4	156.6	138	67	63	72	0.000	1.001	8.155	712		
118	11.914	11.859	45.793	0.10	0.10	0.92	1.22	0.00	78	78	72	1.14	0.40	73	0.020	94	98	59.5	-0.10	0.99		87.2	156.6	147.5	69.4	156.4	137	67	63	72	0.000	1.001	8.238	719		
119	12.014	11.960	46.181	0.10	0.10	0.92	1.23	0.00	78	78	72	1.13	0.40	73	0.020	94	98	59.5	0.00	0.98		86.8	156.4	147.1	69.4	156.2	137	67	63	72	0.000	1.001	8.155	709		
120	12.114	12.060	46.569	0.10	0.10	0.92	1.23	0.00	78	78	72	1.14	0.40	73	0.020	94	97	59.5	0.00	0.98		86.6	156.1	146.8	69.3	155.8	136	67	63	72	0.000	1.001	8.155	707		
121	12.214	12.161	46.957	0.10	0.10	0.92	1.23	0.00	78	78	72	1.14	0.40	73	0.020	94	98	59.5	0.00	1.00		86.5	155.8	146.8	69.4	155.6	135	67	63	72	0.000	1.001	8.321	721		
122	12.314	12.261																																		

Elapsed Time	Particulate Sampling Data																Fuel Weight, lb		Flow, gpm		Temperature Data, oF												Stack			
	Gas Meter Cubic Feet (1)	Gas Meter Cubic Feet (2)	Gas Meter Cubic Feet (amb)	Sample Rate, cfm (1)	Sample Rate, cfm (2)	Orifice dH (1)	Orifice dH (2)	Orifice dH (amb)	Meter oF (1)	Meter oF (2)	Meter oF (amb)	Meter Vac. In. Hg. (1)	Meter Vac. In. Hg. (2)	Dilution Tunnel Temp.	Dilution Tunnel dP	Pro. Rate (%) (1)	Pro. Rate (%) (2)	Scale Reading	Weight Change	Load Side Liquid Flow Rate	Boiler Side Liquid Flow Rate (optional)	Thermopile ΔT	Boiler to Heat Exch. Temp.	Heat Exch to Boiler Temp.	Inlet Load Temp.	Outlet Load Temp.	Stack	Filter (1)	Filter (2)	Ambient	Draft In. H2O	Specific Heat of Inlet Water (BTU/lb-°F)	Mass Flow Rate of Inlet Water (lb/min)	Heat Output, Btu		
151	15.314	15.179	58.600	0.10	0.10	0.92	1.22	0.00	78	77	72	1.14	0.40	73	0.020	94	99	59.5	0.00	1.06		79.4	148.7	139.6	69.2	148.5	128	67	64	72	0.000	1.001	8.821	701		
152	15.424	15.278	58.988	0.11	0.10	0.92	1.23	0.00	78	77	72	1.14	0.40	73	0.020	103	97	59.5	0.00	1.06		79.2	148.5	139.6	69.2	148.2	126	67	64	72	0.000	1.001	8.821	699		
153	15.534	15.379	59.376	0.11	0.10	0.92	1.23	0.00	78	77	72	1.14	0.40	73	0.020	103	99	59.5	0.00	1.09		78.8	148.3	139.1	69.2	148.0	126	67	64	72	0.000	1.001	9.070	715		
154	15.644	15.480	59.764	0.11	0.10	0.91	1.23	0.00	78	77	72	1.13	0.40	73	0.020	103	99	59.4	0.10	1.11		78.6	148.0	138.6	69.1	147.7	126	67	64	72	0.000	1.001	9.237	726		
155	15.754	15.580	60.152	0.11	0.10	0.92	1.23	0.00	78	77	72	1.14	0.40	73	0.020	103	98	59.5	-0.10	1.11		78.5	147.8	138.4	69.1	147.5	127	67	64	72	0.000	1.001	9.237	726		
156	15.864	15.681	60.540	0.11	0.10	0.92	1.22	0.00	78	77	72	1.14	0.40	73	0.020	103	99	59.5	0.00	1.10		78.3	147.6	138.0	69.1	147.3	125	67	64	72	0.000	1.001	9.153	717		
157	15.974	15.781	60.928	0.11	0.10	0.92	1.22	0.00	78	77	72	1.14	0.40	73	0.020	103	98	59.5	0.00	1.11		78.0	147.3	138.3	69.1	147.0	126	67	64	72	0.000	1.001	9.237	722		
158	16.084	15.881	61.316	0.11	0.10	0.92	1.23	0.00	78	77	72	1.14	0.40	73	0.020	103	98	59.4	0.10	1.11		77.6	146.9	137.8	69.2	146.8	126	67	64	72	0.000	1.001	9.237	718		
159	16.194	15.982	61.704	0.11	0.10	0.92	1.23	0.00	78	77	72	1.14	0.40	73	0.020	103	99	59.5	-0.10	1.10		77.4	146.8	137.7	69.1	146.5	125	67	64	72	0.000	1.001	9.153	709		
160	16.304	16.083	62.092	0.11	0.10	0.92	1.22	0.00	78	77	72	1.14	0.40	72	0.020	103	98	59.5	0.00	1.11		77.3	146.5	137.3	69.1	146.3	124	67	64	72	0.000	1.001	9.237	715		
161	16.414	16.184	62.480	0.11	0.10	0.92	1.22	0.00	78	77	72	1.14	0.40	72	0.020	103	98	59.5	0.00	1.11		76.9	146.3	137.5	69.1	146.1	124	67	64	72	0.000	1.001	9.237	712		
162	16.514	16.284	62.868	0.10	0.10	0.92	1.22	0.00	78	77	72	1.14	0.40	72	0.020	94	98	59.5	0.00	1.11		76.7	146.1	136.9	69.1	145.9	124	67	64	72	0.000	1.001	9.237	709		
163	16.614	16.384	63.256	0.10	0.10	0.92	1.23	0.00	78	77	72	1.14	0.40	73	0.020	94	98	59.5	0.00	1.11		76.6	145.8	136.8	69.1	145.6	124	67	64	72	0.000	1.001	9.237	708		
164	16.714	16.485	63.645	0.10	0.10	0.92	1.22	0.00	78	77	72	1.14	0.40	72	0.020	94	98	59.5	0.00	1.11		76.2	145.5	136.7	69.1	145.3	124	67	65	72	0.000	1.001	9.237	705		
165	16.814	16.585	64.033	0.10	0.10	0.92	1.22	0.00	78	77	72	1.14	0.40	72	0.020	94	98	59.6	-0.10	1.10		75.9	145.3	136.3	69.1	145.2	124	67	65	72	0.000	1.001	9.153	696		
166	16.914	16.686	64.421	0.10	0.10	0.92	1.23	0.00	78	77	72	1.14	0.40	72	0.020	94	98	59.5	0.10	1.12		75.8	145.1	136.1	69.1	144.9	123	67	65	72	0.000	1.001	9.320	708		
167	17.014	16.786	64.809	0.10	0.10	0.92	1.23	0.00	78	77	72	1.14	0.40	72	0.020	94	98	59.5	0.00	1.11		75.6	144.8	135.9	69.2	144.6	123	67	65	72	0.000	1.001	9.237	699		
168	17.114	16.886	65.197	0.10	0.10	0.92	1.22	0.00	78	77	72	1.14	0.40	72	0.020	94	98	59.6	-0.10	1.11		75.2	144.6	135.6	69.1	144.4	122	67	65	72	0.000	1.001	9.237	695		
169	17.214	16.987	65.585	0.10	0.10	0.92	1.22	0.00	78	77	72	1.14	0.40	72	0.020	94	98	59.5	0.10	1.11		75.2	144.4	135.5	69.1	144.2	122	67	65	72	0.000	1.001	9.237	695		
170	17.314	17.088	65.973	0.10	0.10	0.92	1.23	0.00	78	77	72	1.14	0.40	72	0.020	94	98	59.5	0.00	1.10		74.8	144.1	135.1	69.1	143.9	122	67	65	72	0.000	1.001	9.154	685		
171	17.414	17.188	66.361	0.10	0.10	0.92	1.23	0.00	78	77	72	1.14	0.40	72	0.020	94	98	59.5	0.00	1.12		74.7	143.9	135.0	69.1	143.7	122	67	65	72	0.000	1.001	9.320	697		
172	17.514	17.288	66.749	0.10	0.10	0.92	1.23	0.00	78	77	72	1.14	0.40	72	0.020	94	98	59.4	0.10	1.11		74.4	143.6	135.0	69.1	143.5	122	67	65	72	0.000	1.001	9.237	688		
173	17.614	17.389	67.137	0.10	0.10	0.92	1.22	0.00	78	77	72	1.14	0.40	72	0.020	94	98	59.6	-0.20	1.11		74.2	143.4	134.7	69.1	143.3	121	67	65	72	0.000	1.001	9.237	686		
174	17.714	17.490	67.525	0.10	0.10	0.92	1.23	0.00	78	77	72	1.14	0.40	72	0.020	94	98	59.6	0.00	1.11		73.9	143.2	134.4	69.1	143.0	120	67	65	72	0.000	1.001	9.237	684		
175	17.814	17.590	67.913	0.10	0.10	0.92	1.23	0.00	78	77	72	1.14	0.40	72	0.020	94	98	59.5	0.10	1.11		73.8	142.9	134.2	69.1	142.7	122	67	65	72	0.000	1.001	9.237	682		
176	17.924	17.691	68.301	0.11																																

Elapsed Time	Particulate Sampling Data																Fuel Weight, lb		Flow, gpm		Temperature Data, oF												Stack				
	Gas Meter Cubic Feet (1)	Gas Meter Cubic Feet (2)	Gas Meter Cubic Feet (amb)	Sample Rate, cfm (1)	Sample Rate, cfm (2)	Orifice dH (1)	Orifice dH (2)	Orifice dH (amb)	Meter oF (1)	Meter oF (2)	Meter oF (amb)	Meter Vac. In. Hg. (1)	Meter Vac. In. Hg. (2)	Dilution Tunnel Temp.	Dilution Tunnel dP	Pro. Rate (%) (1)	Pro. Rate (%) (2)	Scale Reading	Weight Change	Load Side Liquid Flow Rate	Boiler Side Liquid Flow Rate (optional)	Thermopile ΔT	Boiler to Heat Exch. Temp.	Heat Exch to Boiler Temp.	Inlet Load Temp.	Outlet Load Temp.	Stack	Filter (1)	Filter (2)	Ambient	Draft In. H2O	Specific Heat of Inlet Water (BTU/lb-°F)	Mass Flow Rate of Inlet Water (lb/min)	Heat Output, Btu			
205	20.974	20.606	79.556	0.11	0.10	0.92	1.23	0.00	77	77	71	1.14	0.40	72	0.020	103	98	59.6	0.00	1.15		67.2	136.4	128.3	69.0	136.1	115	66	66	71	0.000	1.001	9.570	644			
206	21.084	20.707	79.944	0.11	0.10	0.92	1.23	0.00	77	77	71	1.14	0.40	72	0.020	103	98	59.6	0.00	1.25		67.1	136.0	127.4	69.0	135.9	115	66	66	71	0.000	1.001	10.402	698			
207	21.194	20.807	80.332	0.11	0.10	0.91	1.22	0.00	77	77	71	1.13	0.40	83	0.020	105	99	59.3	0.30	1.25		66.9	135.6	127.0	68.9	135.5	122	67	67	71	0.000	1.001	10.402	697			
208	21.304	20.906	80.720	0.11	0.10	0.91	1.22	0.00	77	77	71	1.13	0.40	85	0.020	105	98	59.1	0.20	1.26		66.5	135.3	126.5	68.9	135.1	126	68	68	71	0.000	1.001	10.485	698			
209	21.414	21.007	81.108	0.11	0.10	0.91	1.22	0.00	77	77	71	1.13	0.40	85	0.020	105	100	58.8	0.30	1.26		66.1	135.0	126.3	68.9	134.7	136	68	68	71	0.000	1.001	10.485	694			
210	21.514	21.107	81.496	0.10	0.10	0.91	1.22	0.00	77	77	71	1.13	0.40	85	0.020	95	99	58.5	0.30	1.24		65.6	134.6	125.9	68.9	134.5	138	68	68	71	0.000	1.001	10.319	678			
211	21.614	21.207	81.884	0.10	0.10	0.91	1.21	0.00	77	77	71	1.13	0.40	85	0.020	95	99	58.3	0.20	1.26		65.4	134.3	125.9	69.0	134.1	138	68	68	71	0.000	1.001	10.485	687			
212	21.714	21.307	82.272	0.10	0.10	0.91	1.21	0.00	77	77	71	1.13	0.40	84	0.020	95	99	58.2	0.10	1.25		65.0	133.9	125.5	68.9	133.8	138	68	68	71	0.000	1.001	10.402	677			
213	21.814	21.406	82.660	0.10	0.10	0.91	1.22	0.00	77	77	71	1.13	0.40	84	0.020	95	98	57.9	0.30	1.25		64.6	133.6	125.3	68.9	133.5	137	68	68	71	0.000	1.001	10.402	673			
214	21.914	21.506	83.048	0.10	0.10	0.91	1.22	0.00	77	77	71	1.13	0.40	84	0.020	95	99	57.8	0.10	1.26		64.5	133.4	124.9	69.0	133.2	136	67	68	71	0.000	1.001	10.485	678			
215	22.014	21.607	83.436	0.10	0.10	0.91	1.22	0.00	77	77	71	1.13	0.40	84	0.020	95	100	57.7	0.10	1.25		64.1	133.1	124.7	69.0	133.0	136	67	67	71	0.000	1.001	10.402	668			
216	22.114	21.707	83.825	0.10	0.10	0.91	1.22	0.00	77	77	71	1.13	0.40	84	0.020	95	99	57.6	0.10	1.26		63.8	132.8	124.4	68.9	132.7	136	67	67	71	0.000	1.001	10.485	670			
217	22.214	21.807	84.213	0.10	0.10	0.91	1.22	0.00	77	77	71	1.13	0.40	84	0.020	95	99	57.4	0.20	1.27		63.6	132.5	124.0	68.9	132.4	136	66	67	71	0.000	1.001	10.569	673			
218	22.314	21.907	84.601	0.10	0.10	0.91	1.22	0.00	77	77	71	1.13	0.40	84	0.020	95	99	57.4	0.00	1.32		63.2	132.3	123.6	68.9	132.1	136	66	67	71	0.000	1.001	10.985	695			
219	22.414	22.007	84.989	0.10	0.10	0.92	1.21	0.00	77	77	71	1.13	0.40	84	0.020	95	99	57.3	0.10	1.34		63.0	132.0	123.1	68.9	131.8	137	66	67	71	0.000	1.001	11.151	704			
220	22.514	22.107	85.377	0.10	0.10	0.92	1.22	0.00	77	77	71	1.13	0.40	84	0.020	95	99	57.2	0.10	1.35		62.7	131.7	123.0	68.9	131.5	137	66	67	71	0.000	1.001	11.234	705			
221	22.614	22.208	85.765	0.10	0.10	0.92	1.23	0.00	77	77	71	1.14	0.40	84	0.020	95	100	57.1	0.10	1.34		62.5	131.5	122.6	68.9	131.3	137	66	67	71	0.000	1.001	11.151	698			
222	22.714	22.308	86.153	0.10	0.10	0.92	1.22	0.00	77	77	71	1.14	0.40	84	0.020	95	99	57.1	0.00	1.35		62.2	131.2	122.5	68.9	131.0	137	67	67	71	0.000	1.001	11.234	700			
223	22.814	22.409	86.541	0.10	0.10	0.92	1.23	0.00	77	77	71	1.14	0.40	84	0.020	95	100	57.0	0.10	1.35		61.9	130.9	122.2	68.9	130.7	137	67	67	71	0.000	1.001	11.234	697			
224	22.914	22.508	86.929	0.10	0.10	0.92	1.23	0.00	77	77	71	1.14	0.40	84	0.020	95	98	57.0	0.00	1.35		61.8	130.7	121.8	68.8	130.4	137	67	68	71	0.000	1.001	11.234	695			
225	23.024	22.609	87.317	0.11	0.10	0.92	1.22	0.00	77	77	71	1.14	0.40	84	0.020	105	100	56.9	0.10	1.35		61.5	130.4	121.7	68.9	130.2	137	67	68	71	0.000	1.001	11.234	692			
226	23.134	22.710	87.705	0.11	0.10	0.92	1.22	0.00	77	77	71	1.14	0.40	84	0.020	105	100	56.9	0.00	1.35		61.1	130.2	121.5	68.8	129.9	137	67	68	71	0.000	1.001	11.234	687			
227	23.244	22.810	88.093	0.11	0.10	0.92	1.23	0.00	77	77	71	1.13	0.40	84	0.020	105	99	56.8	0.10	1.36		60.9	129.9	121.3	68.8	129.6	137	67	68	71	0.000	1.001	11.318	690			
228	23.354	22.911	88.481	0.11	0.10	0.92	1.22	0.00	77	77	71	1.14	0.40	85	0.020	105	100	56.8	0.00	1.35		60.5	129.6	121.0	68.8	129.4	137	67	68	71	0.000	1.001	11.234	680			
229	23.464	23.011	88.870	0.11	0.10	0.92	1.23	0.00	77	77	71	1.13	0.40	85	0.020	105	99	56.8	0.00	1.35		60.3	129.4	120.9	68.8	129.1	137	67	68	71	0.000	1.001	11.234	678			
230	23.574																																				

Elapsed Time	Particulate Sampling Data																Fuel Weight, lb		Flow, gpm		Temperature Data, oF												Stack			
	Gas Meter Cubic Feet (1)	Gas Meter Cubic Feet (2)	Gas Meter Cubic Feet (amb)	Sample Rate, cfm (1)	Sample Rate, cfm (2)	Orifice dH (1)	Orifice dH (2)	Orifice dH (amb)	Meter oF (1)	Meter oF (2)	Meter oF (amb)	Meter Vac. In. Hg. (1)	Meter Vac. In. Hg. (2)	Dilution Tunnel Temp.	Dilution Tunnel dP	Pro. Rate (%) (1)	Pro. Rate (%) (2)	Scale Reading	Weight Change	Load Side Liquid Flow Rate	Boiler Side Liquid Flow Rate (optional)	Thermopile ΔT	Boiler to Heat Exch. Temp.	Heat Exch to Boiler Temp.	Inlet Load Temp.	Outlet Load Temp.	Stack	Filter (1)	Filter (2)	Ambient	Draft In. H2O	Specific Heat of Inlet Water (BTU/lb-°F)	Mass Flow Rate of Inlet Water (lb/min)	Heat Output, Btu		
259	26.614	26.025	100.512	0.10	0.10	0.92	1.23	0.00	77	76	70	1.14	0.40	86	0.020	95	99	55.9	0.10	1.35		52.8	122.3	114.8	68.7	122.1	146	67	68	70	0.000	1.001	11.235	594		
260	26.714	26.126	100.900	0.10	0.10	0.92	1.23	0.00	77	76	70	1.14	0.40	87	0.020	95	100	55.8	0.10	1.35		52.9	122.1	114.6	68.7	121.9	153	67	68	70	0.000	1.001	11.235	595		
261	26.814	26.226	101.288	0.10	0.10	0.92	1.22	0.00	77	76	70	1.14	0.40	89	0.020	96	99	55.7	0.10	1.33		52.6	122.0	114.6	68.7	121.8	162	67	68	70	0.000	1.001	11.068	583		
262	26.914	26.327	101.676	0.10	0.10	0.92	1.23	0.00	76	76	70	1.13	0.40	91	0.020	96	100	55.5	0.20	1.32		52.6	121.9	114.6	68.7	121.7	174	67	69	70	0.000	1.001	10.985	579		
263	27.014	26.428	102.064	0.10	0.10	0.92	1.23	0.00	76	76	70	1.13	0.40	94	0.020	96	101	55.3	0.20	1.35		52.4	121.8	114.3	68.6	121.5	185	67	69	70	0.000	1.001	11.235	589		
264	27.114	26.528	102.452	0.10	0.10	0.92	1.22	0.00	76	76	70	1.13	0.40	97	0.020	96	100	54.9	0.40	1.40		52.3	121.7	114.0	68.7	121.4	196	67	69	70	0.000	1.001	11.651	610		
265	27.214	26.628	102.840	0.10	0.10	0.92	1.23	0.00	76	76	70	1.13	0.40	103	0.020	97	101	54.5	0.40	1.43		52.2	121.7	113.7	68.7	121.4	226	67	69	70	0.000	1.001	11.900	622		
266	27.314	26.728	103.228	0.10	0.10	0.92	1.22	0.00	76	76	70	1.13	0.40	113	0.020	98	101	53.9	0.60	1.41		52.1	121.7	113.8	68.7	121.4	273	68	70	70	0.000	1.001	11.734	612		
267	27.414	26.828	103.616	0.10	0.10	0.92	1.21	0.00	76	76	70	1.12	0.40	122	0.020	99	102	53.3	0.60	1.42		52.1	121.7	113.8	68.6	121.4	317	68	70	70	0.000	1.001	11.817	617		
268	27.514	26.928	104.005	0.10	0.10	0.91	1.21	0.00	76	76	70	1.12	0.40	131	0.020	99	103	52.7	0.60	1.43		52.2	121.8	113.9	68.6	121.4	349	69	71	70	0.000	1.001	11.900	622		
269	27.614	27.028	104.393	0.10	0.10	0.91	1.21	0.00	76	76	70	1.12	0.40	140	0.020	100	104	52.0	0.70	1.50		52.3	121.9	113.7	68.7	121.6	379	69	72	70	0.000	1.001	12.483	654		
270	27.714	27.127	104.781	0.10	0.10	0.91	1.21	0.00	76	76	70	1.12	0.40	150	0.020	101	104	51.1	0.90	1.53		52.5	122.1	113.6	68.7	121.7	419	70	73	70	0.000	1.001	12.733	669		
271	27.814	27.226	105.169	0.10	0.10	0.91	1.21	0.00	76	76	70	1.11	0.40	161	0.020	102	104	50.1	1.00	1.52		52.7	122.2	113.5	68.6	121.8	464	71	74	70	0.000	1.001	12.649	667		
272	27.914	27.325	105.557	0.10	0.10	0.91	1.21	0.00	76	76	70	1.11	0.40	173	0.020	103	106	49.0	1.10	1.55		52.5	122.5	113.7	68.5	122.1	505	72	75	70	0.000	1.001	12.899	678		
273	28.014	27.425	105.945	0.10	0.10	0.90	1.21	0.00	76	76	70	1.11	0.40	183	0.020	104	107	47.9	1.10	1.57		52.9	123.0	114.1	68.5	122.5	529	73	77	70	0.000	1.001	13.066	692		
274	28.114	27.523	106.333	0.10	0.10	0.90	1.20	0.00	76	76	70	1.10	0.40	190	0.020	104	106	46.7	1.20	1.57		53.3	123.4	114.4	68.6	123.0	541	74	78	70	0.000	1.001	13.066	697		
275	28.214	27.622	106.721	0.10	0.10	0.91	1.20	0.00	76	76	70	1.10	0.40	196	0.020	105	107	45.5	1.20	1.58		54.1	124.1	115.0	68.6	123.6	552	74	79	70	0.000	1.001	13.149	712		
276	28.314	27.721	107.109	0.10	0.10	0.90	1.20	0.00	76	76	70	1.10	0.40	202	0.020	105	108	44.2	1.30	1.57		54.5	124.8	115.4	68.5	124.3	568	75	80	70	0.000	1.001	13.066	713		
277	28.414	27.819	107.497	0.10	0.10	0.90	1.18	0.00	76	76	70	1.10	0.40	203	0.020	105	107	43.0	1.20	1.50		55.3	126.0	116.6	68.5	125.3	574	76	81	70	0.000	1.001	12.483	691		
278	28.514	27.917	107.885	0.10	0.10	0.90	1.20	0.00	76	76	70	1.09	0.30	189	0.020	104	106	41.6	1.40	1.31		56.3	127.0	118.9	68.6	126.5	542	76	81	70	0.000	1.001	10.902	614		
279	28.614	28.015	108.273	0.10	0.10	0.89	1.19	0.00	76	76	70	1.09	0.40	199	0.020	105	107	40.6	1.00	1.29		57.4	128.4	120.1	68.6	127.7	562	77	82	70	0.000	1.001	10.735	617		
280	28.714	28.113	108.661	0.10	0.10	0.89	1.19	0.00	76	76	70	1.09	0.30	192	0.020	104	106	39.3	1.30	1.28		58.8	129.8	121.4	68.6	129.1	558	77	82	70	0.000	1.001	10.652	627		
281	28.814	28.211	109.049	0.10	0.10	0.89	1.19	0.00	76	76	70	1.09	0.40	194	0.020	104	106	38.2	1.10	1.28		60.2	130.8	122.2	68.6	130.2	561	78	82	70	0.000	1.001	10.652	642		
282	28.914	28.309	109.438	0.10	0.10	0.89	1.19	0.00	76	76	70	1.08	0.30	190	0.020	104	106	36.9	1.30	1.29		61.1	132.3	123.6	68.6	131.8	546	78	82	70	0.000	1.001	10.735	657		
283	29.014	28.406	109.826	0.10	0.10	0.88	1.18	0.00	76	76	70	1.08	0.30	199	0.020	105	105	35.7	1.20	1.29		62.8	133.8	124.8	68.6	133.1	561	78								

Elapsed Time	Particulate Sampling Data																Fuel Weight, lb		Flow, gpm		Temperature Data, oF												Stack				
	Gas Meter Cubic Feet (1)	Gas Meter Cubic Feet (2)	Gas Meter Cubic Feet (amb)	Sample Rate, cfm (1)	Sample Rate, cfm (2)	Orifice dH (1)	Orifice dH (2)	Orifice dH (amb)	Meter oF (1)	Meter oF (2)	Meter oF (amb)	Meter Vac. In. Hg. (1)	Meter Vac. In. Hg. (2)	Dilution Tunnel Temp.	Dilution Tunnel dP	Pro. Rate (%) (1)	Pro. Rate (%) (2)	Scale Reading	Weight Change	Load Side Liquid Flow Rate	Boiler Side Liquid Flow Rate (optional)	Thermopile ΔT	Boiler to Heat Exch. Temp.	Heat Exch to Boiler Temp.	Inlet Load Temp.	Outlet Load Temp.	Stack	Filter (1)	Filter (2)	Ambient	Draft In. H2O	Specific Heat of Inlet Water (BTU/lb-°F)	Mass Flow Rate of Inlet Water (lb/min)	Heat Output, Btu			
313	32.244	31.387	121.468	0.11	0.10	0.98	1.22	0.00	76	76	70	0.92	0.20	168	0.020	113	106	12.9	0.50	0.86		97.8	167.8	158.3	68.7	167.2	465	72	74	70	0.000	1.001	7.157	701			
314	32.354	31.485	121.856	0.11	0.10	0.99	1.22	0.00	76	76	70	0.93	0.20	166	0.020	112	104	12.4	0.50	0.85		98.8	168.7	159.4	68.7	168.0	460	72	74	70	0.000	1.001	7.074	700			
315	32.464	31.585	122.244	0.11	0.10	1.01	1.22	0.00	76	76	70	0.94	0.20	165	0.020	112	106	11.9	0.50	0.85		99.3	169.4	159.9	68.7	168.8	457	72	73	70	0.000	1.001	7.074	703			
316	32.574	31.685	122.632	0.11	0.10	1.02	1.22	0.00	76	76	70	0.96	0.20	164	0.020	112	106	11.4	0.50	0.83		100.1	170.2	160.9	68.7	169.5	452	71	73	70	0.000	1.001	6.907	692			
317	32.684	31.785	123.020	0.11	0.10	1.03	1.22	0.00	76	76	70	0.96	0.20	162	0.020	112	106	11.0	0.40	0.83		100.7	170.7	161.4	68.7	170.1	447	71	73	70	0.000	1.001	6.907	697			
318	32.794	31.885	123.408	0.11	0.10	1.04	1.23	0.00	76	76	70	0.97	0.20	161	0.020	112	106	10.5	0.50	0.84		101.5	171.7	162.2	68.7	171.0	445	71	73	70	0.000	1.001	6.990	710			
319	32.904	31.985	123.796	0.11	0.10	1.05	1.22	0.00	76	76	70	0.98	0.20	160	0.020	112	105	10.2	0.30	0.85		102.3	172.5	162.6	68.7	171.7	442	71	72	70	0.000	1.001	7.074	725			
320	33.014	32.084	124.184	0.11	0.10	1.03	1.22	0.00	76	76	70	1.02	0.20	150	0.020	111	104	9.7	0.50	0.84		102.9	173.2	163.3	68.7	172.6	436	70	71	70	0.000	1.001	6.990	720			
321	33.114	32.185	124.573	0.10	0.10	0.99	1.23	0.00	76	76	70	1.03	0.20	112	0.020	98	102	9.5	0.20	0.83		104.3	173.9	164.2	68.7	173.1	392	69	70	70	0.000	1.001	6.907	721			
322	33.214	32.287	124.961	0.10	0.10	0.99	1.24	0.00	76	76	70	1.04	0.20	97	0.020	96	102	9.3	0.20	0.83		104.6	174.4	164.6	68.7	173.8	356	69	69	70	0.000	1.001	6.907	723			
323	33.324	32.389	125.349	0.11	0.10	0.99	1.26	0.00	76	76	70	1.04	0.30	89	0.020	105	101	9.1	0.20	0.82		105.4	174.7	165.0	68.6	174.1	337	68	68	70	0.000	1.001	6.824	720			
324	33.434	32.490	125.737	0.11	0.10	1.00	1.26	0.00	76	76	70	1.05	0.30	85	0.020	105	100	9.1	0.00	0.83		105.5	175.1	165.4	68.7	174.4	325	67	67	70	0.000	1.001	6.907	730			
325	33.544	32.592	126.125	0.11	0.10	1.00	1.26	0.00	76	76	70	1.05	0.30	83	0.020	105	101	9.0	0.10	0.83		105.9	175.3	165.6	68.7	174.8	316	67	67	70	0.000	1.001	6.907	732			
326	33.654	32.696	126.513	0.11	0.10	1.01	1.27	0.00	76	76	70	1.05	0.30	82	0.020	105	103	8.9	0.10	0.82		106.3	175.3	165.5	68.7	174.8	307	66	66	70	0.000	1.001	6.824	726			
327	33.764	32.799	126.901	0.11	0.10	1.01	1.29	0.00	76	76	70	1.05	0.30	80	0.020	104	101	8.8	0.10	0.82		106.1	175.3	165.5	68.7	174.8	299	66	66	70	0.000	1.001	6.824	725			
328	33.874	32.903	127.289	0.11	0.10	1.01	1.29	0.00	76	76	70	1.06	0.30	79	0.020	104	102	8.8	0.00	0.83		106.2	175.2	165.7	68.7	174.8	292	65	65	70	0.000	1.001	6.907	734			
329	33.984	33.007	127.677	0.11	0.10	1.02	1.29	0.00	76	76	70	1.06	0.30	79	0.020	104	102	8.8	0.00	0.83		106.1	175.1	165.4	68.7	174.7	285	65	65	70	0.000	1.001	6.907	734			
330	34.094	33.111	128.065	0.11	0.10	1.02	1.31	0.00	76	76	70	1.06	0.30	78	0.020	104	102	8.7	0.10	0.83		106.0	174.9	165.2	68.7	174.5	279	65	64	70	0.000	1.001	6.907	733			
331	34.204	33.216	128.453	0.11	0.11	1.02	1.30	0.00	76	76	70	1.06	0.30	78	0.020	104	103	8.7	0.00	0.83		106.1	174.8	165.3	68.7	174.4	274	64	64	70	0.000	1.001	6.907	733			
332	34.314	33.321	128.841	0.11	0.10	1.02	1.31	0.00	76	76	70	1.06	0.30	77	0.020	104	103	8.6	0.10	0.82		105.9	174.8	165.1	68.7	174.4	268	64	64	70	0.000	1.001	6.824	723			
333	34.414	33.425	129.229	0.10	0.10	1.02	1.32	0.00	76	76	70	1.07	0.30	77	0.020	95	102	8.6	0.00	0.82		105.7	174.6	165.0	68.7	174.2	263	64	63	70	0.000	1.001	6.824	722			
334	34.514	33.531	129.618	0.10	0.11	1.02	1.31	0.00	76	76	70	1.07	0.30	77	0.020	95	104	8.6	0.00	0.82		105.5	174.5	164.9	68.7	174.0	258	64	63	70	0.000	1.001	6.824	721			
335	34.614	33.636	130.006	0.10	0.11	1.03	1.32	0.00	76	76	70	1.07	0.30	76	0.020	95	103	8.6	0.00	0.82		105.5	174.3	164.7	68.7	173.9	253	63	63	70	0.000	1.001	6.824	721			
336	34.724	33.741	130.394	0.11	0.10	1.03	1.32	0.00	76	76	70	1.07	0.30	76	0.020	104	103	8.6	0.00	0.81		105.2	174.2	164.5	68.7	173.8	249	63	62	70	0.000	1.001	6.741	710			
337	34.834	33.847	130.782	0.11	0.11	1.02	1.32	0.00	76	76	70	1.07	0.30	76	0.020	104	104	8.6	0.00	0.82		105.2	174.0	164.5	68.7	173.6	244	63	62	70	0.000	1.0.					

Elapsed Time	Particulate Sampling Data																Fuel Weight, lb		Flow, gpm		Temperature Data, oF												Stack				
	Gas Meter Cubic Feet (1)	Gas Meter Cubic Feet (2)	Gas Meter Cubic Feet (amb)	Sample Rate, cfm (1)	Sample Rate, cfm (2)	Orifice dH (1)	Orifice dH (2)	Orifice dH (amb)	Meter oF (1)	Meter oF (2)	Meter oF (amb)	Meter Vac. In. Hg. (1)	Meter Vac. In. Hg. (2)	Dilution Tunnel Temp.	Dilution Tunnel dP	Pro. Rate (%) (1)	Pro. Rate (%) (2)	Scale Reading	Weight Change	Load Side Liquid Flow Rate	Boiler Side Liquid Flow Rate (optional)	Thermopile ΔT	Boiler to Heat Exch. Temp.	Heat Exch to Boiler Temp.	Inlet Load Temp.	Outlet Load Temp.	Stack	Filter (1)	Filter (2)	Ambient	Draft In. H2O	Specific Heat of Inlet Water (BTU/lb-°F)	Mass Flow Rate of Inlet Water (lb/min)	Heat Output, Btu			
367	38.014	36.870	142.424	0.11	0.10	0.93	1.22	0.00	76	75	70	1.11	0.40	72	0.020	104	98	8.5	-0.10	0.87		99.4	168.3	158.8	68.7	168.0	163	65	64	70	0.000	1.001	7.240	721			
368	38.114	36.970	142.812	0.10	0.10	0.93	1.23	0.00	76	75	70	1.11	0.40	72	0.020	94	98	8.4	0.10	0.87		99.2	168.0	158.6	68.7	167.7	162	65	64	70	0.000	1.001	7.240	719			
369	38.214	37.071	143.200	0.10	0.10	0.93	1.22	0.00	76	75	70	1.11	0.40	72	0.020	94	99	8.4	0.00	0.88		99.1	167.8	158.3	68.7	167.5	161	66	64	70	0.000	1.001	7.323	727			
370	38.314	37.171	143.588	0.10	0.10	0.93	1.23	0.00	76	75	70	1.10	0.40	72	0.020	94	98	8.5	-0.10	0.87		98.6	167.6	158.3	68.7	167.3	159	66	64	70	0.000	1.001	7.240	715			
371	38.414	37.272	143.976	0.10	0.10	0.93	1.22	0.00	76	75	70	1.11	0.40	72	0.020	94	99	8.4	0.10	0.88		98.5	167.4	157.9	68.7	167.1	158	66	64	70	0.000	1.001	7.323	722			
372	38.514	37.372	144.364	0.10	0.10	0.93	1.22	0.00	76	75	70	1.11	0.40	72	0.020	94	98	8.4	0.00	0.88		98.3	167.2	157.7	68.7	166.9	157	66	65	70	0.000	1.001	7.323	721			
373	38.614	37.471	144.753	0.10	0.10	0.93	1.23	0.00	76	75	70	1.11	0.40	72	0.020	94	97	8.4	0.00	0.88		98.0	167.0	157.7	68.7	166.7	156	66	65	70	0.000	1.001	7.323	719			
374	38.714	37.572	145.141	0.10	0.10	0.93	1.22	0.00	76	75	70	1.11	0.40	72	0.020	94	99	8.4	0.00	0.87		97.8	166.8	157.4	68.8	166.4	155	66	65	70	0.000	1.001	7.240	709			
375	38.814	37.672	145.529	0.10	0.10	0.93	1.22	0.00	76	75	70	1.11	0.40	72	0.020	94	98	8.4	0.00	0.87		97.7	166.5	157.6	68.8	166.2	154	66	65	70	0.000	1.001	7.240	708			
376	38.914	37.772	145.917	0.10	0.10	0.93	1.22	0.00	76	75	70	1.11	0.40	72	0.020	94	98	8.5	-0.10	0.88		97.4	166.3	157.1	68.8	166.0	152	66	65	70	0.000	1.001	7.323	714			
377	39.014	37.873	146.305	0.10	0.10	0.93	1.23	0.00	76	75	70	1.11	0.40	72	0.020	94	99	8.5	0.00	0.88		97.0	166.2	156.7	68.8	165.8	152	66	65	70	0.000	1.001	7.323	711			
378	39.114	37.972	146.693	0.10	0.10	0.93	1.22	0.00	76	75	70	1.11	0.40	72	0.020	94	97	8.4	0.10	0.88		96.9	165.9	156.5	68.7	165.6	150	66	65	70	0.000	1.001	7.323	710			
379	39.224	38.072	147.081	0.11	0.10	0.93	1.22	0.00	76	75	70	1.11	0.40	72	0.020	104	98	8.4	0.00	0.88		96.7	165.6	156.1	68.7	165.3	149	66	66	70	0.000	1.001	7.323	709			
380	39.334	38.173	147.469	0.11	0.10	0.93	1.22	0.00	76	75	70	1.10	0.40	72	0.020	104	99	8.4	0.00	0.88		96.7	165.4	156.1	68.7	165.1	148	66	66	70	0.000	1.001	7.323	709			
381	39.444	38.273	147.857	0.11	0.10	0.93	1.22	0.00	76	75	70	1.11	0.40	72	0.020	104	98	8.5	-0.10	0.93		96.4	165.2	155.6	68.7	164.9	147	66	66	70	0.000	1.001	7.739	747			
382	39.554	38.374	148.245	0.11	0.10	0.93	1.22	0.00	76	75	70	1.11	0.40	72	0.020	104	99	8.4	0.10	0.91		96.2	164.9	155.4	68.7	164.7	146	67	66	70	0.000	1.001	7.573	730			
383	39.664	38.474	148.633	0.11	0.10	0.93	1.22	0.00	76	75	70	1.10	0.40	72	0.020	104	98	8.4	0.00	0.92		96.0	164.7	155.1	68.8	164.4	145	67	66	70	0.000	1.001	7.656	735			
384	39.774	38.574	149.021	0.11	0.10	0.94	1.22	0.00	76	75	70	1.11	0.40	71	0.020	104	98	8.5	-0.10	0.92		95.7	164.5	154.9	68.8	164.2	144	67	66	70	0.000	1.001	7.656	734			
385	39.884	38.674	149.409	0.11	0.10	0.94	1.22	0.00	76	75	70	1.11	0.40	71	0.020	104	98	8.5	0.00	0.92		95.3	164.3	155.0	68.8	164.0	144	67	66	70	0.000	1.001	7.656	730			
386	39.994	38.775	149.798	0.11	0.10	0.93	1.23	0.00	76	75	70	1.10	0.40	71	0.020	104	99	8.4	0.10	0.92		95.3	164.0	154.5	68.7	163.7	142	67	67	70	0.000	1.001	7.656	731			
387	40.104	38.875	150.186	0.11	0.10	0.93	1.23	0.00	76	75	70	1.10	0.40	71	0.020	104	98	8.5	-0.10	0.91		94.9	163.8	154.4	68.7	163.4	141	67	67	70	0.000	1.001	7.573	719			
388	40.214	38.976	150.574	0.11	0.10	0.93	1.22	0.00	76	75	69	1.11	0.40	71	0.020	104	99	8.5	0.00	0.92		94.8	163.5	154.4	68.8	163.2	141	67	67	69	0.000	1.001	7.656	726			
389	40.314	39.075	150.962	0.10	0.10	0.93	1.23	0.00	76	75	70	1.10	0.40	71	0.020	94	97	8.5	0.00	0.91		94.5	163.3	154.0	68.8	163.0	140	67	67	70	0.000	1.001	7.573	716			
390	40.414	39.176	151.350	0.10	0.10	0.93	1.22	0.00	76	75	69	1.11	0.40	71	0.020	94	99	8.5	0.00	0.91		94.0	163.1	153.8	68.8	162.8	139	67	67	69	0.000	1.001	7.573	713			
391	40.514	39.277	151.738	0.10	0.10	0.93	1.21	0.00	76	75	70	1.11	0.40	71	0.020	94	99	8.5	0.00	0.92		93.8	162.9	153.6	68.8	162.6	138	67	67	70	0.000	1.001	7.656	719			
392	40.614	39.377	152.126	0.1																																	

Elapsed Time	Particulate Sampling Data																Fuel Weight, lb		Flow, gpm		Temperature Data, oF												Stack		Specific Heat of Inlet Water (BTU/lb-°F)	Mass Flow Rate of Inlet Water (lb/min)	Heat Output, Btu
	Gas Meter Cubic Feet (1)	Gas Meter Cubic Feet (2)	Gas Meter Cubic Feet (amb)	Sample Rate, cfm (1)	Sample Rate, cfm (2)	Orifice dH (1)	Orifice dH (2)	Orifice dH (amb)	Meter oF (1)	Meter oF (2)	Meter oF (amb)	Meter Vac. In. Hg. (1)	Meter Vac. In. Hg. (2)	Dilution Tunnel Temp.	Dilution Tunnel dP	Pro. Rate (%) (1)	Pro. Rate (%) (2)	Scale Reading	Weight Change	Load Side Liquid Flow Rate	Boiler Side Liquid Flow Rate (optional)	Thermopile ΔT	Boiler to Heat Exch. Temp.	Heat Exch to Boiler Temp.	Inlet Load Temp.	Outlet Load Temp.	Stack	Filter (1)	Filter (2)	Ambient	Draft In. H2O						
421	43.624	42.283	163.380	0.11	0.10	0.93	1.20	0.00	75	75	69	1.10	0.40	70	0.020	104	97	8.6	0.00	1.00		87.1	155.9	146.7	68.8	155.6	120	68	67	69	0.000	1.001	8.322	726			
422	43.734	42.382	163.768	0.11	0.10	0.93	1.19	0.00	75	75	69	1.11	0.40	70	0.020	104	97	8.6	0.00	1.00		86.9	155.6	146.4	68.8	155.4	120	68	67	69	0.000	1.001	8.322	724			
423	43.844	42.481	164.156	0.11	0.10	0.94	1.20	0.00	75	75	69	1.11	0.40	70	0.020	104	97	8.5	0.10	0.99		86.5	155.3	146.2	68.7	155.1	120	68	67	69	0.000	1.001	8.239	714			
424	43.954	42.581	164.544	0.11	0.10	0.93	1.20	0.00	75	75	69	1.10	0.40	70	0.020	104	98	8.6	-0.10	1.00		86.3	155.2	146.0	68.8	155.0	119	68	67	69	0.000	1.001	8.322	719			
425	44.064	42.680	164.933	0.11	0.10	0.94	1.21	0.00	75	75	69	1.11	0.40	70	0.020	104	97	8.6	0.00	1.00		86.1	155.0	145.8	68.8	154.7	119	68	67	69	0.000	1.001	8.322	717			
426	44.174	42.780	165.321	0.11	0.10	0.94	1.20	0.00	75	75	69	1.11	0.40	70	0.020	104	98	8.7	-0.10	1.00		85.9	154.7	145.4	68.8	154.4	118	68	67	69	0.000	1.001	8.322	716			
427	44.284	42.879	165.709	0.11	0.10	0.94	1.20	0.00	75	75	69	1.11	0.40	70	0.020	104	97	8.7	0.00	1.00		85.4	154.5	145.4	68.7	154.3	119	68	67	69	0.000	1.001	8.322	712			
428	44.394	42.978	166.097	0.11	0.10	0.94	1.21	0.00	75	75	69	1.11	0.40	70	0.020	104	97	8.6	0.10	1.00		85.6	154.2	145.3	68.7	154.0	118	69	67	69	0.000	1.001	8.322	713			
429	44.504	43.077	166.485	0.11	0.10	0.94	1.21	0.00	75	74	69	1.11	0.40	70	0.020	104	97	8.6	0.00	1.00		85.2	153.9	144.8	68.7	153.7	118	69	67	69	0.000	1.001	8.322	710			
430	44.614	43.177	166.873	0.11	0.10	0.94	1.20	0.00	75	74	69	1.11	0.40	70	0.020	104	98	8.6	0.00	1.00		84.9	153.8	144.7	68.8	153.5	117	69	67	69	0.000	1.001	8.322	708			
431	44.714	43.276	167.261	0.10	0.10	0.94	1.20	0.00	75	74	69	1.11	0.40	70	0.020	94	97	8.6	0.00	1.00		84.7	153.5	144.4	68.7	153.3	117	69	67	69	0.000	1.001	8.322	706			
432	44.814	43.376	167.649	0.10	0.10	0.93	1.21	0.00	75	74	69	1.11	0.40	70	0.020	94	98	8.6	0.00	1.00		84.5	153.3	144.4	68.7	153.1	117	69	67	69	0.000	1.001	8.322	704			
433	44.914	43.475	168.037	0.10	0.10	0.93	1.20	0.00	75	74	69	1.11	0.40	70	0.020	94	97	8.7	-0.10	1.01		84.3	153.0	144.1	68.7	152.8	117	69	67	69	0.000	1.001	8.405	709			
434	45.014	43.574	168.425	0.10	0.10	0.94	1.21	0.00	75	74	69	1.10	0.40	70	0.020	94	97	8.6	0.10	1.01		84.2	152.8	143.7	68.8	152.6	116	69	67	69	0.000	1.001	8.405	708			
435	45.114	43.673	168.813	0.10	0.10	0.94	1.21	0.00	75	74	69	1.11	0.40	70	0.020	94	97	8.6	0.00	1.02		83.9	152.6	143.5	68.8	152.4	116	69	67	69	0.000	1.001	8.488	713			
436	45.214	43.772	169.201	0.10	0.10	0.94	1.20	0.00	75	74	69	1.11	0.40	70	0.020	94	97	8.7	-0.10	1.02		83.5	152.3	143.4	68.7	152.1	116	69	67	69	0.000	1.001	8.488	709			
437	45.314	43.872	169.589	0.10	0.10	0.94	1.20	0.00	75	74	69	1.11	0.40	70	0.020	94	98	8.6	0.10	1.02		83.3	152.2	143.2	68.8	151.9	116	69	67	69	0.000	1.001	8.488	708			
438	45.414	43.971	169.978	0.10	0.10	0.94	1.20	0.00	75	74	69	1.11	0.40	70	0.020	94	97	8.6	0.00	1.01		83.3	151.9	142.8	68.7	151.6	115	69	67	69	0.000	1.001	8.405	701			
439	45.514	44.071	170.366	0.10	0.10	0.94	1.21	0.00	75	74	69	1.11	0.40	70	0.020	94	98	8.7	-0.10	1.02		82.8	151.6	142.7	68.7	151.4	115	69	67	69	0.000	1.001	8.488	704			
440	45.614	44.170	170.754	0.10	0.10	0.94	1.21	0.00	75	74	69	1.11	0.40	70	0.020	94	97	8.6	0.10	1.01		82.5	151.3	142.4	68.8	151.1	114	69	67	69	0.000	1.001	8.405	695			
441	45.714	44.269	171.142	0.10	0.10	0.94	1.21	0.00	75	74	69	1.11	0.40	70	0.020	94	97	8.7	-0.10	1.02		82.2	151.2	142.1	68.7	150.9	114	69	68	69	0.000	1.001	8.488	699			
442	45.824	44.368	171.530	0.11	0.10	0.94	1.20	0.00	75	74	69	1.11	0.40	70	0.020	104	97	8.6	0.10	1.02		82.2	150.9	142.2	68.7	150.7	113	69	68	69	0.000	1.001	8.488	698			
443	45.934	44.467	171.918	0.11	0.10	0.94	1.20	0.00	75	74	69	1.11	0.40	70	0.020	104	97	8.7	-0.10	1.03		81.9	150.7	141.6	68.7	150.5	113	69	68	69	0.000	1.001	8.571	703			
444	46.044	44.567	172.306	0.11	0.10	0.94	1.21	0.00	75	74	69	1.11	0.40	70	0.020	104	98	8.6	0.10	1.04		81.7	150.4	141.3	68.7	150.2	113	69	68	69	0.000	1.001	8.655	708			
445	46.154	44.666	172.694	0.11	0.10	0.93	1.21	0.00	75	74	69	1.11	0.40	70	0.020	104	97	8.6	0.00	1.04		81.4	150.2	141.4	68.7	150.0	113	69	68	69	0.000	1.001	8.655	705			
446	46.264	44.766	173.0																																		

Elapsed Time	Particulate Sampling Data																Fuel Weight, lb		Flow, gpm		Temperature Data, oF												Stack	Specific Heat of Inlet Water (BTU/lb-°F)	Mass Flow Rate of Inlet Water (lb/min)	Heat Output, Btu
	Gas Meter Cubic Feet (1)	Gas Meter Cubic Feet (2)	Gas Meter Cubic Feet (amb)	Sample Rate, cfm (1)	Sample Rate, cfm (2)	Orifice dH (1)	Orifice dH (2)	Orifice dH (amb)	Meter oF (1)	Meter oF (2)	Meter oF (amb)	Meter Vac. In. Hg. (1)	Meter Vac. In. Hg. (2)	Dilution Tunnel Temp.	Dilution Tunnel dP	Pro. Rate (%) (1)	Pro. Rate (%) (2)	Scale Reading	Weight Change	Load Side Liquid Flow Rate	Boiler Side Liquid Flow Rate (optional)	Thermopile ΔT	Boiler to Heat Exch. Temp.	Heat Exch to Boiler Temp.	Inlet Load Temp.	Outlet Load Temp.	Stack	Filter (1)	Filter (2)	Ambient	Draft In. H2O					
475	49.314	47.646	184.336	0.10	0.10	0.94	1.21	0.00	74	74	68	1.11	0.40	69	0.020	94	97	8.8	0.00	1.09		74.3	143.0	134.5	68.6	142.8	107	69	68	68	0.000	1.001	9.071	675		
476	49.414	47.746	184.724	0.10	0.10	0.94	1.21	0.00	74	74	69	1.11	0.40	69	0.020	94	98	8.8	0.00	1.11		74.0	142.8	134.0	68.6	142.6	108	69	68	69	0.000	1.001	9.237	685		
477	49.514	47.845	185.112	0.10	0.10	0.94	1.21	0.00	74	74	68	1.11	0.40	69	0.020	94	97	8.7	0.10	1.11		73.7	142.5	133.8	68.5	142.3	107	69	68	68	0.000	1.001	9.237	682		
478	49.614	47.945	185.501	0.10	0.10	0.94	1.20	0.00	74	74	69	1.11	0.40	69	0.020	94	98	8.8	-0.10	1.12		73.6	142.4	133.7	68.6	142.2	107	69	68	69	0.000	1.001	9.321	687		
479	49.714	48.044	185.889	0.10	0.10	0.94	1.21	0.00	74	74	69	1.11	0.40	69	0.020	94	97	8.7	0.10	1.12		73.5	142.1	133.5	68.6	141.9	106	69	68	69	0.000	1.001	9.321	686		
480	49.814	48.144	186.277	0.10	0.10	0.94	1.21	0.00	74	74	68	1.11	0.40	69	0.020	94	98	8.8	-0.10	1.12		73.1	141.9	133.2	68.6	141.7	106	69	68	68	0.000	1.001	9.321	682		
481	49.914	48.242	186.665	0.10	0.10	0.94	1.21	0.00	74	74	68	1.10	0.40	69	0.020	94	96	8.8	0.00	1.11		72.9	141.6	133.1	68.6	141.4	106	69	68	68	0.000	1.001	9.237	674		
482	50.014	48.342	187.053	0.10	0.10	0.93	1.20	0.00	74	74	68	1.11	0.40	69	0.020	94	98	8.8	0.00	1.11		72.8	141.4	132.8	68.6	141.2	105	69	68	68	0.000	1.001	9.237	673		
483	50.124	48.442	187.441	0.11	0.10	0.94	1.21	0.00	74	74	68	1.11	0.40	69	0.020	104	98	8.8	0.00	1.11		72.4	141.2	132.7	68.6	141.0	106	69	68	68	0.000	1.001	9.237	670		
484	50.234	48.541	187.829	0.11	0.10	0.94	1.21	0.00	74	74	68	1.11	0.40	69	0.020	104	97	8.8	0.00	1.12		72.0	141.0	132.6	68.6	140.8	106	69	68	68	0.000	1.001	9.321	672		
485	50.344	48.641	188.217	0.11	0.10	0.94	1.19	0.00	74	74	68	1.11	0.40	69	0.020	104	98	8.8	0.00	1.11		71.9	140.6	132.2	68.5	140.4	106	69	68	68	0.000	1.001	9.237	665		
486	50.454	48.740	188.605	0.11	0.10	0.94	1.21	0.00	74	74	68	1.11	0.40	69	0.020	104	97	8.8	0.00	1.11		71.9	140.4	131.9	68.6	140.3	105	69	68	68	0.000	1.001	9.237	665		
487	50.564	48.839	188.993	0.11	0.10	0.94	1.21	0.00	74	74	68	1.11	0.40	69	0.020	104	97	8.9	-0.10	1.11		71.7	140.2	131.7	68.6	140.0	105	69	68	68	0.000	1.001	9.237	663		
488	50.674	48.938	189.381	0.11	0.10	0.94	1.21	0.00	74	74	68	1.11	0.40	69	0.020	104	97	8.8	0.10	1.11		71.6	140.0	131.5	68.6	139.8	105	68	68	68	0.000	1.001	9.237	662		
489	50.784	49.037	189.769	0.11	0.10	0.94	1.20	0.00	74	74	68	1.11	0.40	69	0.020	104	97	8.8	0.00	1.10		71.2	139.8	131.5	68.6	139.5	105	68	68	68	0.000	1.001	9.154	652		
490	50.894	49.137	190.157	0.11	0.10	0.94	1.21	0.00	74	74	68	1.11	0.40	69	0.020	104	98	8.8	0.00	1.11		70.9	139.6	131.1	68.6	139.4	104	68	68	68	0.000	1.001	9.237	656		
491	51.004	49.237	190.546	0.11	0.10	0.94	1.21	0.00	74	74	68	1.11	0.40	69	0.020	104	98	8.9	-0.10	1.11		70.7	139.3	130.9	68.5	139.1	104	68	68	68	0.000	1.001	9.238	654		
492	51.114	49.336	190.934	0.11	0.10	0.94	1.21	0.00	74	74	68	1.11	0.40	69	0.020	104	97	8.8	0.10	1.12		70.5	139.0	131.0	68.5	138.9	104	68	68	68	0.000	1.001	9.321	658		
493	51.214	49.436	191.322	0.10	0.10	0.94	1.21	0.00	74	74	68	1.11	0.40	69	0.020	94	98	8.8	0.00	1.11		70.3	138.8	130.3	68.5	138.6	104	68	68	68	0.000	1.001	9.238	650		
494	51.314	49.534	191.710	0.10	0.10	0.94	1.21	0.00	74	74	68	1.11	0.40	69	0.020	94	96	8.9	-0.10	1.11		70.0	138.5	130.2	68.5	138.3	104	68	68	68	0.000	1.001	9.238	647		
495	51.414	49.634	192.098	0.10	0.10	0.94	1.20	0.00	74	74	68	1.11	0.40	69	0.020	94	98	8.8	0.10	1.11		70.1	138.4	130.1	68.5	138.1	103	68	68	68	0.000	1.001	9.238	648		
496	51.514	49.733	192.486	0.10	0.10	0.94	1.20	0.00	74	74	68	1.11	0.40	69	0.020	94	97	8.8	0.00	1.11		69.7	138.2	129.9	68.5	137.9	103	68	68	68	0.000	1.001	9.238	645		
497	51.614	49.833	192.874	0.10	0.10	0.94	1.20	0.00	74	74	68	1.11	0.40	69	0.020	94	98	8.8	0.00	1.11		69.5	137.9	129.8	68.5	137.8	103	68	68	68	0.000	1.001	9.238	643		
498	51.714	49.932	193.262	0.10	0.10	0.94	1.20	0.00	74	74	68	1.11	0.40	69	0.020	94	97	8.9	-0.10	1.11		69.3	137.7	129.5	68.5	137.5	103	68	68	68	0.000	1.001	9.238	641		
499	51.814	50.032	193.650	0.10	0.10	0.94	1.21	0.00	74	74	68	1.11	0.40	69	0.020	94	98	8.9	0.00	1.11		69.1	137.4	129.3	68.4	137.2	103	68	68	68	0.000	1.001	9.238	639		
500	51.914	50.131	194.038																																	

Elapsed Time	Particulate Sampling Data																Fuel Weight, lb		Flow, gpm		Temperature Data, oF												Stack			
	Gas Meter Cubic Feet (1)	Gas Meter Cubic Feet (2)	Gas Meter Cubic Feet (amb)	Sample Rate, cfm (1)	Sample Rate, cfm (2)	Orifice dH (1)	Orifice dH (2)	Orifice dH (amb)	Meter oF (1)	Meter oF (2)	Meter oF (amb)	Meter Vac. In. Hg. (1)	Meter Vac. In. Hg. (2)	Dilution Tunnel Temp.	Dilution Tunnel dP	Pro. Rate (%) (1)	Pro. Rate (%) (2)	Scale Reading	Weight Change	Load Side Liquid Flow Rate	Boiler Side Liquid Flow Rate (optional)	Thermopile ΔT	Boiler to Heat Exch. Temp.	Heat Exch to Boiler Temp.	Inlet Load Temp.	Outlet Load Temp.	Stack	Filter (1)	Filter (2)	Ambient	Draft In. H2O	Specific Heat of Inlet Water (BTU/lb-°F)	Mass Flow Rate of Inlet Water (lb/min)	Heat Output, Btu		
529	54.974	53.010	205.292	0.11	0.10	0.94	1.20	0.00	74	73	68	1.10	0.40	137	0.020	110	103	5.2	0.20	1.14		65.6	135.0	127.0	68.4	134.7	386	66	69	68	0.000	1.001	9.487	623		
530	55.084	53.109	205.681	0.11	0.10	0.94	1.20	0.00	74	73	68	1.10	0.40	139	0.020	110	103	4.9	0.30	1.15		66.2	135.4	127.3	68.5	135.0	390	66	69	68	0.000	1.001	9.570	634		
531	55.194	53.208	206.069	0.11	0.10	0.94	1.20	0.00	74	74	68	1.10	0.40	140	0.020	110	103	4.6	0.30	1.15		66.3	135.8	127.6	68.4	135.4	394	66	69	68	0.000	1.001	9.571	636		
532	55.304	53.307	206.457	0.11	0.10	0.94	1.19	0.00	74	73	68	1.10	0.40	141	0.020	111	103	4.3	0.30	1.15		66.8	136.4	128.1	68.4	136.0	397	66	69	68	0.000	1.001	9.571	640		
533	55.414	53.407	206.845	0.11	0.10	0.94	1.20	0.00	74	73	68	1.10	0.40	142	0.020	111	105	4.0	0.30	1.07		67.7	136.8	128.7	68.4	136.4	400	66	70	68	0.000	1.001	8.905	604		
534	55.514	53.506	207.233	0.10	0.10	0.94	1.19	0.00	74	73	68	1.10	0.40	143	0.020	101	104	3.7	0.30	1.14		67.9	137.3	129.0	68.4	136.9	402	67	70	68	0.000	1.001	9.487	645		
535	55.614	53.604	207.621	0.10	0.10	0.95	1.20	0.00	74	73	68	1.10	0.40	143	0.020	101	103	3.5	0.20	1.15		68.3	137.9	129.4	68.4	137.5	403	67	70	68	0.000	1.001	9.571	654		
536	55.714	53.703	208.009	0.10	0.10	0.94	1.20	0.00	74	73	68	1.10	0.40	144	0.020	101	104	3.2	0.30	1.15		68.8	138.4	130.0	68.4	138.0	403	67	70	68	0.000	1.001	9.571	660		
537	55.814	53.802	208.397	0.10	0.10	0.94	1.19	0.00	74	73	68	1.10	0.40	144	0.020	101	104	3.0	0.20	1.15		70.0	139.0	130.3	68.4	138.6	401	67	70	68	0.000	1.001	9.571	670		
538	55.914	53.901	208.785	0.10	0.10	0.95	1.20	0.00	74	73	68	1.10	0.40	143	0.020	101	104	2.7	0.30	1.15		70.1	139.4	130.7	68.4	138.9	399	67	71	68	0.000	1.001	9.571	672		
539	56.014	54.000	209.173	0.10	0.10	0.94	1.20	0.00	74	73	68	1.10	0.40	143	0.020	101	104	2.5	0.20	1.14		70.6	140.1	131.2	68.4	139.6	397	67	71	68	0.000	1.001	9.487	671		
540	56.124	54.099	209.561	0.11	0.10	0.95	1.19	0.00	74	73	68	1.10	0.40	142	0.020	111	103	2.2	0.30	1.14		71.3	140.7	132.0	68.4	140.3	393	67	71	68	0.000	1.001	9.487	678		
541	56.234	54.198	209.949	0.11	0.10	0.94	1.20	0.00	74	73	68	1.10	0.40	141	0.020	111	103	2.0	0.20	1.15		72.0	141.2	132.4	68.4	140.7	390	67	71	68	0.000	1.001	9.571	690		
542	56.344	54.296	210.337	0.11	0.10	0.94	1.19	0.00	74	73	68	1.10	0.40	141	0.020	111	102	1.7	0.30	1.15		71.9	141.8	132.9	68.4	141.4	389	67	71	68	0.000	1.001	9.571	689		
543	56.454	54.394	210.726	0.11	0.10	0.94	1.20	0.00	74	73	68	1.10	0.40	140	0.020	110	102	1.5	0.20	1.14		72.8	142.3	133.2	68.4	141.9	385	67	71	68	0.000	1.001	9.487	691		
544	56.554	54.493	211.114	0.10	0.10	0.94	1.20	0.00	74	73	68	1.10	0.40	140	0.020	100	103	1.3	0.20	1.13		73.1	142.8	133.9	68.4	142.3	380	67	71	68	0.000	1.001	9.404	689		
545	56.654	54.592	211.502	0.10	0.10	0.94	1.20	0.00	74	73	68	1.10	0.40	139	0.020	100	103	1.1	0.20	1.14		74.0	143.3	134.2	68.3	142.8	376	67	71	68	0.000	1.001	9.487	703		
546	56.754	54.691	211.890	0.10	0.10	0.94	1.20	0.00	74	73	68	1.10	0.40	139	0.020	100	103	0.9	0.20	1.15		74.4	143.7	134.3	68.3	143.3	380	67	71	68	0.000	1.001	9.571	713		
547	56.854	54.790	212.278	0.10	0.10	0.94	1.20	0.00	74	73	68	1.10	0.40	139	0.020	100	103	0.6	0.30	1.15		74.5	144.0	134.9	68.3	143.8	380	67	71	68	0.000	1.001	9.571	714		
548	56.954	54.889	212.666	0.10	0.10	0.94	1.20	0.00	74	73	68	1.10	0.40	139	0.020	100	103	0.5	0.10	1.14		75.3	144.6	135.2	68.3	144.1	377	68	72	68	0.000	1.001	9.487	715		
549	57.054	54.987	213.054	0.10	0.10	0.94	1.20	0.00	74	73	68	1.10	0.40	138	0.020	100	102	0.0	0.50	1.15		75.7	145.1	135.7	68.3	144.7	373	68	72	68	0.000	1.001	9.571	725		
	57.054	54.987	213.054			0.93	1.22	0.00	76	76	70			95	0.020					1.05	#DIV/0!	81.1	150.4	141.5	68.9	150.1		68.17	68.01		0.00			692		
TOTAL:																																			380063	

Page 1 of 1

200X OWHH Spreadsheet for report
4-35 of 4-66

[illegible]

Total Weight of Load (lb): 88.8

Total Moisture of Load (%): 22.7

Equipment Numbers:
340, 431, 353

Run Notes

Unit () @ 207 min
 Unit on @ 505 min
 Fuel adjusted @ 518 min

Client: HeatmorModel: 200XProject #: 0275WB011ETracking #: 1997Run #: 6Date: 10/2/14Test Crew: A. Kravitz, J. Clark, S. ButtonOMNI Equipment ID #(s): 428A, 428B, 356PREBURN

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

PRIMARY:

Target Output: 16-24 %
 = 29,660 - 44,490 Btu/hr

SECONDARY: N/ATERTIARY: N/AFAN: AutoPREBURN SETTINGS AND ACTIVITIES

TIME	AIR (THERMO) CHANGES PRIMARY/SECONDARY/TERTIARY	FAN SETTING CHANGE	ADD FUEL + WT.	ADD FUEL - WT.	RAKE COAL	COMMENT
	None					

TEST

TEST FUEL CONFIGURATION SKETCH
 (INDICATE VIEW ANGLE)

See fuel photographs

START UP PROCEDURES

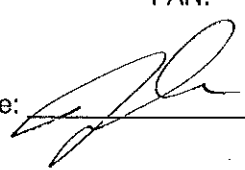
BYPASS: N/AFUEL LOADING Done @ 2:15 min ETDOOR: Closed @ 2:15 min ETPRIMARY AIR: Set @ 2:15 min ET

OTHER:

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

PRIMARY:

Target Output: 16-24 %
 = 29,660 - 44,490 Btu/hr

SECONDARY: N/ATERTIARY: N/AFAN: AutoTechnician signature: Date: 10/3/14

Supplemental Data EPA 5G/5H

Client: Heatmor

Model: 200X

Project #: 0275WB011E

Tracking #: 1997

Date: 10/2/14 Run #: 6 Booth: E3

Test Crew: A. Krawitz, J. Clark, S. Bottom Start Time: 21:59 10/2/14 Stop Time: 7:08 10/3/14

OMNI Equipment #(s): 132, 204, 410, 417, 419, 559, 513, 533

Stack Gas Leak Check:

Initial: Ø

Final: Ø

Dilution Tunnel Gas Leak Check (5H only):

Initial: N/A

Final: N/A

Calibrations: Span Gas CO₂: 16.80 O₂: N/A CO: 4.295 CO₂ (DT): N/A
Mid Gas CO₂: 9.87 O₂: N/A CO: 2.493 CO₂ (DT): N/A

Time
O ₂
CO ₂
CO
CO ₂ (DT)

Pre Test		
Zero	Span	Mid
19:25	19:27	19:29
N/A		
0.00	16.80	10.30
0.000	4.295	2.540
N/A		

Post Test		
Zero	Span	Mid
7:17	7:12	7:14
N/A		
0.28	16.88	10.46
0.033	4.269	2.524
N/A		

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

Scale Audit (lbs): Initial: 10.0 Final: 10.0

Pitot Tube Leak Test: Initial: Ø Final: Ø

Stack Diameter (inches): 8

Induced Draft: Ø

% Smoke Capture: 100

Flue Pipe Cleaned Prior to First Test in Series:

Date: 9/23/14 Initials: AK

	Initial	Middle	Ending
P _b (in/Hg)	30.29	30.29	30.30
Ambient (°F)	74	70	68

Tunnel Traverse	
dP (in H ₂ O)	T(°F)
0.020	76
0.024	
0.026	
0.026	
0.018	
0.006	
0.014	
0.021	
0.024	
0.026	
0.024	
0.014	
Static P:	-0.26

Technician signature: [Signature]

Date: 7th 10/3/14

OMNI-Test Laboratories, Inc.

Manufacturer: Heatmor
Model: 200X
Date: 10/02/14
Run: 6
Control #: 0275WB011E
Test Duration: 549
Output Category: II

Technicians: A. Kravitz
 S. Button

Test Results in Accordance with CSA B415.1-09

	HHV Basis	LHV Basis
Overall Efficiency	71.5%	77.0%
Combustion Efficiency	96.8%	96.8%
Heat Transfer Efficiency	74%	79.5%

Output Rate (kJ/h)	54,147	51,365	(Btu/h)
Burn Rate (kg/h)	3.81	8.39	(lb/h)
Input (kJ/h)	75,709	71,818	(Btu/h)

Test Load Weight (dry kg)	34.83	76.77	dry lb
MC wet (%)	18.5		
MC dry (%)	22.70		
Particulate (g)	0		
CO (g)	1,752		
Test Duration (h)	9.15		

Emissions	Particulate	CO
g/MJ Output	0.00	3.54
g/kg Dry Fuel	0.00	50.30
g/h	0.00	191.50
lb/MM Btu Output	0.00	8.22

Air/Fuel Ratio (A/F)	12.67
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VERSION:

2.3

3/23/2010

*Model: 200X
Heatmor
105 Industrial Park Ct. NE, P.O. Box 787
Warroad, MN 56763*

Run 7

Hydronic Heating Appliances - Test Method 28 WHH Results

Manufacturer: Heatmor
 Model: 200X
 Tracking No.: 1997
 Project No.: 0275WB011E
 Run: 7
 Test Date: October 3, 2014

Burn Rate	4.04 kg/hr dry
Average Tunnel Temperature	103 degrees Fahrenheit
Average Gas Velocity in Dilution Tunnel - vs	9.1 feet/second
Average Gas Flow Rate in Dilution Tunnel - Qsd	23861 dscf/hour
Average Delta p	0.018 inches H2O
Average Delta H	0.96 inches H2O
Total Time of Test	516 minutes

	SAMPLE TRAIN 1	SAMPLE TRAIN 2	AMBIENT SAMPLE TRAIN
Total Sample Volume - Vm	55.06 cubic feet	51.11 cubic feet	202.33 cubic feet
Average Gas Meter Temperature	82 degrees Fahrenheit	82 degrees Fahrenheit	77 degrees Fahrenheit
Total Sample Volume (Standard Conditions) - Vmstd	54.7 dscf	51.1 dscf	198.8 dscf
Total Particulates - mn	17.7 mg	16.1 mg	1.5 mg
Particulate Concentration (dry-standard)	0.00032 grams/dscf	0.00032 grams/dscf	0.000008 grams/dscf
Particulate Emission Rate	64.81 grams	63.11 grams	
Difference from Average	0.85 grams	0.85 grams	
Results Are Acceptable			

AVERAGE	
Total Sample Volume - Vm	53.09 cubic feet
Average Gas Meter Temperature	82 degrees Fahrenheit
Total Sample Volume (Standard Conditions) - Vmstd	52.9 dscf
Total Particulates - mn	
Particulate Concentration (dry-standard)	0.00031 grams/dscf
Particulate Emission Rate	63.96 grams
7.5% of the average emission rate	4.80 grams

Hydronic Heating Appliances - Test Method 28 WHH
Test Data

Run: 7

Manufacturer: Heatmor

Model: 200X

Tracking No.: 1997

Project No.: 0275WB011E

Test Date: October 3, 2014

Technician: A. Kravitz, S. Button

Beginning Clock Time: 11:24

Recording Interval: 1 min.

Total Sampling Time: 516 min.

Velocity Traverse Data

	Pt.1	Pt.2	Pt.3	Pt.4	Pt.5	Pt.6	Pt.7	Pt.8	Pt.9	Pt.10	Pt.11	Pt.12
Initial dP	0.016	0.020	0.020	0.022	0.020	0.008	0.014	0.022	0.022	0.022	0.016	0.012
Initial Temp.	71	71	71	71	71	71	71	71	71	71	71	71

Air Velocity: Initial: <50 Final: <50

Scale Audit: Pre: 10 Post: 10

Pitot Tube Leak Test: Pre: 0 Post: 0

Induced Draft: 0

% Smoke Capture: 100

Flue Pipe Cleaned Prior to First Test in Series: Date: 9/23/2014

*H2O

oF

PM Control Module: 428A/428B

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: -0.240 "H2O

Pitot Tube Cp: 0.99

Meter Box Y Factor: 1.007 1.012 0.989

Barometric Pressure: Begin Middle End

30.28 30.24 30.19

Signature/Date:

Tunnel Velocity: 9.09 ft/sec.

Initial Tunnel Flow: 404.3 scfm

Average Tunnel Flow: 397.7 scfm

Tunnel Area: 0.785 ft2

Post-Test Leak Check (1): .001@1 cfm@"Hg

Post-Test Leak Check (2): .006@2 cfm@"Hg

Fuel Moisture (dry basis %): 22.1

Total Particulate (1): 17.7

Total Particulate (2): 16.1

Average 30.24 "Hg

Elapsed Time	Particulate Sampling Data																Fuel Weight, lb		Flow, gpm		Temperature Data, oF												Stack	Specific Heat of Inlet Water (BTU/lb-°F)	Mass Flow Rate of Inlet Water (lb/min)	Heat Output, Btu
	Gas Meter Cubic Feet (1)	Gas Meter Cubic Feet (2)	Gas Meter Cubic Feet (amb)	Sample Rate, cfm (1)	Sample Rate, cfm (2)	Orifice dH (1)	Orifice dH (2)	Orifice dH (amb)	Meter oF (1)	Meter oF (2)	Meter oF (amb)	Meter Vac. In. Hg. (1)	Meter Vac. In. Hg. (2)	Dilution Tunnel Temp.	Dilution Tunnel dP	Pro. Rate (%) (1)	Pro. Rate (%) (2)	Scale Reading	Weight Change	Load Side Liquid Flow Rate	Boiler Side Liquid Flow Rate (optional)	Thermopile ΔT	Boiler to Heat Exch. Temp.	Heat Exch to Boiler Temp.	Inlet Load Temp.	Outlet Load Temp.	Stack	Filter (1)	Filter (2)	Ambient	Draft In. H2O					
0	0.000	0.000	0.00001			0.01	0.03	0.00	71	71	71	1.62	1	71	0.018			93.6		1.24		70.47	137.74	128.44	67.54	137.30	380	65	66	71	0.000	1.001	10.321			
1	0.105	0.098	0.392132	0.10	0.10	0.96	1.18	0.00	71	71	71	1.13	0.4	142	0.018	104	105	93.3	0.30	1.22		70.77	137.93	128.54	67.56	137.63	332	65	66	71	0.000	1.001	10.154	719		
2	0.209	0.197	0.784254	0.10	0.10	0.96	1.19	0.00	71	71	71	1.13	0.4	134	0.018	102	104	92.9	0.40	1.23		71.30	138.51	129.04	67.61	138.10	269	66	67	71	0.000	1.001	10.237	731		
3	0.314	0.295	1.176376	0.11	0.10	0.96	1.19	0.00	71	71	71	1.13	0.4	136	0.018	103	104	92.2	0.70	1.20		71.59	138.79	129.55	67.69	138.55	320	66	67	71	0.000	1.001	9.988	716		
4	0.418	0.393	1.568498	0.10	0.10	0.96	1.20	0.00	72	71	71	1.13	0.4	153	0.018	104	105	91.3	0.90	1.24		71.43	139.07	129.58	67.84	138.79	437	67	68	71	0.000	1.001	10.320	738		
5	0.522	0.491	1.96062	0.10	0.10	0.96	1.20	0.00	72	71	71	1.12	0.4	168	0.018	105	107	90.3	1.00	1.25		71.60	139.00	129.41	67.87	138.75	516	68	69	71	0.000	1.001	10.404	746		
6	0.626	0.589	2.352743	0.10	0.10	0.96	1.20	0.00	72	71	71	1.12	0.4	170	0.018	105	107	89.4	0.90	1.18		71.77	139.37	130.16	67.93	139.15	518	69	70	71	0.000	1.001	9.821	706		
7	0.730	0.686	2.744865	0.10	0.10	0.96	1.20	0.00	72	71	71	1.12	0.4	171	0.018	105	107	88.5	0.90	1.23		71.90	139.39	130.07	67.93	139.20	530	69	71	71	0.090	1.001	10.237	737		
8	0.833	0.784	3.136987	0.10	0.10	0.95	1.20	0.00	72	72	71	1.12	0.4	172	0.018	104	106	87.2	1.30	1.24		72.61	139.80	130.22	67.93	139.48	532	70	72	71	0.000	1.001	10.320	750		
9	0.937	0.881	3.529109	0.10	0.10	0.95	1.20	0.00	72	72	71	1.12	0.4	173	0.018	105	106	86.1	1.10	1.23		72.89	140.38	130.74	67.89	140.00	534	71	72	71	0.000	1.001	10.237	747		
10	1.040	0.978	3.921231	0.10	0.10	0.95	1.19	0.00	72	72	71	1.12	0.4	174	0.018	104	106	85.3	0.80	1.28		73.71	141.01	131.00	67.87	140.68	536	71	73	71	0.000	1.001	10.653	786		
11	1.143	1.075	4.313353	0.10	0.10	0.94	1.20	0.00	72	72	72	1.11	0.4	176	0.018	104	106	83.8	1.50	1.18		74.63	141.74	132.05	67.84	141.35	543	72	74	72	0.000	1.001	9.821	734		
12	1.247	1.173	4.705475	0.10	0.10	0.94	1.19	0.00	72	72	72	1.11	0.4	178	0.018	106	107	82.8	1.00	1.18		75.71	142.62	132.96	67.82	142.25	550	72	74	72	0.000	1.001	9.821	744		
13	1.351	1.270	5.097597	0.10	0.10	0.94	1.19	0.00	72	72	72	1.11	0.4	177	0.018	106	107	81.9	0.90	1.14		76.83	143.57	133.95	67.76	143.11	547	73	75	72	0.000	1.001	9.488	730		
14	1.455	1.368	5.489719	0.10	0.10	0.94	1.19	0.00	72	72	72	1.11	0.4	178	0.018	106	107	80.7	1.20	1.13		77.78	144.66	135.09	67.72	144.32	552	73	75	72	0.000	1.001	9.405	732		
15	1.559	1.466	5.881841	0.10	0.10	0.94	1.18	0.00	73	72	72	1.11	0.4	180	0.018	106	107	79.4	1.30	1.12		79.25	145.63	135.78	67.65	145.14	557	73	76	72	0.000	1.001	9.322	740		
16	1.663	1.563	6.273963	0.10	0.10	0.93	1.18	0.00	73	73	72	1.1	0.4	182	0.018	106	107	78.3	1.10	1.13		80.27	146.92	137.15	67.69	146.54	561	73	76	72	0.000	1.001	9.405	756		
17	1.767	1.658	6.666086	0.10	0.09	0.93	1.17	0.00	73	73	72	1.1	0.3	183	0.018	106	104	77.0	1.30	1.11		81.32	148.05	138.08	67.59	147.48	564	73	77	72	0.000	1.001	9.239	752		
18	1.872	1.752	7.058208	0.11	0.09	0.93	1.13	0.00	73	73	72	1.1	0.3	184	0.018	107	104	76.2	0.80	1.13		82.47	149.29	138.94	67.59	148.73	565	74	77	72	0.000	1.001	9.405	777		
19	1.976	1.847	7.45033	0.10	0.10	0.93	1.16	0.00	73	73	72	1.1	0.3	185	0.018	106	104	74.4	1.80	1.14		84.24	150.43	139.91	67.63	150.00	570	74	78	72	0.000	1.001	9.488	800		
20	2.081	1.943	7.842452	0.11	0.10	0.90	1.18	0.00	73	73	72	1.04	0.3	189	0.018	107	105	73.1	1.30	1.11		85.22	151.81	141.37	67.61	151.27	577	75	78	72	0.000	1.001	9.239	788		
21	2.186	2.038	8.234574	0.11	0.10	0.98	1.25	0.00	73	73	72	1	0.2	189	0.018	107	105	72.1	1.00	1.12		86.67	153.02	142.36	67.63	152.54	577	75	79	72	0.000	1.001	9.322	809		
22	2.290	2.134	8.626696	0.10	0.10	0.98	1.24	0.00	73	73	72	1	0.2	195	0.018	107	106	71.1	1.00	0.97		88.09	154.50	145.08	67.65	153.90	576	76	80	72	0.000	1.001	8.073	712		
23	2.394	2.230	9.018818	0.10	0.10	0.98	1.24	0.00	73	74	72	1	0.2	200	0.018	107	106	70.0	1.10	0.96		89.56	155.77	146.22	67.69	155.17	577	77	80	72	0.000	1.001	7.990	716		
24	2.499	2.326	9.41094	0.11	0.10	0.95	1.21	0.00	74	74	72	0.95	0.2	200	0.018	108	107	68.8	1.20	0.96		90.87	157.11	147.44	67.69	156.57	574	77	80	72	0.000	1.001	7.990	727		
25	2.605	2.423	9.803062	0.11	0.10	0.95	1.18	0.00	74	74	72	0.92	0.1	203	0.018	109	107	67.5	1.30	0.95		91.68	158.63	148.73	67.72	157.97	576	77	80	72	0.000	1.001	7.907	726		
26	2.710	2.520	10.19518	0.11	0.10	0.95	1.01	0.00	74	74	72	0.92	-0.2	204	0.018	108	108	66.3	1.20	0.96		93.35	159.86	149.68	67.69	159.26	576	78	80	72	0.000	1.001	7.990	747		
27	2.816	2.621	10.58731	0.11	0.10	0.94	0.68	0.00	74	74	72	0.91	-5.4	204	0.018	109	112	65.3	1.00	0.96		94.73	161.33	150.99	67.72	160.62	571	78	77	72	0.000	1.001	7.990	758		
28	2.922	2.723	10.97943	0.11	0.10	0.96	1.26	0.00	74	74	72	0.9	-8.5	204	0.018	109	113	64.3	1.00	0.96		95.84	162.98	152.69	67.76	162.21	572	78	77	72	0.000	1.001	7.990	767		
29	3.029	2.824	11.37155	0.11	0.10	0.94	1.28	0.00	74	74	72	0.85	-8.4	205	0.018	111	113	62.2	2.10	0.94		97.58	164.28	154.12	67.80	163.74	575	78	77	72	0.000	1.001	7.824	764		
30	3.136	2.928	11.76367	0.11	0.10	0.96	1.26	0.00	74	75	72	0.82	-8.4	204	0.018	110	115	61.4	0.80	0.94		99.09	165.78	155.15	67.86	165.13	572	79	77	72	0.000	1.001	7.823	776		
31	3.243	3.031	12.15579	0.11	0.10	0.88	1.26	0.00	74	75	72	-0.3	-8.3	175	0.018	108	112	6																		

Elapsed Time	Particulate Sampling Data																Fuel Weight, lb		Flow, gpm		Temperature Data, oF												Stack	Specific Heat of Inlet Water (BTU/lb-°F)	Mass Flow Rate of Inlet Water (lb/min)	Heat Output, Btu
	Gas Meter Cubic Feet (1)	Gas Meter Cubic Feet (2)	Gas Meter Cubic Feet (amb)	Sample Rate, cfm (1)	Sample Rate, cfm (2)	Orifice dH (1)	Orifice dH (2)	Orifice dH (amb)	Meter oF (1)	Meter oF (2)	Meter oF (amb)	Meter Vac. In. Hg. (1)	Meter Vac. In. Hg. (2)	Dilution Tunnel Temp.	Dilution Tunnel dP	Pro. Rate (%) (1)	Pro. Rate (%) (2)	Scale Reading	Weight Change	Load Side Liquid Flow Rate	Boiler Side Liquid Flow Rate (optional)	Thermopile ΔT	Boiler to Heat Exch. Temp.	Heat Exch to Boiler Temp.	Inlet Load Temp.	Outlet Load Temp.	Stack	Filter (1)	Filter (2)	Ambient	Draft In. H2O					
43	4.524	4.234	16.86126	0.11	0.10	1.00	1.23	0.00	76	76	73	-0.7	-0.5	82	0.018	98	97	59.4	-0.10	0.79		105.31	173.25	163.87	68.17	173.04	314	69	69	73	0.000	1.001	6.575	693		
44	4.631	4.332	17.25338	0.11	0.10	0.96	1.12	0.00	76	76	73	-0.2	-0.3	82	0.018	99	98	59.3	0.10	0.80		105.08	173.16	163.61	68.15	172.86	307	68	68	73	0.000	1.001	6.658	700		
45	4.737	4.430	17.6455	0.11	0.10	0.96	1.15	0.00	76	76	73	0.15	-0.2	82	0.018	98	98	59.2	0.10	0.80		104.75	173.03	163.72	68.19	172.82	300	68	68	73	0.000	1.001	6.658	698		
46	4.844	4.529	18.03763	0.11	0.10	0.96	1.15	0.00	76	76	73	0.35	-0.1	81	0.018	99	99	59.2	0.00	0.79		104.56	172.78	163.07	68.19	172.56	293	68	68	73	0.000	1.001	6.575	688		
47	4.951	4.627	18.42975	0.11	0.10	1.01	1.20	0.00	76	76	73	0.54	0	81	0.018	99	99	59.2	0.00	0.79		104.49	172.61	163.09	68.17	172.43	287	68	68	73	0.000	1.001	6.575	688		
48	5.058	4.726	18.82187	0.11	0.10	0.97	1.24	0.00	76	76	73	0.61	0	81	0.018	99	99	59.2	0.00	0.79		104.43	172.54	162.94	68.21	172.26	281	67	67	73	0.000	1.001	6.575	687		
49	5.166	4.825	19.21399	0.11	0.10	0.92	1.28	0.00	76	77	73	0.72	0	80	0.018	100	98	59.1	0.10	0.80		104.20	172.33	162.92	68.21	172.13	275	67	67	73	0.000	1.001	6.658	695		
50	5.274	4.924	19.60611	0.11	0.10	0.96	1.11	0.00	76	77	73	0.77	0.2	80	0.018	100	99	59.2	-0.10	0.80		103.97	172.15	162.98	68.25	171.92	269	67	67	73	0.000	1.001	6.658	693		
51	5.383	5.024	19.99824	0.11	0.10	1.00	1.13	0.00	76	77	73	0.82	0.2	80	0.018	101	100	59.1	0.10	0.80		103.87	172.02	162.59	68.25	171.74	264	67	67	73	0.000	1.001	6.658	692		
52	5.492	5.125	20.39036	0.11	0.10	1.02	1.16	0.00	77	77	73	0.88	0.2	80	0.018	101	100	59.1	0.00	0.79		103.67	171.83	162.34	68.27	171.61	259	67	67	73	0.000	1.001	6.575	682		
53	5.601	5.226	20.78248	0.11	0.10	0.94	1.18	0.00	77	77	73	0.93	0.2	80	0.018	101	101	59.1	0.00	0.81		103.57	171.72	162.23	68.34	171.44	253	66	66	73	0.000	1.001	6.741	699		
54	5.710	5.328	21.1746	0.11	0.10	0.96	1.20	0.00	77	77	73	0.96	0.3	79	0.018	101	101	59.1	0.00	0.79		103.07	171.51	162.44	68.38	171.27	249	66	66	73	0.000	1.001	6.575	678		
55	5.820	5.429	21.56672	0.11	0.10	0.97	1.21	0.00	77	77	73	0.98	0.3	79	0.018	102	101	59.0	0.10	0.79		103.13	171.48	162.02	68.42	171.12	244	66	66	73	0.000	1.001	6.575	679		
56	5.929	5.531	21.95885	0.11	0.10	0.99	1.22	0.00	77	77	73	0.99	0.3	79	0.018	101	101	59.0	0.00	0.79		102.67	171.14	161.95	68.42	170.95	240	66	66	73	0.000	1.001	6.575	676		
57	6.038	5.632	22.35097	0.11	0.10	1.01	1.23	0.00	77	77	73	1	0.3	79	0.018	101	101	59.1	-0.10	0.80		102.54	170.93	161.67	68.45	170.65	235	66	66	73	0.000	1.001	6.658	683		
58	6.146	5.732	22.74309	0.11	0.10	1.02	1.24	0.00	77	77	73	1.01	0.3	79	0.018	100	100	59.0	0.10	0.79		102.28	170.80	161.56	68.43	170.52	231	65	66	73	0.000	1.001	6.575	673		
59	6.254	5.832	23.13521	0.11	0.10	1.02	1.26	0.00	77	77	73	1.03	0.3	79	0.018	100	100	59.0	0.00	0.79		101.89	170.62	161.35	68.47	170.34	227	65	66	73	0.000	1.001	6.574	671		
60	6.362	5.932	23.52734	0.11	0.10	1.03	1.26	0.00	77	77	73	1.03	0.3	79	0.018	100	99	59.0	0.00	0.79		101.85	170.49	161.30	68.47	170.17	224	65	66	73	0.000	1.001	6.574	670		
61	6.469	6.031	23.91946	0.11	0.10	1.04	1.27	0.00	77	77	73	1.04	0.3	79	0.018	99	99	59.0	0.00	0.79		101.66	170.17	161.15	68.49	169.93	220	65	65	73	0.000	1.001	6.574	669		
62	6.576	6.129	24.31158	0.11	0.10	1.05	1.28	0.00	77	77	73	1.04	0.3	78	0.018	99	98	58.9	0.10	0.79		101.40	170.06	160.94	68.51	169.78	216	65	65	73	0.000	1.001	6.574	667		
63	6.683	6.227	24.7037	0.11	0.10	1.06	1.28	0.00	77	77	73	1.05	0.3	78	0.018	99	98	58.9	0.00	0.77		101.33	169.87	161.05	68.49	169.61	213	65	65	73	0.000	1.001	6.408	650		
64	6.789	6.325	25.09582	0.11	0.10	1.06	1.28	0.00	77	78	73	1.05	0.3	78	0.018	98	97	58.9	0.00	0.81		101.03	169.66	160.68	68.55	169.40	209	65	65	73	0.000	1.001	6.741	682		
65	6.895	6.422	25.48795	0.11	0.10	0.95	1.17	0.00	77	78	73	1.09	0.4	78	0.018	98	97	58.9	0.00	0.79		100.74	169.50	160.49	68.53	169.22	206	64	65	73	0.000	1.001	6.574	663		
66	7.002	6.520	25.88007	0.11	0.10	0.96	1.17	0.00	77	78	74	1.1	0.4	78	0.018	99	97	58.9	0.00	0.79		100.52	169.29	160.29	68.58	169.01	204	64	65	74	0.000	1.001	6.574	662		
67	7.108	6.617	26.27219	0.11	0.10	0.96	1.18	0.00	78	78	74	1.1	0.4	78	0.018	98	97	58.9	0.00	0.79		100.58	169.10	160.21	68.58	168.82	201	64	65	74	0.000	1.001	6.574	662		
68	7.215	6.715	26.66431	0.11	<																															

Elapsed Time	Particulate Sampling Data																Fuel Weight, lb		Flow, gpm		Temperature Data, oF												Stack	Specific Heat of Inlet Water (BTU/lb-°F)	Mass Flow Rate of Inlet Water (lb/min)	Heat Output, Btu
	Gas Meter Cubic Feet (1)	Gas Meter Cubic Feet (2)	Gas Meter Cubic Feet (amb)	Sample Rate, cfm (1)	Sample Rate, cfm (2)	Orifice dH (1)	Orifice dH (2)	Orifice dH (amb)	Meter oF (1)	Meter oF (2)	Meter oF (amb)	Meter Vac. In. Hg. (1)	Meter Vac. In. Hg. (2)	Dilution Tunnel Temp.	Dilution Tunnel dP	Pro. Rate (%) (1)	Pro. Rate (%) (2)	Scale Reading	Weight Change	Load Side Liquid Flow Rate	Boiler Side Liquid Flow Rate (optional)	Thermopile ΔT	Boiler to Heat Exch. Temp.	Heat Exch to Boiler Temp.	Inlet Load Temp.	Outlet Load Temp.	Stack	Filter (1)	Filter (2)	Ambient	Draft In. H2O					
97	10.285	9.564	38.03585	0.10	0.10	0.97	1.18	0.00	79	79	74	1.11	0.4	77	0.018	92	97	58.5	0.00	0.84		94.31	162.92	154.16	68.71	162.77	152	63	64	74	0.000	1.001	6.990	660		
98	10.385	9.663	38.42797	0.10	0.10	0.97	1.19	0.00	79	79	75	1.11	0.4	77	0.018	92	97	58.4	0.10	0.85		94.11	162.85	153.99	68.71	162.64	150	63	64	75	0.000	1.001	7.074	666		
99	10.485	9.761	38.8201	0.10	0.10	0.97	1.18	0.00	79	79	75	1.12	0.4	77	0.018	92	97	58.4	0.00	0.83		93.75	162.68	153.83	68.71	162.40	150	63	64	75	0.000	1.001	6.907	648		
100	10.585	9.859	39.21222	0.10	0.10	0.97	1.18	0.00	79	79	75	1.11	0.4	77	0.018	92	97	58.4	0.00	0.83		93.49	162.47	153.88	68.77	162.23	148	63	64	75	0.000	1.001	6.907	647		
101	10.685	9.957	39.60434	0.10	0.10	0.97	1.19	0.00	79	79	75	1.12	0.4	77	0.018	92	97	58.4	0.00	0.84		93.17	162.21	153.79	68.71	161.95	149	64	64	75	0.000	1.001	6.990	652		
102	10.795	10.055	39.99646	0.11	0.10	0.97	1.18	0.00	79	79	75	1.11	0.4	77	0.018	101	97	58.4	0.00	0.83		93.19	162.01	153.56	68.75	161.78	148	64	64	75	0.000	1.001	6.907	644		
103	10.905	10.154	40.38859	0.11	0.10	0.97	1.19	0.00	79	79	75	1.12	0.4	77	0.018	101	97	58.4	0.00	0.83		93.00	161.78	153.38	68.77	161.54	148	64	64	75	0.000	1.001	6.907	643		
104	11.015	10.252	40.78071	0.11	0.10	0.97	1.19	0.00	79	79	75	1.11	0.4	77	0.018	101	97	58.4	0.00	0.83		92.74	161.67	152.97	68.75	161.41	147	64	64	75	0.000	1.001	6.907	641		
105	11.125	10.350	41.17283	0.11	0.10	0.97	1.17	0.00	79	79	75	1.11	0.4	77	0.018	101	97	58.3	0.10	0.84		92.54	161.45	152.87	68.79	161.20	147	64	64	75	0.000	1.001	6.990	648		
106	11.235	10.448	41.56495	0.11	0.10	0.97	1.18	0.00	79	79	75	1.11	0.4	77	0.018	101	97	58.3	0.00	0.83		92.15	161.28	152.69	68.81	160.98	146	64	64	75	0.000	1.001	6.907	637		
107	11.345	10.547	41.95707	0.11	0.10	0.97	1.19	0.00	79	79	75	1.12	0.4	77	0.018	101	97	58.3	0.00	0.84		92.31	161.07	152.57	68.79	160.83	145	64	64	75	0.000	1.001	6.990	646		
108	11.455	10.645	42.3492	0.11	0.10	0.97	1.18	0.00	79	79	75	1.11	0.4	77	0.018	101	97	58.3	0.00	0.84		91.95	160.94	152.31	68.81	160.68	145	64	64	75	0.000	1.001	6.990	644		
109	11.565	10.743	42.74132	0.11	0.10	0.96	1.18	0.00	79	79	75	1.12	0.4	77	0.018	101	97	58.3	0.00	0.84		91.88	160.74	152.14	68.83	160.47	145	64	64	75	0.000	1.001	6.990	643		
110	11.675	10.841	43.13344	0.11	0.10	0.96	1.19	0.00	79	79	75	1.11	0.4	77	0.018	101	97	58.3	0.00	0.83		91.27	160.44	151.90	68.81	160.21	145	64	64	75	0.000	1.001	6.907	631		
111	11.785	10.940	43.52556	0.11	0.10	0.97	1.18	0.00	79	79	75	1.12	0.4	77	0.018	101	97	58.3	0.00	0.83		91.33	160.31	151.94	68.83	160.05	143	64	64	75	0.000	1.001	6.907	632		
112	11.885	11.038	43.91768	0.10	0.10	0.97	1.18	0.00	79	79	75	1.12	0.4	77	0.018	92	97	58.3	0.00	0.85		91.16	160.08	151.44	68.81	159.82	144	64	64	75	0.000	1.001	7.073	646		
113	11.985	11.136	44.30981	0.10	0.10	0.96	1.19	0.00	79	79	75	1.12	0.4	77	0.018	92	97	58.2	0.10	0.85		90.87	159.95	151.34	68.83	159.71	142	64	64	75	0.000	1.001	7.073	643		
114	12.085	11.234	44.70193	0.10	0.10	0.96	1.18	0.00	79	79	75	1.11	0.4	77	0.018	92	97	58.3	-0.10	0.98		90.44	159.75	150.07	68.83	159.50	143	64	64	75	0.000	1.001	8.155	738		
115	12.185	11.333	45.09405	0.10	0.10	0.97	1.18	0.00	79	79	75	1.12	0.4	77	0.018	92	97	58.3	0.00	0.97		90.57	159.32	149.57	68.75	159.15	142	64	64	75	0.000	1.001	8.072	732		
116	12.295	11.431	45.48617	0.11	0.10	0.96	1.18	0.00	79	79	75	1.11	0.4	77	0.018	101	97	58.2	0.10	0.98		90.30	159.17	149.31	68.77	158.94	141	64	64	75	0.000	1.001	8.155	737		
117	12.405	11.529	45.87829	0.11	0.10	0.97	1.19	0.00	79	79	75	1.12	0.4	77	0.018	101	97	58.2	0.00	0.99		89.85	158.91	148.95	68.75	158.70	142	64	64	75	0.000	1.001	8.239	741		
118	12.515	11.627	46.27042	0.11	0.10	0.97	1.19	0.00	79	79	75	1.11	0.4	77	0.018	101	97	58.2	0.00	0.98		89.72	158.66	148.99	68.77	158.42	142	65	64	75	0.000	1.001	8.155	733		
119	12.625	11.726	46.66254	0.11	0.10	0.97	1.18	0.00	79	79	75	1.11	0.4	77	0.018	101	97	58.2	0.00	0.97		89.51	158.38	148.82	68.71	158.25	141	65	64	75	0.000	1.001	8.072	723		
120	12.735	11.824	47.05466	0.11	0.10	0.97	1.19	0.00	80	80	75	1.11	0.4	77	0.018	101	97	58.3	-0.10	0.97		89.47	158.20	148.75	68.75	158.01	142	65	64	75	0.000	1.001	8.072	723		
121	12.845	11.922	47.44678	0.11	0.10	0.96	1.18	0.00	79	80	75	1.11	0.4	77	0.018	101	97	58.2	0.10	0.98		89.09	157.95	148.30	68.71	157.75	140	65	64	75	0.000	1.001	8.155	727		
12																																				

Elapsed Time	Particulate Sampling Data																Fuel Weight, lb		Flow, gpm		Temperature Data, oF												Stack				
	Gas Meter Cubic Feet (1)	Gas Meter Cubic Feet (2)	Gas Meter Cubic Feet (amb)	Sample Rate, cfm (1)	Sample Rate, cfm (2)	Orifice dH (1)	Orifice dH (2)	Orifice dH (amb)	Meter oF (1)	Meter oF (2)	Meter oF (amb)	Meter Vac. In. Hg. (1)	Meter Vac. In. Hg. (2)	Dilution Tunnel Temp.	Dilution Tunnel dP	Pro. Rate (%) (1)	Pro. Rate (%) (2)	Scale Reading	Weight Change	Load Side Liquid Flow Rate	Boiler Side Liquid Flow Rate (optional)	Thermopile ΔT	Boiler to Heat Exch. Temp.	Heat Exch to Boiler Temp.	Inlet Load Temp.	Outlet Load Temp.	Stack	Filter (1)	Filter (2)	Ambient	Draft In. H2O	Specific Heat of Inlet Water (BTU/lb-°F)	Mass Flow Rate of Inlet Water (lb/min)	Heat Output, Btu			
151	16.065	14.871	59.21045	0.11	0.10	0.96	1.19	0.00	80	80	76	1.12	0.4	78	0.018	101	97	57.9	0.00	0.94		82.39	151.38	142.92	68.86	151.15	134	65	65	76	0.000	1.001	7.822	645			
152	16.175	14.969	59.60257	0.11	0.10	0.97	1.18	0.00	80	80	76	1.11	0.4	78	0.018	101	97	57.9	0.00	0.94		82.35	151.10	142.54	68.88	150.89	132	65	65	76	0.000	1.001	7.822	645			
153	16.285	15.068	59.99469	0.11	0.10	0.97	1.18	0.00	80	80	76	1.12	0.4	78	0.018	101	97	57.9	0.00	0.93		82.09	150.87	142.34	68.85	150.69	131	65	65	76	0.000	1.001	7.739	636			
154	16.385	15.166	60.38681	0.10	0.10	0.96	1.18	0.00	80	80	76	1.11	0.4	78	0.018	92	97	57.9	0.00	0.95		81.76	150.69	142.23	68.85	150.54	132	65	65	76	0.000	1.001	7.906	647			
155	16.485	15.264	60.77893	0.10	0.10	0.96	1.18	0.00	80	80	76	1.12	0.4	78	0.018	92	97	57.8	0.10	0.94		81.79	150.54	142.02	68.85	150.33	133	65	65	76	0.000	1.001	7.822	641			
156	16.585	15.363	61.17106	0.10	0.10	0.97	1.18	0.00	80	80	76	1.12	0.4	78	0.018	92	97	57.9	-0.10	0.95		81.47	150.24	141.76	68.83	150.11	131	65	65	76	0.000	1.001	7.906	645			
157	16.685	15.461	61.56318	0.10	0.10	0.96	1.18	0.00	80	80	76	1.11	0.4	78	0.018	92	97	57.8	0.10	0.94		81.30	150.16	141.55	68.81	149.88	130	65	65	76	0.000	1.001	7.822	637			
158	16.795	15.559	61.9553	0.11	0.10	0.97	1.17	0.00	80	80	76	1.12	0.4	78	0.018	101	97	57.8	0.00	0.94		81.10	149.90	141.65	68.83	149.79	131	65	65	76	0.000	1.001	7.822	635			
159	16.905	15.657	62.34742	0.11	0.10	0.96	1.18	0.00	80	80	76	1.11	0.4	78	0.018	101	97	57.8	0.00	0.93		80.90	149.68	141.26	68.77	149.49	128	65	65	76	0.000	1.001	7.739	627			
160	17.015	15.755	62.73954	0.11	0.10	0.96	1.18	0.00	80	80	76	1.11	0.4	78	0.018	101	97	57.8	0.00	0.94		80.80	149.47	141.37	68.73	149.27	128	65	65	76	0.000	1.001	7.823	633			
161	17.125	15.854	63.13167	0.11	0.10	0.97	1.18	0.00	80	81	76	1.12	0.4	78	0.018	101	97	57.8	0.00	0.93		80.67	149.32	140.96	68.71	149.10	129	65	65	76	0.000	1.001	7.739	625			
162	17.235	15.952	63.52379	0.11	0.10	0.97	1.18	0.00	80	81	76	1.12	0.4	78	0.018	101	97	57.8	0.00	0.93		80.28	149.08	140.90	68.68	148.91	129	65	65	76	0.000	1.001	7.739	622			
163	17.345	16.050	63.91591	0.11	0.10	0.96	1.18	0.00	81	81	76	1.12	0.4	78	0.018	101	97	57.8	0.00	0.94		80.18	148.95	140.70	68.66	148.75	130	65	65	76	0.000	1.001	7.823	628			
164	17.455	16.149	64.30803	0.11	0.10	0.96	1.18	0.00	81	81	76	1.12	0.4	78	0.018	101	97	57.7	0.10	0.94		80.11	148.71	140.45	68.58	148.54	129	65	65	76	0.000	1.001	7.823	627			
165	17.565	16.247	64.70015	0.11	0.10	0.96	1.18	0.00	81	81	76	1.12	0.4	78	0.018	101	97	57.8	-0.10	1.10		79.75	148.47	138.81	68.51	148.30	129	65	65	76	0.000	1.001	9.154	731			
166	17.675	16.345	65.09228	0.11	0.10	0.97	1.18	0.00	81	81	76	1.12	0.4	78	0.018	101	97	57.8	0.00	1.14		79.58	148.17	138.23	68.47	147.98	128	65	65	76	0.000	1.001	9.487	756			
167	17.785	16.444	65.4844	0.11	0.10	0.96	1.19	0.00	81	81	76	1.12	0.4	78	0.018	101	97	57.7	0.10	1.14		79.50	147.87	138.04	68.43	147.70	129	65	65	76	0.000	1.001	9.487	755			
168	17.885	16.542	65.87652	0.10	0.10	0.96	1.18	0.00	81	81	76	1.11	0.4	78	0.018	92	97	57.7	0.00	1.14		79.11	147.53	137.67	68.34	147.40	128	65	65	76	0.000	1.001	9.487	751			
169	17.985	16.640	66.26864	0.10	0.10	0.97	1.18	0.00	81	81	76	1.12	0.4	78	0.018	92	97	57.7	0.00	1.15		78.94	147.36	137.56	68.43	147.25	127	65	65	76	0.000	1.001	9.571	756			
170	18.085	16.739	66.66077	0.10	0.10	0.97	1.18	0.00	81	81	76	1.12	0.4	78	0.018	92	97	57.7	0.00	1.13		78.87	147.20	137.32	68.34	146.99	128	65	65	76	0.000	1.001	9.404	743			
171	18.185	16.837	67.05289	0.10	0.10	0.96	1.18	0.00	81	81	76	1.12	0.4	78	0.018	92	97	57.7	0.00	1.15		78.64	146.92	137.15	68.23	146.71	127	65	65	76	0.000	1.001	9.571	754			
172	18.295	16.935	67.44501	0.11	0.10	0.97	1.18	0.00	81	81	76	1.12	0.4	78	0.018	101	97	57.7	0.00	1.14		78.32	146.62	136.81	68.21	146.52	127	65	65	76	0.000	1.001	9.488	744			
173	18.405	17.034	67.83713	0.11	0.10	0.96	1.18	0.00	81	81	76	1.12	0.4	78	0.018	101	97	57.7	0.00	1.13		78.12	146.37	136.79	68.19	146.22	128	65	65	76	0.000	1.001	9.404	735			
174	18.515	17.132	68.22925	0.11	0.10	0.96	1.18	0.00	81	81	76	1.11	0.4	78	0.018	101	97	57.7	0.00	1.14		77.79	146.19	136.47	68.17	146.00	127	65	65	76	0.000	1.001	9.488	739			
175	18.625	17.230	68.62138	0.11	0.10	0.96	1.18	0.00	81	81	76	1.11	0.4	78	0.018	101	97	57.7	0.00	1.15		77.66	145.91	136.19	68.19	145.78	126	65	65	76	0.000						

Elapsed Time	Particulate Sampling Data																Fuel Weight, lb		Flow, gpm		Temperature Data, oF												Stack				
	Gas Meter Cubic Feet (1)	Gas Meter Cubic Feet (2)	Gas Meter Cubic Feet (amb)	Sample Rate, cfm (1)	Sample Rate, cfm (2)	Orifice dH (1)	Orifice dH (2)	Orifice dH (amb)	Meter oF (1)	Meter oF (2)	Meter oF (amb)	Meter Vac. In. Hg. (1)	Meter Vac. In. Hg. (2)	Dilution Tunnel Temp.	Dilution Tunnel dP	Pro. Rate (%) (1)	Pro. Rate (%) (2)	Scale Reading	Weight Change	Load Side Liquid Flow Rate	Boiler Side Liquid Flow Rate (optional)	Thermopile ΔT	Boiler to Heat Exch. Temp.	Heat Exch to Boiler Temp.	Inlet Load Temp.	Outlet Load Temp.	Stack	Filter (1)	Filter (2)	Ambient	Draft In. H2O	Specific Heat of Inlet Water (BTU/lb-°F)	Mass Flow Rate of Inlet Water (lb/min)	Heat Output, Btu			
205	21.845	20.179	80.38504	0.11	0.10	0.96	1.19	0.00	81	81	77	1.12	0.4	78	0.018	101	97	57.7	-0.10	1.22		70.33	138.51	129.25	68.15	138.32	120	66	66	77	0.000	1.001	10.153	715			
206	21.955	20.277	80.77716	0.11	0.10	0.96	1.18	0.00	81	81	77	1.11	0.4	78	0.018	101	97	57.6	0.10	1.21		70.33	138.29	129.13	68.21	138.19	119	66	66	77	0.000	1.001	10.070	709			
207	22.065	20.376	81.16928	0.11	0.10	0.96	1.18	0.00	81	81	77	1.12	0.4	78	0.018	101	97	57.6	0.00	1.23		69.83	138.02	128.76	68.19	137.91	118	66	66	77	0.000	1.001	10.237	716			
208	22.175	20.474	81.5614	0.11	0.10	0.96	1.18	0.00	81	82	77	1.11	0.4	78	0.018	101	97	57.6	0.00	1.24		69.44	137.82	128.52	68.21	137.61	118	66	66	77	0.000	1.001	10.320	717			
209	22.285	20.572	81.95353	0.11	0.10	0.96	1.18	0.00	82	82	77	1.12	0.4	78	0.018	101	97	57.6	0.00	1.22		69.37	137.48	128.37	68.17	137.37	118	66	66	77	0.000	1.001	10.153	705			
210	22.385	20.671	82.34565	0.10	0.10	0.96	1.18	0.00	81	82	77	1.11	0.4	78	0.018	92	97	57.6	0.00	1.23		69.14	137.30	128.22	68.19	137.13	118	66	66	77	0.000	1.001	10.237	709			
211	22.485	20.769	82.73777	0.10	0.10	0.96	1.18	0.00	82	82	77	1.12	0.4	78	0.018	92	97	57.6	0.00	1.24		68.75	137.05	127.75	68.21	136.89	118	66	66	77	0.000	1.001	10.320	710			
212	22.585	20.867	83.12989	0.10	0.10	0.97	1.18	0.00	82	82	77	1.12	0.4	78	0.018	92	97	57.7	-0.10	1.24		68.53	136.81	127.64	68.21	136.68	118	66	66	77	0.000	1.001	10.320	708			
213	22.685	20.965	83.52202	0.10	0.10	0.97	1.18	0.00	82	82	77	1.12	0.4	78	0.018	92	97	57.6	0.10	1.26		68.42	136.59	127.45	68.17	136.46	118	66	66	77	0.000	1.001	10.486	718			
214	22.785	21.063	83.91414	0.10	0.10	0.96	1.19	0.00	82	82	77	1.12	0.4	78	0.018	92	97	57.6	0.00	1.26		68.03	136.34	127.10	68.17	136.14	118	66	66	77	0.000	1.001	10.486	714			
215	22.895	21.161	84.30626	0.11	0.10	0.96	1.18	0.00	82	82	77	1.12	0.4	78	0.018	101	97	57.6	0.00	1.25		67.83	136.16	126.93	68.23	135.99	117	66	66	77	0.000	1.001	10.403	706			
216	23.005	21.259	84.69838	0.11	0.10	0.96	1.18	0.00	82	82	77	1.12	0.4	79	0.018	101	97	57.7	-0.10	1.26		67.60	135.82	126.73	68.21	135.76	117	66	66	77	0.000	1.001	10.486	710			
217	23.115	21.357	85.0905	0.11	0.10	0.96	1.18	0.00	82	82	77	1.11	0.4	85	0.018	101	97	57.6	0.10	1.30		67.43	135.62	126.09	68.21	135.45	122	67	67	77	0.000	1.001	10.819	730			
218	23.225	21.455	85.48263	0.11	0.10	0.95	1.17	0.00	82	82	77	1.11	0.4	90	0.018	102	98	57.3	0.30	1.34		66.94	135.24	125.59	68.21	135.13	123	67	67	77	0.000	1.001	11.152	747			
219	23.335	21.553	85.87475	0.11	0.10	0.95	1.17	0.00	82	82	77	1.11	0.4	92	0.018	102	98	57.0	0.30	1.36		66.35	134.81	125.12	68.21	134.72	130	67	67	77	0.000	1.001	11.319	752			
220	23.445	21.651	86.26687	0.11	0.10	0.95	1.17	0.00	82	82	77	1.11	0.4	92	0.018	102	98	56.7	0.30	1.34		65.89	134.49	124.97	68.21	134.36	141	67	68	77	0.000	1.001	11.152	736			
221	23.555	21.748	86.65899	0.11	0.10	0.95	1.18	0.00	82	82	77	1.11	0.4	92	0.018	102	98	56.4	0.30	1.35		65.76	134.08	124.58	68.17	133.97	145	67	67	77	0.000	1.001	11.235	740			
222	23.665	21.846	87.05111	0.11	0.10	0.95	1.16	0.00	82	82	77	1.11	0.4	93	0.018	102	98	56.2	0.20	1.26		65.53	133.82	124.63	68.23	133.67	146	67	67	77	0.000	1.001	10.486	688			
223	23.775	21.944	87.44324	0.11	0.10	0.95	1.18	0.00	82	82	77	1.11	0.4	93	0.018	102	97	55.9	0.30	1.28		65.43	133.58	124.52	68.23	133.41	150	67	67	77	0.000	1.001	10.653	698			
224	23.885	22.041	87.83536	0.11	0.10	0.95	1.18	0.00	82	82	77	1.11	0.4	94	0.018	102	97	55.6	0.30	1.26		65.17	133.28	124.35	68.21	133.17	157	67	67	77	0.000	1.001	10.486	684			
225	23.985	22.138	88.22748	0.10	0.10	0.96	1.17	0.00	82	82	77	1.1	0.4	96	0.018	93	97	55.2	0.40	1.29		64.98	133.17	124.15	68.25	132.96	166	67	67	77	0.000	1.001	10.736	698			
226	24.085	22.235	88.6196	0.10	0.10	0.95	1.17	0.00	82	82	77	1.1	0.4	98	0.018	93	98	54.9	0.30	1.28		64.55	132.96	124.05	68.27	132.83	178	67	68	77	0.000	1.001	10.653	688			
227	24.185	22.332	89.01172	0.10	0.10	0.96	1.18	0.00	82	82	77	1.11	0.4	105	0.018	94	98	54.4	0.50	1.30		64.52	132.81	123.76	68.30	132.61	206	68	68	77	0.000	1.001	10.819	699			
228	24.285	22.429	89.40385	0.10	0.10	0.95	1.18	0.00	82	82	77	1.1	0.4	115	0.018	95	99	53.6	0.80	1.31		64.72	132.76	123.55	68.34	132.55	263	68	69	77	0.000	1.001	10.902	706			
229	24.385	22.526	89.79597	0.10	0.10	0.95	1.16	0.00	82	82	77	1.1	0.4	128	0.018	96	100	52.9	0.70	1.32		64.62	132.87	123.59	68.38	132.63	319	69	70								

Elapsed Time	Particulate Sampling Data																Fuel Weight, lb		Flow, gpm		Temperature Data, oF												Stack	Specific Heat of Inlet Water (BTU/lb-°F)	Mass Flow Rate of Inlet Water (lb/min)	Heat Output, Btu
	Gas Meter Cubic Feet (1)	Gas Meter Cubic Feet (2)	Gas Meter Cubic Feet (amb)	Sample Rate, cfm (1)	Sample Rate, cfm (2)	Orifice dH (1)	Orifice dH (2)	Orifice dH (amb)	Meter oF (1)	Meter oF (2)	Meter oF (amb)	Meter Vac. In. Hg. (1)	Meter Vac. In. Hg. (2)	Dilution Tunnel Temp.	Dilution Tunnel dP	Pro. Rate (%) (1)	Pro. Rate (%) (2)	Scale Reading	Weight Change	Load Side Liquid Flow Rate	Boiler Side Liquid Flow Rate (optional)	Thermopile ΔT	Boiler to Heat Exch. Temp.	Heat Exch to Boiler Temp.	Inlet Load Temp.	Outlet Load Temp.	Stack	Filter (1)	Filter (2)	Ambient	Draft In. H2O					
259	27.565	25.347	101.5596	0.11	0.10	0.94	1.16	0.00	83	83	78	0.69	-7.3	213	0.018	112	112	22.5	0.90	0.89		96.26	164.25	155.13	68.88	163.43	548	81	79	78	0.000	1.001	7.406	714		
260	27.675	25.447	101.9518	0.11	0.10	0.94	1.16	0.00	83	83	78	0.68	-7.3	210	0.018	112	109	21.8	0.70	0.94		97.34	165.44	155.21	69.07	164.83	541	81	79	78	0.000	1.001	7.822	762		
261	27.785	25.547	102.3439	0.11	0.10	0.93	1.16	0.00	83	83	78	0.68	-7.3	208	0.018	112	110	21.0	0.80	0.87		98.92	166.77	157.13	69.05	166.02	534	81	79	78	0.000	1.001	7.240	717		
262	27.885	25.648	102.736	0.10	0.10	0.93	1.16	0.00	83	83	78	0.68	-7.3	206	0.018	102	110	20.2	0.80	0.85		100.00	168.36	158.76	69.09	167.57	530	81	79	78	0.000	1.001	7.073	708		
263	27.985	25.749	103.1281	0.10	0.10	0.95	1.15	0.00	83	83	78	0.68	-7.3	180	0.018	100	109	19.6	0.60	0.81		101.31	169.66	160.44	69.07	168.75	514	80	78	78	0.000	1.001	6.740	684		
264	28.085	25.851	103.5202	0.10	0.10	0.99	1.18	0.00	83	83	78	0.72	-7.2	137	0.018	96	105	19.1	0.50	0.81		102.40	170.80	161.33	69.07	170.02	426	79	76	78	0.000	1.001	6.740	691		
265	28.185	25.953	103.9124	0.10	0.10	0.98	1.22	0.00	83	83	78	0.78	-6.9	118	0.018	95	104	18.7	0.40	0.90		103.87	171.85	161.26	69.09	171.18	379	78	75	78	0.000	1.001	7.489	779		
266	28.295	26.055	104.3045	0.11	0.10	0.96	1.19	0.00	83	83	78	0.79	-5.2	107	0.018	103	103	18.5	0.20	0.93		104.33	172.86	162.16	69.09	172.43	356	77	74	78	0.000	1.001	7.739	808		
267	28.405	26.157	104.6966	0.11	0.10	0.97	1.16	0.00	83	83	78	0.8	-5	102	0.018	103	103	18.3	0.20	0.95		104.59	173.74	162.53	69.09	173.01	342	77	74	78	0.000	1.001	7.905	828		
268	28.515	26.257	105.0887	0.11	0.10	0.97	1.83	0.00	83	83	79	0.81	-2.8	98	0.018	102	100	18.1	0.20	0.97		105.41	173.90	162.45	69.05	173.44	331	76	73	79	0.000	1.001	8.072	852		
269	28.625	26.356	105.4809	0.11	0.10	0.98	1.59	0.00	83	83	78	0.81	0.5	96	0.018	102	99	17.9	0.20	0.98		105.51	174.30	162.72	69.01	173.85	322	75	73	78	0.000	1.001	8.155	861		
270	28.735	26.457	105.873	0.11	0.10	0.98	1.23	0.00	83	83	78	0.82	-0.9	94	0.018	102	101	17.7	0.20	1.03		105.44	174.31	162.08	68.88	173.96	314	75	73	78	0.000	1.001	8.571	905		
271	28.845	26.558	106.2651	0.11	0.10	0.95	1.28	0.00	83	83	79	0.86	-0.4	92	0.018	102	100	17.6	0.10	1.02		105.27	174.16	161.78	68.85	173.92	307	74	72	79	0.000	1.001	8.488	895		
272	28.955	26.659	106.6572	0.11	0.10	0.93	1.18	0.00	83	83	79	0.86	-0.2	91	0.018	102	100	17.5	0.10	1.07		105.04	173.98	161.50	68.79	173.70	300	74	72	79	0.000	1.001	8.904	936		
273	29.065	26.760	107.0493	0.11	0.10	0.93	1.27	0.00	83	83	78	0.88	-0.2	90	0.018	102	100	17.4	0.10	1.11		104.68	173.81	160.70	68.75	173.53	293	73	72	78	0.000	1.001	9.237	968		
274	29.175	26.860	107.4415	0.11	0.10	0.95	1.25	0.00	83	83	79	0.88	0	89	0.018	102	100	17.3	0.10	1.13		104.46	173.53	160.31	68.71	173.27	287	73	71	79	0.000	1.001	9.404	983		
275	29.285	26.961	107.8336	0.11	0.10	0.96	1.24	0.00	83	83	79	0.9	0.1	89	0.018	102	100	17.2	0.10	0.89		104.45	173.31	162.57	68.81	173.01	281	73	71	79	0.000	1.001	7.406	775		
276	29.385	27.062	108.2257	0.10	0.10	0.97	1.19	0.00	83	83	79	0.91	0.1	88	0.018	92	101	17.3	-0.10	0.83		104.71	173.23	163.58	68.71	172.91	275	72	71	79	0.000	1.001	6.907	724		
277	29.495	27.163	108.6178	0.11	0.10	0.98	1.22	0.00	83	83	79	0.92	0.2	88	0.018	101	100	17.2	0.10	1.04		104.02	173.23	160.62	68.70	172.89	269	72	70	79	0.000	1.001	8.655	901		
278	29.605	27.264	109.01	0.11	0.10	0.99	1.26	0.00	83	83	79	0.94	0.2	88	0.018	101	100	17.1	0.10	0.76		104.06	172.86	163.91	68.71	172.58	264	72	70	79	0.000	1.001	6.325	659		
279	29.715	27.365	109.4021	0.11	0.10	1.01	1.27	0.00	83	83	79	0.95	0.2	87	0.018	101	100	17.0	0.10	0.74		104.19	172.86	164.04	68.77	172.47	258	71	70	79	0.000	1.001	6.158	642		
280	29.825	27.465	109.7942	0.11	0.10	0.95	1.19	0.00	83	83	79	0.99	0.3	87	0.018	101	100	16.9	0.10	0.84		103.86	172.69	162.55	68.71	172.45	253	71	69	79	0.000	1.001	6.990	727		
281	29.935	27.566	110.1863	0.11	0.10	0.98	1.21	0.00	83	83	79	1	0.3	87	0.018	101	100	16.9	0.00	0.85		103.57	172.56	162.75	68.79	172.19	249	71	69	79	0.000	1.001	7.073	733		
282	30.045	27.667	110.5784	0.11	0.10	1.00	1.22	0.00	83	83	79	1.01	0.3	86	0.018	101	100	16.9	0.00	0.84		103.24	172.28	162.55	68.79	172.09	244	70	69	79	0.000	1.001	6.990	723		
283	30.155	27.767	110.9706	0.11	0.10	1.00	1.24	0.00	83	83	79	1.02	0.3	86	0.018	101	100	16.9	0.00	0.82		103.27	172.13	162.72	68.81	171.83	240	70</								

Elapsed Time	Particulate Sampling Data																Fuel Weight, lb		Flow, gpm		Temperature Data, oF												Stack				
	Gas Meter Cubic Feet (1)	Gas Meter Cubic Feet (2)	Gas Meter Cubic Feet (amb)	Sample Rate, cfm (1)	Sample Rate, cfm (2)	Orifice dH (1)	Orifice dH (2)	Orifice dH (amb)	Meter oF (1)	Meter oF (2)	Meter oF (amb)	Meter Vac. In. Hg. (1)	Meter Vac. In. Hg. (2)	Dilution Tunnel Temp.	Dilution Tunnel dP	Pro. Rate (%) (1)	Pro. Rate (%) (2)	Scale Reading	Weight Change	Load Side Liquid Flow Rate	Boiler Side Liquid Flow Rate (optional)	Thermopile ΔT	Boiler to Heat Exch. Temp.	Heat Exch to Boiler Temp.	Inlet Load Temp.	Outlet Load Temp.	Stack	Filter (1)	Filter (2)	Ambient	Draft In. H2O	Specific Heat of Inlet Water (BTU/lb-°F)	Mass Flow Rate of Inlet Water (lb/min)	Heat Output, Btu			
313	33.355	30.775	122.7342	0.11	0.10	0.95	1.22	0.00	84	84	79	1.09	0.4	83	0.018	101	99	16.4	0.00	0.84		96.88	166.06	156.89	68.85	165.76	166	66	68	79	0.000	1.001	6.990	678			
314	33.465	30.876	123.1263	0.11	0.10	0.95	1.22	0.00	84	84	79	1.09	0.4	83	0.018	101	99	16.4	0.00	0.84		96.68	165.89	156.80	68.88	165.61	165	66	68	79	0.000	1.001	6.990	677			
315	33.575	30.976	123.5185	0.11	0.10	0.95	1.22	0.00	84	84	79	1.09	0.4	83	0.018	101	99	16.4	0.00	0.85		96.74	165.65	156.40	68.88	165.41	163	66	68	79	0.000	1.001	7.073	685			
316	33.685	31.076	123.9106	0.11	0.10	0.95	1.22	0.00	84	84	79	1.09	0.4	83	0.018	101	99	16.4	0.00	0.85		96.32	165.37	156.38	68.83	165.18	162	66	68	79	0.000	1.001	7.073	682			
317	33.785	31.176	124.3027	0.10	0.10	0.95	1.23	0.00	84	84	79	1.09	0.4	83	0.018	92	99	16.4	0.00	0.85		96.15	165.22	156.14	68.86	164.96	161	66	68	79	0.000	1.001	7.073	681			
318	33.885	31.277	124.6948	0.10	0.10	0.95	1.22	0.00	84	84	79	1.09	0.4	83	0.018	92	99	16.4	0.00	0.84		95.99	165.01	155.99	68.86	164.71	160	66	68	79	0.000	1.001	6.990	672			
319	33.985	31.377	125.087	0.10	0.10	0.95	1.22	0.00	84	84	79	1.09	0.4	83	0.018	92	99	16.5	-0.10	0.84		95.66	164.85	155.90	68.86	164.56	159	66	68	79	0.000	1.001	6.990	669			
320	34.085	31.477	125.4791	0.10	0.10	0.95	1.22	0.00	84	84	79	1.09	0.4	83	0.018	92	99	16.4	0.10	0.85		95.44	164.60	155.75	68.88	164.30	158	66	68	79	0.000	1.001	7.073	676			
321	34.185	31.577	125.8712	0.10	0.10	0.95	1.22	0.00	84	84	79	1.09	0.4	82	0.018	92	99	16.4	0.00	0.83		95.27	164.43	155.60	68.88	164.17	157	66	68	79	0.000	1.001	6.907	659			
322	34.295	31.677	126.2633	0.11	0.10	0.95	1.21	0.00	84	84	79	1.09	0.4	82	0.018	101	99	16.4	0.00	0.85		95.04	164.19	155.32	68.86	163.93	156	66	68	79	0.000	1.001	7.073	673			
323	34.405	31.778	126.6554	0.11	0.10	0.95	1.22	0.00	84	84	79	1.09	0.4	82	0.018	101	99	16.4	0.00	0.84		95.10	164.00	155.02	68.86	163.78	155	66	68	79	0.000	1.001	6.990	666			
324	34.515	31.878	127.0476	0.11	0.10	0.94	1.22	0.00	84	84	79	1.09	0.4	82	0.018	101	99	16.4	0.00	0.85		94.90	163.80	154.95	68.86	163.58	154	66	68	79	0.000	1.001	7.073	672			
325	34.625	31.978	127.4397	0.11	0.10	0.95	1.21	0.00	84	84	79	1.09	0.4	82	0.018	101	99	16.4	0.00	0.85		94.58	163.56	154.61	68.83	163.31	153	66	68	79	0.000	1.001	7.073	670			
326	34.735	32.078	127.8318	0.11	0.10	0.94	1.21	0.00	84	84	79	1.09	0.4	82	0.018	101	99	16.4	0.00	0.84		94.67	163.44	154.46	68.83	163.13	152	66	68	79	0.000	1.001	6.990	663			
327	34.845	32.179	128.2239	0.11	0.10	0.95	1.21	0.00	84	84	80	1.09	0.4	82	0.018	101	99	16.4	0.00	0.83		94.15	163.31	154.35	68.88	163.03	151	66	68	80	0.000	1.001	6.907	651			
328	34.955	32.279	128.6161	0.11	0.10	0.95	1.22	0.00	84	84	80	1.09	0.4	82	0.018	101	99	16.4	0.00	0.84		93.95	163.07	154.24	68.88	162.79	150	66	68	80	0.000	1.001	6.990	657			
329	35.065	32.379	129.0082	0.11	0.10	0.95	1.22	0.00	84	84	80	1.09	0.4	82	0.018	101	99	16.4	0.00	0.83		93.98	162.75	153.88	68.88	162.53	150	66	68	80	0.000	1.001	6.907	650			
330	35.175	32.479	129.4003	0.11	0.10	0.95	1.22	0.00	84	84	80	1.09	0.4	82	0.018	101	99	16.4	0.00	0.85		93.52	162.49	153.77	68.85	162.25	148	66	68	80	0.000	1.001	7.073	662			
331	35.285	32.580	129.7924	0.11	0.10	0.95	1.22	0.00	84	84	80	1.09	0.4	82	0.018	101	99	16.3	0.10	0.85		93.30	162.40	153.60	68.88	162.06	148	66	68	80	0.000	1.001	7.073	661			
332	35.385	32.680	130.1845	0.10	0.10	0.95	1.22	0.00	84	84	80	1.09	0.4	82	0.018	92	99	16.4	-0.10	0.84		93.16	162.16	153.27	68.88	161.89	147	66	68	80	0.000	1.001	6.990	652			
333	35.485	32.780	130.5767	0.10	0.10	0.95	1.23	0.00	84	84	80	1.09	0.4	82	0.018	92	99	16.4	0.00	0.83		92.80	161.93	153.32	68.85	161.71	146	66	68	80	0.000	1.001	6.907	642			
334	35.585	32.881	130.9688	0.10	0.10	0.95	1.22	0.00	84	84	80	1.09	0.4	82	0.018	92	99	16.3	0.10	0.85		92.77	161.71	153.06	68.88	161.46	145	66	68	80	0.000	1.001	7.073	657			
335	35.685	32.981	131.3609	0.10	0.10	0.95	1.22	0.00	85	84	80	1.09	0.4	82	0.018	91	99	16.4	-0.10	0.84		92.44	161.56	152.91	68.88	161.33	145	66	68	80	0.000	1.001	6.990	647			
336	35.795	33.081	131.753	0.11	0.10	0.95	1.22	0.00	85	84	80	1.09	0.4	82	0.018	101	99	16.4	0.00	0.84		92.12	161.37	152.61	68.88	161.09	143	67	68	80	0.000	1.001	6.990	645			
337	35.905	33.182	132.1452	0.11	0.10	0.95	1.22	0.00	85	84	80	1.09	0.4	82	0.018	101	99	16.4	0.00	0.84		91.92	161.04	152.54	68.86	160.87	143	67	68	80	0.000	1.001	6.990	643			

Elapsed Time	Particulate Sampling Data																Fuel Weight, lb		Flow, gpm		Temperature Data, oF												Stack	Specific Heat of Inlet Water (BTU/lb-°F)	Mass Flow Rate of Inlet Water (lb/min)	Heat Output, Btu
	Gas Meter Cubic Feet (1)	Gas Meter Cubic Feet (2)	Gas Meter Cubic Feet (amb)	Sample Rate, cfm (1)	Sample Rate, cfm (2)	Orifice dH (1)	Orifice dH (2)	Orifice dH (amb)	Meter oF (1)	Meter oF (2)	Meter oF (amb)	Meter Vac. In. Hg. (1)	Meter Vac. In. Hg. (2)	Dilution Tunnel Temp.	Dilution Tunnel dP	Pro. Rate (%) (1)	Pro. Rate (%) (2)	Scale Reading	Weight Change	Load Side Liquid Flow Rate	Boiler Side Liquid Flow Rate (optional)	Thermopile ΔT	Boiler to Heat Exch. Temp.	Heat Exch to Boiler Temp.	Inlet Load Temp.	Outlet Load Temp.	Stack	Filter (1)	Filter (2)	Ambient	Draft In. H2O					
367	39.115	36.192	143.9088	0.11	0.10	0.95	1.22	0.00	85	85	80	1.09	0.4	81	0.018	100	99	16.4	0.00	0.89		85.77	154.87	146.67	69.05	154.70	126	67	68	80	0.000	1.001	7.406	636		
368	39.225	36.292	144.3009	0.11	0.10	0.95	1.22	0.00	85	85	80	1.09	0.4	81	0.018	100	99	16.4	0.00	0.88		85.64	154.63	146.28	69.05	154.40	127	67	68	80	0.000	1.001	7.323	628		
369	39.335	36.392	144.6931	0.11	0.10	0.95	1.21	0.00	85	85	80	1.09	0.4	81	0.018	100	99	16.4	0.00	0.87		85.12	154.44	146.15	69.05	154.20	126	67	68	80	0.000	1.001	7.240	617		
370	39.445	36.493	145.0852	0.11	0.10	0.95	1.22	0.00	85	85	80	1.09	0.4	81	0.018	100	99	16.4	0.00	0.89		85.21	154.27	146.06	69.11	154.09	125	67	68	80	0.000	1.001	7.406	632		
371	39.555	36.593	145.4773	0.11	0.10	0.95	1.22	0.00	85	85	80	1.09	0.4	81	0.018	100	99	16.4	0.00	0.87		84.79	154.16	145.91	69.11	153.88	125	67	68	80	0.000	1.001	7.240	615		
372	39.665	36.693	145.8694	0.11	0.10	0.95	1.22	0.00	85	85	80	1.09	0.4	81	0.018	100	99	16.4	0.00	0.88		84.56	153.92	145.89	69.14	153.69	125	67	68	80	0.000	1.001	7.323	620		
373	39.775	36.794	146.2615	0.11	0.10	0.95	1.22	0.00	85	85	80	1.09	0.4	81	0.018	100	99	16.4	0.00	0.88		84.49	153.66	145.53	69.14	153.51	125	67	68	80	0.000	1.001	7.323	619		
374	39.885	36.894	146.6537	0.11	0.10	0.95	1.22	0.00	85	85	80	1.09	0.4	81	0.018	100	99	16.4	0.00	0.87		84.14	153.47	145.22	69.16	153.23	124	67	68	80	0.000	1.001	7.240	610		
375	39.985	36.994	147.0458	0.10	0.10	0.95	1.22	0.00	85	85	80	1.09	0.4	81	0.018	91	99	16.4	0.00	0.87		83.78	153.27	145.22	69.16	153.10	124	67	68	80	0.000	1.001	7.240	607		
376	40.085	37.095	147.4379	0.10	0.10	0.95	1.21	0.00	85	85	80	1.09	0.4	81	0.018	91	99	16.4	0.00	0.89		83.78	153.10	144.84	69.20	152.85	124	68	68	80	0.000	1.001	7.406	621		
377	40.185	37.195	147.83	0.10	0.10	0.94	1.23	0.00	85	85	80	1.09	0.4	81	0.018	91	99	16.4	0.00	0.88		83.58	152.84	144.86	69.22	152.72	123	68	68	80	0.000	1.001	7.323	613		
378	40.285	37.295	148.2222	0.10	0.10	0.95	1.22	0.00	85	85	80	1.09	0.4	81	0.018	91	99	16.4	0.00	0.88		83.19	152.69	144.64	69.22	152.46	123	68	68	80	0.000	1.001	7.323	610		
379	40.385	37.396	148.6143	0.10	0.10	0.95	1.22	0.00	85	85	80	1.09	0.4	81	0.018	91	99	16.4	0.00	1.00		82.70	152.42	143.27	69.22	152.29	122	68	68	80	0.000	1.001	8.321	689		
380	40.495	37.496	149.0064	0.11	0.10	0.95	1.21	0.00	85	85	80	1.09	0.4	81	0.018	100	99	16.4	0.00	1.00		82.86	152.07	143.07	69.22	151.92	123	68	68	80	0.000	1.001	8.321	690		
381	40.605	37.596	149.3985	0.11	0.10	0.95	1.22	0.00	85	85	80	1.09	0.4	81	0.018	100	99	16.4	0.00	1.00		82.69	151.83	142.73	69.16	151.68	123	68	68	80	0.000	1.001	8.321	689		
382	40.715	37.697	149.7906	0.11	0.10	0.95	1.22	0.00	85	85	80	1.09	0.4	81	0.018	100	99	16.5	-0.10	1.00		82.43	151.62	142.81	69.22	151.44	122	68	68	80	0.000	1.001	8.321	687		
383	40.825	37.797	150.1828	0.11	0.10	0.95	1.22	0.00	85	85	80	1.09	0.4	81	0.018	100	99	16.4	0.10	1.00		81.97	151.38	142.30	69.14	151.27	121	68	68	80	0.000	1.001	8.321	683		
384	40.935	37.897	150.5749	0.11	0.10	0.95	1.21	0.00	85	85	80	1.09	0.4	81	0.018	100	99	16.4	0.00	1.01		81.71	151.23	142.12	69.20	151.02	121	68	68	80	0.000	1.001	8.404	688		
385	41.045	37.998	150.967	0.11	0.10	0.95	1.21	0.00	85	85	80	1.09	0.4	81	0.018	100	99	16.5	-0.10	1.01		81.73	150.95	142.00	69.20	150.80	122	68	68	80	0.000	1.001	8.404	688		
386	41.155	38.098	151.3591	0.11	0.10	0.95	1.22	0.00	85	85	80	1.09	0.4	81	0.018	100	99	16.4	0.10	1.00		81.54	150.76	141.95	69.18	150.58	121	68	68	80	0.000	1.001	8.321	679		
387	41.265	38.198	151.7513	0.11	0.10	0.95	1.22	0.00	85	85	80	1.09	0.4	81	0.018	100	99	16.5	-0.10	1.00		81.37	150.54	141.70	69.22	150.39	121	68	68	80	0.000	1.001	8.321	678		
388	41.375	38.299	152.1434	0.11	0.10	0.95	1.22	0.00	85	85	80	1.09	0.4	81	0.018	100	99	16.5	0.00	1.04		80.98	150.41	141.16	69.16	150.18	120	68	68	80	0.000	1.001	8.654	702		
389	41.485	38.399	152.5355	0.11	0.10	0.95	1.22	0.00	85	85	80	1.09	0.4	81	0.018	100	99	16.4	0.10	1.04		80.72	150.09	140.75	69.13	149.90	120	68	68	80	0.000	1.001	8.654	699		
390	41.585	38.499	152.9276	0.10	0.10	0.95	1.22	0.00	85	85	80	1.09	0.4	81	0.018	91	99	16.4	0.00	1.04		80.55	149.90	140.68	69.18	149.66	120	68	68	80	0.000	1.001	8.654	698		
391	41.685	38.600	153.3197	0.10	0.10	0.95	1.22	0.00	85	85	80	1.09	0.4	80	0.018	91	99	16.4	0.00	1.04		80.16	149.55	140.38	69.14	149.40	119	68	68	80	0.000	1.001	8.654	69		

Elapsed Time	Particulate Sampling Data																Fuel Weight, lb		Flow, gpm		Temperature Data, oF												Stack				
	Gas Meter Cubic Feet (1)	Gas Meter Cubic Feet (2)	Gas Meter Cubic Feet (amb)	Sample Rate, cfm (1)	Sample Rate, cfm (2)	Orifice dH (1)	Orifice dH (2)	Orifice dH (amb)	Meter oF (1)	Meter oF (2)	Meter oF (amb)	Meter Vac. In. Hg. (1)	Meter Vac. In. Hg. (2)	Dilution Tunnel Temp.	Dilution Tunnel dP	Pro. Rate (%) (1)	Pro. Rate (%) (2)	Scale Reading	Weight Change	Load Side Liquid Flow Rate	Boiler Side Liquid Flow Rate (optional)	Thermopile ΔT	Boiler to Heat Exch. Temp.	Heat Exch to Boiler Temp.	Inlet Load Temp.	Outlet Load Temp.	Stack	Filter (1)	Filter (2)	Ambient	Draft In. H2O	Specific Heat of Inlet Water (BTU/lb-°F)	Mass Flow Rate of Inlet Water (lb/min)	Heat Output, Btu			
421	44.895	41.612	165.0834	0.11	0.10	0.96	1.22	0.00	85	85	79	1.09	0.4	80	0.018	100	99	16.5	0.00	1.09		73.36	142.58	133.77	68.88	142.38	113	68	68	79	0.000	1.001	9.071	666			
422	45.005	41.712	165.4755	0.11	0.10	0.95	1.22	0.00	85	85	79	1.09	0.4	80	0.018	100	99	16.5	0.00	1.08		73.16	142.41	133.71	68.83	142.17	112	68	68	79	0.000	1.001	8.987	658			
423	45.115	41.812	165.8677	0.11	0.10	0.95	1.22	0.00	85	85	79	1.09	0.4	80	0.018	100	99	16.5	0.00	1.09		72.99	142.08	133.43	68.88	141.98	112	68	68	79	0.000	1.001	9.071	663			
424	45.225	41.913	166.2598	0.11	0.10	0.96	1.22	0.00	85	85	79	1.09	0.4	79	0.018	100	99	16.6	-0.10	1.11		72.63	141.91	133.49	68.85	141.72	112	68	68	79	0.000	1.001	9.237	672			
425	45.335	42.013	166.6519	0.11	0.10	0.96	1.22	0.00	85	85	79	1.09	0.4	79	0.018	100	99	16.5	0.10	1.11		72.57	141.67	133.15	68.77	141.46	112	68	68	79	0.000	1.001	9.237	671			
426	45.445	42.114	167.044	0.11	0.10	0.96	1.22	0.00	85	85	79	1.09	0.4	79	0.018	100	99	16.6	-0.10	1.09		72.34	141.44	133.06	68.81	141.26	112	68	68	79	0.000	1.001	9.071	657			
427	45.555	42.214	167.4361	0.11	0.10	0.96	1.22	0.00	85	85	79	1.09	0.4	79	0.018	100	99	16.6	0.00	1.09		72.07	141.24	132.72	68.81	141.07	112	68	68	79	0.000	1.001	9.071	654			
428	45.665	42.315	167.8283	0.11	0.10	0.96	1.22	0.00	85	85	79	1.09	0.4	79	0.018	100	99	16.6	0.00	1.11		71.94	140.96	132.46	68.81	140.83	111	67	68	79	0.000	1.001	9.237	665			
429	45.775	42.415	168.2204	0.11	0.10	0.95	1.22	0.00	85	85	79	1.09	0.4	79	0.018	100	99	16.6	0.00	1.08		72.03	140.75	132.18	68.77	140.62	111	67	68	79	0.000	1.001	8.988	648			
430	45.885	42.516	168.6125	0.11	0.10	0.95	1.22	0.00	85	85	79	1.09	0.4	79	0.018	100	99	16.6	0.00	1.08		71.63	140.53	132.14	68.77	140.38	111	67	68	79	0.000	1.001	8.988	645			
431	45.985	42.616	169.0046	0.10	0.10	0.95	1.22	0.00	85	85	79	1.09	0.4	79	0.018	91	99	16.6	0.00	1.10		71.66	140.27	131.82	68.77	140.15	111	67	68	79	0.000	1.001	9.154	657			
432	46.085	42.717	169.3968	0.10	0.10	0.96	1.23	0.00	85	85	79	1.09	0.4	79	0.018	91	99	16.6	0.00	1.09		71.27	140.08	131.64	68.73	140.00	111	67	68	79	0.000	1.001	9.071	647			
433	46.185	42.817	169.7889	0.10	0.10	0.96	1.22	0.00	85	85	79	1.09	0.4	79	0.018	91	99	16.7	-0.10	1.10		71.01	139.86	131.39	68.68	139.67	110	67	68	79	0.000	1.001	9.154	651			
434	46.285	42.917	170.181	0.10	0.10	0.96	1.23	0.00	85	85	79	1.09	0.4	79	0.018	91	99	16.6	0.10	1.09		71.00	139.65	131.25	68.70	139.48	111	67	68	79	0.000	1.001	9.071	645			
435	46.395	43.018	170.5731	0.11	0.10	0.96	1.22	0.00	85	85	79	1.09	0.4	79	0.018	100	99	16.7	-0.10	1.09		70.71	139.46	131.21	68.66	139.31	111	67	68	79	0.000	1.001	9.071	642			
436	46.505	43.118	170.9652	0.11	0.10	0.95	1.22	0.00	85	85	79	1.09	0.4	79	0.018	100	99	16.7	0.00	1.10		70.48	139.22	130.93	68.66	139.09	111	67	68	79	0.000	1.001	9.154	646			
437	46.615	43.219	171.3574	0.11	0.10	0.96	1.23	0.00	85	85	79	1.09	0.4	79	0.018	100	99	16.6	0.10	1.10		70.46	138.98	130.74	68.66	138.79	110	67	68	79	0.000	1.001	9.154	646			
438	46.725	43.319	171.7495	0.11	0.10	0.96	1.22	0.00	85	84	79	1.09	0.4	79	0.018	100	99	16.6	0.00	1.09		70.02	138.77	130.63	68.66	138.62	110	67	68	79	0.000	1.001	9.071	636			
439	46.835	43.420	172.1416	0.11	0.10	0.96	1.23	0.00	85	84	79	1.09	0.4	79	0.018	100	99	16.7	-0.10	1.10		69.89	138.53	130.35	68.66	138.36	109	67	68	79	0.000	1.001	9.154	640			
440	46.945	43.520	172.5337	0.11	0.10	0.95	1.22	0.00	85	84	79	1.09	0.4	79	0.018	100	99	16.7	0.00	1.10		69.60	138.29	130.07	68.55	138.10	110	67	68	79	0.000	1.001	9.154	638			
441	47.055	43.621	172.9259	0.11	0.10	0.96	1.22	0.00	85	84	79	1.09	0.4	79	0.018	100	99	16.7	0.00	1.09		69.54	138.17	130.03	68.55	137.95	109	67	68	79	0.000	1.001	9.071	632			
442	47.165	43.721	173.318	0.11	0.10	0.96	1.23	0.00	85	84	78	1.09	0.4	79	0.018	100	99	16.6	0.10	1.10		69.20	137.88	129.64	68.55	137.74	109	67	68	78	0.000	1.001	9.154	634			
443	47.275	43.822	173.7101	0.11	0.10	0.96	1.22	0.00	85	84	78	1.09	0.4	79	0.018	100	99	16.6	0.00	1.09		69.12	137.73	129.62	68.58	137.52	109	67	68	78	0.000	1.001	9.071	628			
444	47.385	43.922	174.1022	0.11	0.10	0.96	1.23	0.00	85	84	78	1.09	0.4	79	0.018	100	99	16.7	-0.10	1.09		68.81	137.45	129.47	68.53	137.32	109	67	68	78	0.000	1.001	9.071	625			
445	47.485	44.023	174.4943	0.10	0.10	0.95	1.22	0.00	85	84	78	1.09	0.4	79	0.018	91	99	16.6	0.10	1.11		68.38	137.24	129.23	68.58	137.09	109	67	68								

Elapsed Time	Particulate Sampling Data																	Fuel Weight, lb		Flow, gpm		Temperature Data, oF											Stack				
	Gas Meter Cubic Feet (1)	Gas Meter Cubic Feet (2)	Gas Meter Cubic Feet (amb)	Sample Rate, cfm (1)	Sample Rate, cfm (2)	Orifice dH (1)	Orifice dH (2)	Orifice dH (amb)	Meter oF (1)	Meter oF (2)	Meter oF (amb)	Meter Vac. In. Hg. (1)	Meter Vac. In. Hg. (2)	Dilution Tunnel Temp.	Dilution Tunnel dP	Pro. Rate (%) (1)	Pro. Rate (%) (2)	Scale Reading	Weight Change	Load Side Liquid Flow Rate	Boiler Side Liquid Flow Rate (optional)	Thermopile ΔT	Boiler to Heat Exch. Temp.	Heat Exch to Boiler Temp.	Inlet Load Temp.	Outlet Load Temp.	Stack	Filter (1)	Filter (2)	Ambient	Draft In. H2O	Specific Heat of Inlet Water (BTU/lb-°F)	Mass Flow Rate of Inlet Water (lb/min)	Heat Output, Btu			
475	50.685	47.029	186.258	0.10	0.10	0.95	1.22	0.00	84	84	77	1.08	0.4	141	0.018	96	104	13.0	0.30	1.28		66.26	134.23	125.21	68.27	133.86	349	69	71	77	0.000	1.001	10.653	707			
476	50.785	47.129	186.6501	0.10	0.10	0.95	1.21	0.00	84	84	77	1.08	0.4	144	0.018	97	104	12.7	0.30	1.26		66.55	134.42	125.55	68.21	134.05	359	70	71	77	0.000	1.001	10.486	699			
477	50.885	47.229	187.0422	0.10	0.10	0.95	1.22	0.00	84	84	77	1.08	0.4	146	0.018	97	104	12.3	0.40	1.28		66.78	134.76	125.85	68.27	134.46	370	70	71	77	0.000	1.001	10.653	712			
478	50.985	47.329	187.4344	0.10	0.10	0.96	1.21	0.00	84	84	77	1.08	0.4	149	0.018	97	104	12.0	0.30	1.27		67.18	135.20	126.07	68.30	134.79	378	70	71	77	0.000	1.001	10.569	711			
479	51.095	47.429	187.8265	0.11	0.10	0.95	1.22	0.00	84	83	77	1.08	0.4	151	0.018	107	105	11.7	0.30	1.28		67.67	135.62	126.41	68.30	135.13	382	70	71	77	0.000	1.001	10.653	722			
480	51.205	47.529	188.2186	0.11	0.10	0.95	1.22	0.00	84	83	77	1.08	0.4	152	0.018	107	105	11.4	0.30	1.28		68.20	136.05	126.99	68.38	135.69	389	70	72	77	0.000	1.001	10.652	727			
481	51.315	47.628	188.6107	0.11	0.10	0.95	1.22	0.00	84	83	77	1.07	0.4	154	0.018	107	105	11.0	0.40	1.27		68.52	136.53	127.42	68.38	136.10	394	70	72	77	0.000	1.001	10.569	725			
482	51.425	47.728	189.0029	0.11	0.10	0.95	1.22	0.00	84	83	77	1.08	0.4	156	0.018	107	105	10.7	0.30	1.28		69.14	136.83	127.57	68.27	136.46	399	71	72	77	0.000	1.001	10.653	737			
483	51.535	47.828	189.395	0.11	0.10	0.96	1.22	0.00	84	83	77	1.07	0.4	157	0.018	107	105	10.3	0.40	1.19		69.57	137.32	128.61	68.27	137.00	402	71	72	77	0.000	1.001	9.904	690			
484	51.645	47.928	189.7871	0.11	0.10	0.95	1.21	0.00	84	83	77	1.07	0.4	159	0.018	108	105	10.0	0.30	1.20		70.32	137.82	129.02	68.25	137.39	406	71	72	77	0.000	1.001	9.987	703			
485	51.755	48.027	190.1792	0.11	0.10	0.96	1.22	0.00	84	83	77	1.07	0.4	160	0.018	108	105	9.6	0.40	1.19		70.91	138.38	129.38	68.27	137.93	412	71	73	77	0.000	1.001	9.904	703			
486	51.865	48.127	190.5713	0.11	0.10	0.95	1.21	0.00	84	83	77	1.08	0.3	161	0.018	108	105	9.3	0.30	1.19		71.15	139.07	130.12	68.27	138.64	415	71	73	77	0.000	1.001	9.904	705			
487	51.975	48.227	190.9635	0.11	0.10	0.95	1.22	0.00	84	83	77	1.07	0.3	162	0.018	108	106	8.9	0.40	1.19		71.87	139.44	130.18	68.30	139.05	416	71	73	77	0.000	1.001	9.904	713			
488	52.085	48.326	191.3556	0.11	0.10	0.95	1.21	0.00	84	83	77	1.07	0.4	163	0.018	108	106	8.5	0.40	1.18		72.23	140.15	131.08	68.27	139.72	418	72	73	77	0.000	1.001	9.820	710			
489	52.185	48.426	191.7477	0.10	0.10	0.95	1.21	0.00	84	83	77	1.07	0.4	163	0.018	98	106	8.2	0.30	1.19		72.80	140.81	131.47	68.34	140.27	420	72	73	77	0.000	1.001	9.904	722			
490	52.285	48.525	192.1398	0.10	0.10	0.95	1.21	0.00	84	83	77	1.07	0.3	164	0.018	98	105	7.8	0.40	1.19		73.33	141.31	131.95	68.38	140.86	423	72	73	77	0.000	1.001	9.903	727			
491	52.385	48.625	192.532	0.10	0.10	0.95	1.22	0.00	84	83	77	1.07	0.3	164	0.018	98	106	7.4	0.40	1.20		74.08	141.95	132.85	68.27	141.54	424	72	73	77	0.000	1.001	9.987	741			
492	52.485	48.725	192.9241	0.10	0.10	0.95	1.21	0.00	84	83	77	1.07	0.3	165	0.018	98	106	7.0	0.40	1.19		74.97	142.69	133.17	68.38	142.19	425	72	74	77	0.000	1.001	9.903	743			
493	52.585	48.824	193.3162	0.10	0.10	0.96	1.22	0.00	84	83	77	1.07	0.3	164	0.018	98	106	6.6	0.40	1.18		75.40	143.37	133.97	68.34	142.99	423	72	74	77	0.000	1.001	9.820	741			
494	52.685	48.924	193.7083	0.10	0.10	0.95	1.21	0.00	84	83	77	1.07	0.3	165	0.018	98	106	6.3	0.30	1.19		76.44	144.00	134.31	68.30	143.50	426	72	74	77	0.000	1.001	9.904	758			
495	52.795	49.023	194.1004	0.11	0.10	0.95	1.21	0.00	83	83	77	1.07	0.3	165	0.018	108	106	5.9	0.40	1.13		76.45	144.60	135.28	68.34	144.21	426	73	74	77	0.000	1.001	9.404	720			
496	52.905	49.123	194.4926	0.11	0.10	0.95	1.21	0.00	84	83	77	1.07	0.3	166	0.018	108	106	5.6	0.30	1.13		77.39	145.31	135.86	68.34	144.80	431	73	74	77	0.000	1.001	9.404	729			
497	53.015	49.222	194.8847	0.11	0.10	0.95	1.21	0.00	83	83	77	1.07	0.3	167	0.018	109	106	5.2	0.40	1.12		78.18	145.89	136.47	68.27	145.40	438	73	74	77	0.000	1.001	9.321	730			
498	53.125	49.322	195.2768	0.11	0.10	0.95	1.21	0.00	83	83	77	1.07	0.4	168	0.018	109	106	4.9	0.30	1.13		78.45	146.54	136.98	68.38	146.09	442	73	74	77	0.000	1.001	9.404	739			
499	53.235	49.421	195.6689	0.11	0.10	0.95	1.22	0.00	83	83	77	1.07	0.3	169	0.018	109	106	4.5	0.40	1.13		79.04	147.10	137.52	68.34	146.75	444	73	74	77	0.000	1.001	9.404	744			
500	53.345	49.521	196.0611	0.11	0.10	0.95	1.21	0.00	83	83	77	1.07	0.4	169	0.018	109	106	4.2	0.30	1.13		79.96	147.81	138.06	68.38	147.34	443	73	74	77	0.000	1.001	9.404	753			
501	53.455	49.620	196.4532	0.11	0.10	0.95	1.21	0.00	83	83	77	1.07	0.4	169	0.018	109	106	3.9	0.30	1.13		80.62	148.52	138.64	68.36	147.96	443	73	75	77	0.000	1.001	9.404				

Hydronic Heating Appliances - Test Method 28 WHH Fuel Moisture

Manufacturer:	Heatmor
Model:	200X
Tracking No.:	1997
Project No.:	0275WB011E
Technician:	A. Kravitz, S. Button
Run #:	7
Test Date:	October 3, 2014

[illegible]

Total Weight of Load (lb): 88.1

Total Moisture of Load (%): 22.1

Equipment Numbers:
340, 431, 353

Run Notes

Client: HeatmorModel: 200XProject #: 0275WB011ETracking #: 1997Run #: 7 Date: 10/3/14Test Crew: A. Kravitz, J. Clark, S. ButtonOMNI Equipment ID #(s): 428A, 428B, 356

PREBURN

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

PRIMARY:

Target Output: 16-24%

SECONDARY: N/ATERTIARY: N/AFAN: Auto

PREBURN SETTINGS AND ACTIVITIES

TIME	AIR (THERMO) CHANGES PRIMARY/SECONDARY/TERTIARY	FAN SETTING CHANGE	ADD FUEL + WT.	ADD FUEL - WT.	RAKE COAL	COMMENT
	None					

TEST

TEST FUEL CONFIGURATION SKETCH
(INDICATE VIEW ANGLE)

See fuel photographs

START UP PROCEDURES

BYPASS: N/AFUEL LOADING: Done @ 1:37DOOR: Closed @ 2:00PRIMARY AIR: Set @ 2:00OTHER: N/ADESCRIBE OR SKETCH TEST SETTINGS BELOW:
(SETTINGS MUST BE ACCURATE AND REPRODUCIBLE)

PRIMARY:

Target Output: 16-24%

SECONDARY: N/ATERTIARY: N/AFAN: AutoTechnician signature: [Signature]Date: 10/3/14

Supplemental Data EPA 5G/5H

Client: Heatmor

Model: 200X

Project #: 0275WB011E

Tracking #: 1997

Date: 6/3/14 Run #: 7 Booth: E3

Test Crew: A. Kravitz, J. Clark, S. Bottom Start Time: 11:25 Stop Time: _____

OMNI Equipment #(s): 132, wd, 410, 417, 419, 559, 513, 533

Stack Gas Leak Check:

Dilution Tunnel Gas Leak Check (5H only):

Initial: Ø

Initial: *N/A*

Final: 6

Final: NA

Calibrations: Span Gas CO₂: 16.80 O₂: N/A CO: 4.245 CO₂(DT): N/A

Mid Gas CO₂: 9.87 O₂: N/A CO: 2.493 CO₂ (DT): N/A

Time
O ₂
CO ₂
CO
CO ₂ (DT)

Pre Test		
Zero	Span	Mid
10.35	10.36	10.38
N/A		
0.00	16.81	10.11
0.000	4.295	2.507
N/A		

Post Test		
Zero	Span	Mid
20:15	20:16	20:18
N/A		
0.09	16.89	10.26
0.016	4.321	2.533
N/A		

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

Scale Audit (lbs): Initial: 10.0 Final: 10.0

Pitot Tube Leak Test: Initial: 0 Final: 0

Stack Diameter (inches): 8

Induced Draft: Ø

% Smoke Capture: 100

Flue Pipe Cleaned Prior to First Test in Series:

Date: 9/23/14 Initials: AM

	Initial	Middle	Ending
P _b (in/Hg)	30.28	30.24	30.19
Ambient (°F)	71	74	76

Technician signature: [Signature]

Date: 10/3/14

Tunnel Traverse	
dP (in H ₂ O)	T(°F)
0.016	71
0.020	1
0.020	
0.022	
0.020	
0.008	
0.014	
0.022	
0.022	
0.022	
0.016	
0.012	
Static P:	-0.24

OMNI-Test Laboratories, Inc.

Manufacturer: Heatmor
Model: 200X
Date: 10/03/14
Run: 7
Control #: 0275WB011E
Test Duration: 516
Output Category: II

Technicians: A. Kravitz
S. Button

Test Results in Accordance with CSA B415.1-09

	HHV Basis	LHV Basis
Overall Efficiency	73.8%	79.4%
Combustion Efficiency	97.0%	97.0%
Heat Transfer Efficiency	76%	81.9%

Output Rate (kJ/h)	59,324	56,276	(Btu/h)
Burn Rate (kg/h)	4.04	8.91	(lb/h)
Input (kJ/h)	80,430	76,297	(Btu/h)

Test Load Weight (dry kg)	34.78	76.66	dry lb
MC wet (%)	18.1		
MC dry (%)	22.10		
Particulate (g)	0		
CO (g)	1,581		
Test Duration (h)	8.60		

Emissions	Particulate	CO
g/MJ Output	0.00	3.10
g/kg Dry Fuel	0.00	45.44
g/h	0.00	183.79
lb/MM Btu Output	0.00	7.20

Air/Fuel Ratio (A/F)	10.43
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VERSION:

2.3

3/23/2010

*Model: 200X
Heatmor
105 Industrial Park Ct. NE, P.O. Box 787
Warroad, MN 56763*

Run 8

Hydronic Heating Appliances - Test Method 28 WHH Results

Manufacturer: Heatmor
 Model: 200X
 Tracking No.: 1997
 Project No.: 0275WB011E
 Run: 8
 Test Date: October 6, 2014

Burn Rate	6.90 kg/hr dry
Average Tunnel Temperature	118 degrees Fahrenheit
Average Gas Velocity in Dilution Tunnel - vs	8.9 feet/second
Average Gas Flow Rate in Dilution Tunnel - Qsd	22540 dscf/hour
Average Delta p	0.017 inches H2O
Average Delta H	0.96 inches H2O
Total Time of Test	304 minutes

	SAMPLE TRAIN 1	SAMPLE TRAIN 2	AMBIENT SAMPLE TRAIN
Total Sample Volume - Vm	32.71 cubic feet	30.66 cubic feet	119.29 cubic feet
Average Gas Meter Temperature	84 degrees Fahrenheit	84 degrees Fahrenheit	80 degrees Fahrenheit
Total Sample Volume (Standard Conditions) - Vmstd	32.1 dscf	30.3 dscf	115.5 dscf
Total Particulates - mn	15.2 mg	14.2 mg	1 mg
Particulate Concentration (dry-standard)	0.00047 grams/dscf	0.00047 grams/dscf	0.000009 grams/dscf
Particulate Emission Rate	53.10 grams	52.59 grams	
Difference from Average	0.25 grams	0.25 grams	
Results Are Acceptable			

AVERAGE	
Total Sample Volume - Vm	31.69 cubic feet
Average Gas Meter Temperature	84 degrees Fahrenheit
Total Sample Volume (Standard Conditions) - Vmstd	31.2 dscf
Total Particulates - mn	
Particulate Concentration (dry-standard)	0.00046 grams/dscf
Particulate Emission Rate	52.85 grams
7.5% of the average emission rate	3.96 grams

Hydronic Heating Appliances - Test Method 28 WHH
Test Data

Run: 8

Manufacturer: Heatmor

Model: 200X

Tracking No.: 1997

Project No.: 0275WB011E

Test Date: October 6, 2014

Technician: A. Kravitz, S. Button

Beginning Clock Time: 13:39

Recording Interval: 1 min.

Total Sampling Time: 304 min.

Velocity Traverse Data

	Pt.1	Pt.2	Pt.3	Pt.4	Pt.5	Pt.6	Pt.7	Pt.8	Pt.9	Pt.10	Pt.11	Pt.12	
Initial dP	0.012	0.020	0.022	0.022	0.018	0.008	0.010	0.018	0.022	0.022	0.018	0.006	"H2O
Initial Temp.	76	76	76	76	76	76	76	76	76	76	76	76	oF

Air Velocity: Initial: <50 Final: <50

Scale Audit: Pre: 10 Post: 10

Pitot Tube Leak Test: Pre: 0 Post: 0

Induced Draft: 0

% Smoke Capture: 100

Flue Pipe Cleaned Prior to First Test in Series: Date: 9/23/2014

PM Control Module: 428A/428B

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: -0.260 "H2O

Pitot Tube Cp: 0.99

Meter Box Y Factor: 1.007 1.012 0.989

Barometric Pressure: Begin Middle End

30.04 29.96 29.94

Signature/Date:

Tunnel Velocity: 8.90 ft/sec.

Initial Tunnel Flow: 381.8 scfm

Average Tunnel Flow: 375.7 scfm

Tunnel Area: 0.785 ft2

Post-Test Leak Check (1): .002@1 cfm@"Hg

Post-Test Leak Check (2): .006@2 cfm@"Hg

Fuel Moisture (dry basis %): 21.7

Total Particulate (1): 15.2

Total Particulate (2): 14.2

Average 29.98 "Hg

Elapsed Time	Particulate Sampling Data																Fuel Weight, lb		Flow, gpm		Temperature Data, oF												Stack			
	Gas Meter Cubic Feet (1)	Gas Meter Cubic Feet (2)	Gas Meter Cubic Feet (amb)	Sample Rate, cfm (1)	Sample Rate, cfm (2)	Orifice dH (1)	Orifice dH (2)	Orifice dH (amb)	Meter oF (1)	Meter oF (2)	Meter oF (amb)	Meter Vac. In. Hg. (1)	Meter Vac. In. Hg. (2)	Dilution Tunnel Temp.	Dilution Tunnel dP	Pro. Rate (%) (1)	Pro. Rate (%) (2)	Scale Reading	Weight Change	Load Side Liquid Flow Rate	Boiler Side Liquid Flow Rate (optional)	Thermopile ΔT	Boiler to Heat Exch. Temp.	Heat Exch to Boiler Temp.	Inlet Load Temp.	Outlet Load Temp.	Stack	Filter (1)	Filter (2)	Ambient	Draft In. H2O	Specific Heat of Inlet Water (BTU/lb-°F)	Mass Flow Rate of Inlet Water (lb/min)	Heat Output, Btu		
0	0.000	0.000	0			0.01	0.03	0	77	77	76	1.62	1	76.00	0.017			93.8		2.40		66.1	134.9	126.7	68.5	134.6	307	76	76	76	0.000	1.001	19.973			
1	0.090	0.091	0.392388	0.09	0.09	0.94	1.18	0	77	77	76	1.13	0.4	128	0.017	85	92	93.3	0.50	2.38		66.0	134.8	126.6	68.5	134.5	255	77	77	76	0.000	1.001	19.807	1308		
2	0.195	0.189	0.784776	0.11	0.10	0.94	1.18	0	77	77	76	1.12	0.4	131	0.017	100	100	92.8	0.50	2.40		65.6	134.4	126.2	68.5	134.1	304	77	78	76	0.000	1.001	19.973	1311		
3	0.300	0.288	1.177164	0.11	0.10	0.95	1.19	0	77	77	77	1.11	0.4	152	0.017	102	102	91.8	1.00	2.37		65.7	134.6	126.3	68.6	134.2	450	78	79	77	0.000	1.001	19.723	1297		
4	0.405	0.386	1.569553	0.11	0.10	0.95	1.20	0	77	77	77	1.11	0.4	176	0.017	104	103	90.8	1.00	2.42		66.0	134.8	126.5	68.6	134.5	545	80	81	77	0.000	1.001	20.139	1330		
5	0.510	0.484	1.961941	0.11	0.10	0.95	1.19	0	77	77	77	1.1	0.4	191	0.017	105	104	89.6	1.20	2.40		66.2	135.1	126.9	68.6	134.7	581	81	83	77	0.000	1.001	19.973	1323		
6	0.614	0.582	2.354329	0.10	0.10	0.94	1.19	0	77	77	77	1.1	0.4	190	0.017	104	104	88.4	1.20	2.41		66.7	135.6	127.3	68.6	135.3	554	82	83	77	0.000	1.001	20.056	1338		
7	0.719	0.680	2.746717	0.11	0.10	0.95	1.20	0	77	77	77	1.1	0.4	196	0.017	105	105	87.2	1.20	2.44		67.2	136.3	127.8	68.6	135.8	574	80	83	77	0.040	1.001	20.306	1366		
8	0.823	0.778	3.139105	0.10	0.10	0.94	1.20	0	77	77	77	1.1	0.4	200	0.017	105	105	86.0	1.20	2.37		68.1	137.2	128.5	68.6	136.7	581	77	80	77	0.000	1.001	19.723	1345		
9	0.927	0.876	3.531493	0.10	0.10	0.94	1.19	0	77	77	77	1.09	0.4	204	0.017	105	105	84.8	1.20	2.40		69.1	137.9	129.3	68.7	137.7	595	77	79	77	0.020	1.001	19.973	1381		
10	1.031	0.974	3.923882	0.10	0.10	0.95	1.20	0	78	77	77	1.09	0.4	204	0.017	105	105	83.4	1.40	2.39		69.8	138.8	130.0	68.6	138.4	591	76	78	77	0.000	1.001	19.890	1390		
11	1.135	1.071	4.31627	0.10	0.10	0.94	1.19	0	78	77	77	1.09	0.4	210	0.017	105	105	82.1	1.30	2.41		71.1	140.2	131.1	68.6	139.7	606	76	78	77	0.000	1.001	20.056	1428		
12	1.238	1.168	4.708658	0.10	0.10	0.93	1.20	0	78	77	77	1.08	0.4	209	0.017	104	105	80.9	1.20	2.40		72.3	141.5	132.1	68.6	140.9	602	76	79	77	0.000	1.001	19.973	1446		
13	1.340	1.264	5.101046	0.10	0.10	0.93	1.18	0	78	78	77	1.09	0.4	217	0.017	104	105	79.6	1.30	2.38		73.5	142.5	133.2	68.6	142.0	622	76	79	77	0.000	1.001	19.806	1456		
14	1.442	1.360	5.493434	0.10	0.10	0.93	1.19	0	78	78	77	1.08	0.4	220	0.017	104	104	78.2	1.40	2.36		74.5	143.6	134.0	68.6	143.0	629	76	79	77	0.000	1.001	19.640	1464		
15	1.545	1.457	5.885822	0.10	0.10	0.92	1.18	0	78	78	77	1.08	0.4	224	0.017	105	105	76.9	1.30	2.38		75.6	145.0	135.3	68.7	144.3	635	77	79	77	0.000	1.001	19.806	1500		
16	1.649	1.553	6.278211	0.10	0.10	0.92	1.18	0	78	78	77	1.08	0.4	224	0.017	106	105	75.6	1.30	2.40		76.8	146.4	136.4	68.6	145.4	632	77	80	77	0.000	1.001	19.973	1535		
17	1.752	1.650	6.670599	0.10	0.10	0.92	1.18	0	78	78	77	1.08	0.4	224	0.017	105	105	74.2	1.40	2.40		77.9	147.2	137.3	68.7	146.6	631	78	80	77	0.000	1.001	19.973	1558		
18	1.856	1.747	7.062987	0.10	0.10	0.92	1.18	0	78	78	77	1.08	0.4	224	0.017	106	105	72.8	1.40	2.39		79.6	148.8	138.6	68.6	148.2	628	78	81	77	0.000	1.001	19.890	1585		
19	1.960	1.837	7.455375	0.10	0.09	0.91	1.18	0	78	78	77	1.08	0.4	217	0.017	106	98	71.6	1.20	2.26		81.0	150.3	140.4	68.7	149.7	610	78	81	77	0.000	1.001	18.807	1525		
20	2.063	1.925	7.847763	0.10	0.09	0.92	1.13	0	78	78	77	1.07	0.3	212	0.017	104	95	70.3	1.30	2.24		82.1	151.3	141.5	68.7	150.8	602	79	81	77	0.000	1.001	18.641	1532		
21	2.166	2.013	8.240151	0.10	0.09	0.9	1.10	0	79	79	77	1.04	0.3	211	0.017	104	95	69.0	1.30	2.20		83.3	152.2	142.4	68.7	152.0	596	79	82	77	0.000	1.001	18.308	1527		
22	2.262	2.101	8.632539	0.10	0.09	0.78	1.11	0	79	79	77	0.92	0.3	209	0.017	97	95	67.8	1.20	2.20		84.3	153.7	143.7	68.7	153.0	594	80	82	77	0.000	1.001	18.308	1545		
23	2.352	2.187	9.024928	0.09	0.09	0.74	1.07	0	79	79	77	0.91	0.3	208	0.017	91	92	66.6	1.20	2.18		85.8	154.6	144.8	68.7	154.5	592	80	82	77	0.000	1.001	18.142	1559		
24	2.442	2.269	9.417316	0.09	0.08	1.03	1.17	0	79	79	77	0.75	0.2	208	0.017	91	88	65.1	1.50	2.19		86.7	155.7	145.7	68.7	155.4	593	81	82	77	0.000	1.001	18.225	1582		
25	2.531	2.350	9.809704	0.09	0.08	0.99	1.21	0	79	79	77	0.8	0.2	208	0.017	90	87	64.1	1.00	2.16		87.6	156.9	146.6	68.7	156.3	593	82	83	77	0.000	1.001	17.975	1577		
26	2.620	2.431	10.20209	0.09	0.08	0.94	1.21	0	79	79	77	0.79	0.1	210	0.017	90	87	62.7	1.40	2.15		89.0	158.3	147.8	68.7	157.7	599	82	83	77	0.000	1.001	17.892	1595		
27	2.709	2.512	10.59448	0.09	0.08	0.94	1.16	0	79	79	77	0.79	0.1	210	0.017	90	88	61.3	1.40	2.19		90.4	159.4	148.8	68.7	159.1	598	82	84	77	0.000	1.001	18.225	1649		
28	2.798	2.594	10.98687	0.09	0.08	0.94	1.06	0	79	79	78	0.79	0	211	0.017	90	88	60.0	1.30	2.21		91.3	160.4	149.7	68.7	160.0	599	80	84	78	0.000	1.001	18.391	1681		
29	2.887	2.683	11.37926	0.09	0.09	0.91	0.11	0	79	79	78	0.72	-3.2	213	0.017	90	95	58.7	1.30	2.18		92.4	161.7	150.8	68.7	161.2	603	75	75	78	0.000	1.001	18.142	1679		
30	2.976	2.774	11.77164	0.09	0.09	0.8	1.08	0	80	80	78	0.6	-9.1	213	0.017	90	98	57.4	1.30	2.14		93.7	163.0	152.2	68.7	162.5	603	74	75	78	0.000	1.001	17.809	1671		
31	3.066	2.866	12.16403	0.09	0.09	0.72	1.10	0	80	80	78	0.51	-9	210	0.017	91	99	55.9	1.50	2.10		94.9	163.9	153.6	68.8	163.7	596	72	75	78	0.000	1.001	17.476	1661		
32	3.163	2.958	12.55642																																	

Elapsed Time	Particulate Sampling Data																Fuel Weight, lb		Flow, gpm		Temperature Data, oF												Stack				
	Gas Meter Cubic Feet (1)	Gas Meter Cubic Feet (2)	Gas Meter Cubic Feet (amb)	Sample Rate, cfm (1)	Sample Rate, cfm (2)	Orifice dH (1)	Orifice dH (2)	Orifice dH (amb)	Meter oF (1)	Meter oF (2)	Meter oF (amb)	Meter Vac. In. Hg. (1)	Meter Vac. In. Hg. (2)	Dilution Tunnel Temp.	Dilution Tunnel dP	Pro. Rate (%) (1)	Pro. Rate (%) (2)	Scale Reading	Weight Change	Load Side Liquid Flow Rate	Boiler Side Liquid Flow Rate (optional)	Thermopile ΔT	Boiler to Heat Exch. Temp.	Heat Exch to Boiler Temp.	Inlet Load Temp.	Outlet Load Temp.	Stack	Filter (1)	Filter (2)	Ambient	Draft In. H2O	Specific Heat of Inlet Water (BTU/lb-°F)	Mass Flow Rate of Inlet Water (lb/min)	Heat Output, Btu			
43	4.316	4.068	16.87269	0.11	0.10	0.91	1.25	0	81	81	78	0.18	-0.7	104	0.017	97	101	43.9	0.20	1.70		107.2	176.2	166.2	69.0	176.2	397	72	71	78	0.000	1.001	14.147	1518			
44	4.422	4.170	17.26508	0.11	0.10	0.91	1.24	0	81	81	78	0.19	-0.7	99	0.017	97	100	43.8	0.10	1.75		106.8	175.9	166.0	69.0	175.8	388	72	71	78	0.000	1.001	14.563	1557			
45	4.528	4.273	17.65747	0.11	0.10	0.92	1.25	0	81	81	78	0.19	-0.7	96	0.017	97	100	43.8	0.00	1.78		106.4	175.5	165.7	69.1	175.4	378	72	70	78	0.000	1.001	14.812	1578			
46	4.634	4.376	18.04986	0.11	0.10	0.92	1.25	0	81	81	78	0.19	-0.7	94	0.017	97	100	43.6	0.20	1.76		106.1	175.1	165.2	69.0	175.1	369	71	70	78	0.000	1.001	14.646	1555			
47	4.740	4.479	18.44224	0.11	0.10	0.93	1.25	0	81	81	78	0.2	-0.7	92	0.017	97	100	43.6	0.00	1.75		105.6	174.8	165.0	69.1	174.6	361	71	70	78	0.000	1.001	14.563	1539			
48	4.847	4.582	18.83463	0.11	0.10	0.92	1.25	0	81	81	78	0.2	-0.7	91	0.017	98	100	43.5	0.10	1.74		105.3	174.5	164.6	69.1	174.3	352	71	70	78	0.000	1.001	14.479	1526			
49	4.954	4.685	19.22702	0.11	0.10	0.93	1.27	0	81	81	78	0.2	-0.7	90	0.017	98	100	43.5	0.00	1.75		104.9	174.1	164.4	69.1	174.0	345	70	69	78	0.000	1.001	14.562	1529			
50	5.061	4.788	19.61941	0.11	0.10	0.93	1.26	0	81	81	78	0.21	-0.7	90	0.017	98	100	43.5	0.00	1.75		104.3	173.5	163.9	69.2	173.5	337	70	69	78	0.000	1.001	14.562	1521			
51	5.168	4.890	20.0118	0.11	0.10	0.93	1.28	0	81	81	78	0.22	-0.7	89	0.017	97	100	43.4	0.10	1.74		103.8	173.2	163.4	69.1	173.0	329	70	69	78	0.000	1.001	14.479	1505			
52	5.275	4.993	20.40418	0.11	0.10	0.94	1.27	0	81	81	78	0.22	-0.7	88	0.017	97	99	43.4	0.00	1.76		103.5	172.6	163.0	69.1	172.6	322	70	69	78	0.000	1.001	14.646	1517			
53	5.383	5.095	20.79657	0.11	0.10	0.94	1.27	0	81	82	78	0.22	-0.7	88	0.017	98	99	43.3	0.10	1.75		103.0	172.2	162.5	69.2	172.2	315	70	69	78	0.000	1.001	14.562	1502			
54	5.491	5.197	21.18896	0.11	0.10	0.94	1.28	0	82	82	78	0.22	-0.7	88	0.017	98	99	43.3	0.00	1.74		102.6	171.9	162.2	69.2	171.7	308	70	69	78	0.000	1.001	14.479	1487			
55	5.599	5.299	21.58135	0.11	0.10	0.95	1.28	0	82	82	78	0.23	-0.7	87	0.017	98	98	43.3	0.00	1.73		102.2	171.5	162.0	69.2	171.4	301	70	69	78	0.000	1.001	14.396	1473			
56	5.708	5.400	21.97374	0.11	0.10	0.95	1.29	0	82	82	78	0.24	-0.7	87	0.017	99	98	43.3	0.00	1.74		101.7	171.0	161.4	69.2	170.8	295	70	69	78	0.000	1.001	14.479	1474			
57	5.817	5.501	22.36613	0.11	0.10	0.95	1.30	0	82	82	78	0.24	-0.7	87	0.017	99	98	43.3	0.00	1.79		101.2	170.4	161.1	69.2	170.4	288	69	68	78	0.000	1.001	14.895	1509			
58	5.926	5.603	22.75851	0.11	0.10	0.96	1.30	0	82	82	78	0.24	-0.6	86	0.017	99	98	43.3	0.00	1.75		100.8	170.1	160.8	69.2	170.0	282	69	68	78	0.000	1.001	14.562	1470			
59	6.036	5.704	23.1509	0.11	0.10	0.97	1.20	0	82	82	78	0.25	-0.5	86	0.017	100	98	43.2	0.10	1.77		100.4	169.7	160.4	69.2	169.6	276	69	68	78	0.000	1.001	14.729	1481			
60	6.147	5.806	23.54329	0.11	0.10	0.97	1.20	0	82	82	79	0.26	-0.5	86	0.017	101	99	43.3	-0.10	1.75		99.8	169.2	160.1	69.2	169.0	271	69	68	79	0.000	1.001	14.562	1455			
61	6.258	5.909	23.93568	0.11	0.10	0.98	1.22	0	82	82	79	0.27	-0.5	86	0.017	101	99	43.3	0.00	1.72		99.5	168.7	159.5	69.2	168.7	266	69	68	79	0.000	1.001	14.313	1425			
62	6.370	6.012	24.32807	0.11	0.10	0.99	1.22	0	82	82	79	0.28	-0.5	85	0.017	101	100	43.2	0.10	1.77		99.0	168.3	159.1	69.3	168.3	260	69	68	79	0.000	1.001	14.728	1460			
63	6.482	6.116	24.72045	0.11	0.10	1	1.23	0	82	82	79	0.3	-0.5	85	0.017	101	100	43.2	0.00	1.72		98.5	167.8	158.9	69.3	167.8	255	69	68	79	0.000	1.001	14.312	1412			
64	6.595	6.220	25.11284	0.11	0.10	1.01	1.24	0	82	82	79	0.31	-0.5	85	0.017	102	101	43.2	0.00	1.75		98.0	167.4	158.5	69.3	167.3	251	69	68	79	0.000	1.001	14.562	1429			
65	6.708	6.325	25.50523	0.11	0.11	1.02	1.25	0	82	82	79	0.32	-0.5	85	0.017	102	101	43.2	0.00	1.76		97.5	167.1	158.0	69.3	166.9	246	69	68	79	0.000	1.001	14.645	1430			
66	6.822	6.431	25.89762	0.11	0.11	1.03	1.27	0	82	82	79	0.33	-0.5	85	0.017	103	102	43.2	0.00	1.75		97.2	166.4	157.6	69.3	166.5	242	69	68	79	0.000	1.001	14.562	1417			
67	6.937	6.537	26.29001	0.12	0.11	1.03	1.27	0	82	82	79	0.34	-0.4	85	0.017	104	103	43.1	0.10	1.76		96.6	166.1	157.2	69.3	166.0	237	69	68	79	0.000	1.001	14.645	1417			
68	7.053	6.644	26.68239	0.12	0.11	1.05	1.28	0	82	82	79	0.36	-0.4	85	0.017	105	103	43.2	-0.10	1.73		96.1	165.6	156.7	69.3												

Elapsed Time	Particulate Sampling Data																Fuel Weight, lb		Flow, gpm		Temperature Data, oF												Stack	Specific Heat of Inlet Water (BTU/lb-°F)	Mass Flow Rate of Inlet Water (lb/min)	Heat Output, Btu
	Gas Meter Cubic Feet (1)	Gas Meter Cubic Feet (2)	Gas Meter Cubic Feet (amb)	Sample Rate, cfm (1)	Sample Rate, cfm (2)	Orifice dH (1)	Orifice dH (2)	Orifice dH (amb)	Meter oF (1)	Meter oF (2)	Meter oF (amb)	Meter Vac. In. Hg. (1)	Meter Vac. In. Hg. (2)	Dilution Tunnel Temp.	Dilution Tunnel dP	Pro. Rate (%) (1)	Pro. Rate (%) (2)	Scale Reading	Weight Change	Load Side Liquid Flow Rate	Boiler Side Liquid Flow Rate (optional)	Thermopile ΔT	Boiler to Heat Exch. Temp.	Heat Exch to Boiler Temp.	Inlet Load Temp.	Outlet Load Temp.	Stack	Filter (1)	Filter (2)	Ambient	Draft In. H2O					
97	10.280	9.724	38.06165	0.11	0.10	0.95	1.24	0	83	83	79	0.96	0.20	82	0.017	99	100	42.9	0.00	1.94		83.5	153.0	144.4	69.4	152.9	161	69	69	79	0.000	1.001	16.143	1350		
98	10.390	9.828	38.45404	0.11	0.10	0.95	1.24	0	84	83	79	0.98	0.20	82	0.017	99	100	42.8	0.10	1.92		83.1	152.6	144.3	69.4	152.5	160	69	69	79	0.000	1.001	15.976	1329		
99	10.500	9.932	38.84643	0.11	0.10	0.97	1.26	0	84	83	79	0.98	0.20	82	0.017	99	100	42.8	0.00	1.92		82.5	152.1	143.7	69.4	152.0	159	69	69	79	0.000	1.001	15.976	1320		
100	10.610	10.037	39.23882	0.11	0.10	0.97	1.26	0	84	83	79	0.99	0.20	82	0.017	99	101	42.9	-0.10	1.93		82.2	151.7	143.3	69.4	151.6	158	69	69	79	0.000	1.001	16.060	1321		
101	10.720	10.142	39.6312	0.11	0.10	0.97	1.28	0	84	83	79	1.00	0.20	82	0.017	99	101	42.8	0.10	1.95		81.8	151.3	142.9	69.4	151.2	156	69	69	79	0.000	1.001	16.226	1328		
102	10.830	10.246	40.02359	0.11	0.10	0.98	1.29	0	84	83	79	1.00	0.20	82	0.017	99	100	42.8	0.00	1.94		81.3	150.9	142.6	69.4	150.7	155	69	69	79	0.000	1.001	16.143	1314		
103	10.940	10.350	40.41598	0.11	0.10	0.99	1.29	0	84	83	80	1.01	0.20	82	0.017	99	100	42.9	-0.10	1.98		81.0	150.4	142.1	69.3	150.2	154	69	69	80	0.000	1.001	16.476	1336		
104	11.050	10.454	40.80837	0.11	0.10	1.00	1.29	0	84	84	79	1.01	0.30	82	0.017	99	99	42.8	0.10	1.94		80.5	150.0	141.8	69.3	149.8	153	69	69	79	0.000	1.001	16.143	1301		
105	11.160	10.557	41.20076	0.11	0.10	1.00	1.30	0	84	84	79	1.02	0.30	82	0.017	99	99	42.8	0.00	1.93		80.1	149.5	141.4	69.2	149.3	152	69	69	79	0.000	1.001	16.060	1288		
106	11.270	10.660	41.59314	0.11	0.10	1.00	1.30	0	84	84	80	1.02	0.30	82	0.017	99	99	42.8	0.00	1.94		79.7	149.1	141.2	69.3	149.0	150	69	69	80	0.000	1.001	16.143	1288		
107	11.370	10.762	41.98553	0.10	0.10	1.01	1.31	0	84	84	80	1.03	0.30	82	0.017	90	98	42.8	0.00	1.92		79.2	148.6	140.6	69.3	148.5	150	69	69	80	0.000	1.001	15.977	1267		
108	11.480	10.864	42.37792	0.11	0.10	1.02	1.31	0	84	84	80	1.03	0.30	82	0.017	99	98	42.8	0.00	1.93		78.9	148.3	140.1	69.2	148.1	149	69	69	80	0.000	1.001	16.060	1268		
109	11.590	10.966	42.77031	0.11	0.10	1.02	1.32	0	84	84	80	1.03	0.30	82	0.017	99	97	42.8	0.00	1.96		78.5	148.0	139.9	69.3	147.8	147	69	69	80	0.000	1.001	16.309	1282		
110	11.700	11.067	43.1627	0.11	0.10	1.02	1.32	0	84	84	80	1.04	0.30	82	0.017	99	97	42.8	0.00	1.98		78.0	147.5	139.5	69.3	147.3	147	69	69	80	0.000	1.001	16.476	1286		
111	11.810	11.167	43.55509	0.11	0.10	0.95	1.21	0	84	84	79	1.07	0.30	82	0.017	99	97	42.8	0.00	1.95		77.5	147.1	139.2	69.3	146.9	145	69	69	79	0.000	1.001	16.226	1259		
112	11.920	11.268	43.94747	0.11	0.10	0.96	1.22	0	84	84	80	1.07	0.30	82	0.017	99	97	42.8	0.00	1.95		77.2	146.7	139.0	69.4	146.5	145	69	69	80	0.000	1.001	16.226	1253		
113	12.030	11.369	44.33986	0.11	0.10	0.96	1.21	0	84	84	80	1.08	0.30	82	0.017	99	97	42.8	0.00	1.93		76.7	146.2	138.4	69.4	146.1	144	69	69	80	0.000	1.001	16.060	1233		
114	12.140	11.470	44.73225	0.11	0.10	0.96	1.22	0	84	84	80	1.08	0.30	82	0.017	99	97	42.8	0.00	1.97		76.3	145.9	138.0	69.4	145.7	143	69	69	80	0.000	1.001	16.393	1253		
115	12.250	11.571	45.12464	0.11	0.10	0.96	1.22	0	84	84	80	1.08	0.40	82	0.017	99	97	42.8	0.00	1.93		75.9	145.4	137.6	69.4	145.3	142	69	69	80	0.000	1.001	16.060	1221		
116	12.360	11.673	45.51703	0.11	0.10	0.97	1.22	0	84	84	80	1.08	0.40	82	0.017	99	97	42.8	0.00	1.92		75.4	145.0	137.4	69.4	144.8	141	69	69	80	0.000	1.001	15.976	1207		
117	12.470	11.774	45.90941	0.11	0.10	0.97	1.23	0	84	84	80	1.08	0.40	82	0.017	99	97	42.8	0.00	1.94		74.9	144.7	137.1	69.4	144.3	141	69	69	80	0.000	1.001	16.143	1211		
118	12.570	11.874	46.3018	0.10	0.10	0.97	1.22	0	84	84	80	1.09	0.40	82	0.017	90	97	42.8	0.00	1.94		74.7	144.2	136.7	69.4	144.1	140	69	69	80	0.000	1.001	16.143	1207		
119	12.670	11.975	46.69419	0.10	0.10	0.97	1.24	0	84	84	80	1.09	0.40	82	0.017	90	96	42.8	0.00	1.92		74.3	143.8	136.3	69.4	143.7	139	69	69	80	0.000	1.001	15.976	1188		
120	12.770	12.075	47.08658	0.10	0.10	0.97	1.23	0	84	84	80	1.09	0.40	82	0.017	90	96	42.7	0.10	1.94		74.0	143.5	136.0	69.2	143.3	139	69	69	80	0.000	1.001	16.143	1197		
121	12.880	12.175	47.47897	0.11	0.10	0.97	1.24	0	84	84	80	1.08	0.40	82	0.017	99	96	42.7	0.00	1.95		73.7	143.1	135.6	69.3	143.0	138	69	69	80	0.000	1.001	16.226	1196		
122	12.990	12.274	47.87136	0.11	0.10	0.97	1.24	0	84	84	80																									

Elapsed Time	Particulate Sampling Data																	Fuel Weight, lb		Flow, gpm		Temperature Data, oF												Stack				
	Gas Meter Cubic Feet (1)	Gas Meter Cubic Feet (2)	Gas Meter Cubic Feet (amb)	Sample Rate, cfm (1)	Sample Rate, cfm (2)	Orifice dH (1)	Orifice dH (2)	Orifice dH (amb)	Meter oF (1)	Meter oF (2)	Meter oF (amb)	Meter Vac. In. Hg. (1)	Meter Vac. In. Hg. (2)	Dilution Tunnel Temp.	Dilution Tunnel dP	Pro. Rate (%) (1)	Pro. Rate (%) (2)	Scale Reading	Weight Change	Load Side Liquid Flow Rate	Boiler Side Liquid Flow Rate (optional)	Thermopile ΔT	Boiler to Heat Exch. Temp.	Heat Exch to Boiler Temp.	Inlet Load Temp.	Outlet Load Temp.	Stack	Filter (1)	Filter (2)	Ambient	Draft In. H2O	Specific Heat of Inlet Water (BTU/lb-°F)	Mass Flow Rate of Inlet Water (lb/min)	Heat Output, Btu				
151	16.090	15.138	59.25061	0.11	0.10	0.95	1.19	0	85	85	80	1.05	0.30	180	0.017	107	102	32.3	1.00	1.90		65.8	135.2	128.7	69.1	134.9	516	79	78	80	0.000	1.001	15.811	1042				
152	16.200	15.236	59.643	0.11	0.10	0.95	1.19	0	85	85	81	1.05	0.30	187	0.017	108	102	31.2	1.10	1.89		66.7	136.2	129.5	69.1	135.8	533	80	79	81	0.000	1.001	15.727	1049				
153	16.310	15.334	60.03539	0.11	0.10	0.95	1.19	0	85	85	80	1.05	0.30	191	0.017	108	103	30.2	1.00	1.86		67.4	137.1	130.3	69.2	136.5	541	80	79	80	0.000	1.001	15.478	1044				
154	16.420	15.432	60.42778	0.11	0.10	0.94	1.19	0	85	85	81	1.05	0.40	193	0.017	108	103	29.2	1.00	1.91		68.3	137.9	131.0	69.2	137.5	543	81	80	81	0.000	1.001	15.894	1087				
155	16.530	15.529	60.82016	0.11	0.10	0.95	1.19	0	85	85	80	1.04	0.30	195	0.017	109	103	28.2	1.00	1.91		69.5	139.0	132.1	69.2	138.7	548	81	80	80	0.000	1.001	15.894	1106				
156	16.640	15.627	61.21255	0.11	0.10	0.95	1.19	0	85	85	81	1.05	0.40	183	0.017	108	102	27.2	1.00	1.91		70.4	140.0	133.1	69.2	139.6	517	81	80	81	0.000	1.001	15.894	1120				
157	16.750	15.724	61.60494	0.11	0.10	0.95	1.17	0	85	85	81	1.05	0.30	176	0.017	107	101	26.2	1.00	1.92		72.0	141.6	134.4	69.3	141.2	510	82	81	81	0.000	1.001	15.977	1151				
158	16.860	15.822	61.99733	0.11	0.10	0.94	1.18	0	85	85	81	1.04	0.30	182	0.017	108	102	25.2	1.00	1.86		73.4	143.1	135.9	69.3	142.7	529	82	81	81	0.000	1.001	15.477	1137				
159	16.970	15.920	62.38972	0.11	0.10	0.94	1.17	0	85	85	81	1.04	0.30	188	0.017	108	103	24.3	0.90	1.88		74.7	144.0	136.7	69.2	143.9	541	82	81	81	0.000	1.001	15.644	1169				
160	17.070	16.019	62.78211	0.10	0.10	0.93	1.16	0	85	85	81	1.04	0.30	191	0.017	98	103	23.4	0.90	1.83		75.8	145.3	138.1	69.2	145.0	542	83	82	81	0.000	1.001	15.228	1155				
161	17.170	16.117	63.17449	0.10	0.10	0.93	1.15	0	85	85	81	1.04	0.30	194	0.017	99	104	22.4	1.00	1.84		76.9	146.7	139.2	69.2	146.1	544	83	82	81	0.000	1.001	15.311	1179				
162	17.270	16.216	63.56688	0.10	0.10	0.93	1.14	0	85	85	81	1.04	0.30	195	0.017	99	104	21.5	0.90	1.81		78.3	147.9	140.6	69.2	147.5	548	83	82	81	0.000	1.001	15.061	1181				
163	17.370	16.315	63.95927	0.10	0.10	0.92	1.14	0	85	85	81	1.02	0.30	197	0.017	99	104	20.5	1.00	1.83		79.7	149.3	141.8	69.2	148.9	553	83	83	81	0.000	1.001	15.228	1215				
164	17.470	16.414	64.35166	0.10	0.10	0.92	1.14	0	85	85	81	1.02	0.30	197	0.017	99	105	19.5	1.00	1.77		80.9	150.6	143.1	69.2	150.1	554	83	83	81	0.000	1.001	14.729	1193				
165	17.570	16.514	64.74405	0.10	0.10	0.92	1.14	0	85	85	81	1.02	0.30	196	0.017	99	105	18.7	0.80	1.72		82.0	151.6	144.1	69.2	151.1	546	84	83	81	0.000	1.001	14.313	1174				
166	17.670	16.614	65.13643	0.10	0.10	0.94	1.29	0	85	85	81	1.01	0.30	194	0.017	99	105	17.8	0.90	1.73		83.1	152.8	145.1	69.2	152.3	538	84	83	81	0.000	1.001	14.396	1197				
167	17.780	16.713	65.52882	0.11	0.10	0.94	1.20	0	85	85	81	1.01	0.30	193	0.017	108	105	17.1	0.70	1.67		84.0	153.9	146.3	69.2	153.2	532	84	83	81	0.000	1.001	13.896	1169				
168	17.890	16.813	65.92121	0.11	0.10	0.94	1.20	0	85	85	81	1.01	0.30	190	0.017	108	105	16.3	0.80	1.70		85.2	155.0	147.1	69.2	154.4	521	83	83	81	0.000	1.001	14.146	1207				
169	18.000	16.913	66.3136	0.11	0.10	0.94	1.20	0	85	85	81	1.01	0.30	187	0.017	108	105	15.6	0.70	1.65		86.4	156.4	148.5	69.3	155.7	511	83	83	81	0.000	1.001	13.730	1188				
170	18.110	17.013	66.70599	0.11	0.10	0.94	1.19	0	85	85	81	1.01	0.30	185	0.017	108	104	15.0	0.60	1.30		87.3	157.1	151.1	69.3	156.6	502	83	83	81	0.000	1.001	10.817	945				
171	18.220	17.113	67.09837	0.11	0.10	0.94	1.21	0	85	85	81	1.01	0.30	182	0.017	108	104	14.4	0.60	1.24		88.2	158.0	152.1	69.4	157.6	495	83	83	81	0.000	1.001	10.318	911				
172	18.330	17.213	67.49076	0.11	0.10	0.94	1.21	0	85	85	81	1.02	0.30	180	0.017	107	104	13.8	0.60	1.23		88.9	158.8	152.8	69.4	158.3	488	83	82	81	0.000	1.001	10.235	911				
173	18.440	17.314	67.88315	0.11	0.10	0.94	1.21	0	85	85	81	1.02	0.30	178	0.017	107	104	13.3	0.50	1.23		90.0	159.6	153.7	69.4	159.4	479	82	82	81	0.000	1.001	10.235	922				
174	18.550	17.414	68.27554	0.11	0.10	0.95	1.21	0	85	85	81	1.02	0.30	175	0.017	107	104	12.7	0.60	1.27		90.7	160.7	154.7	69.5	160.2	470	82	82	81	0.000	1.001	10.568	960				
175	18.660	17.515	68.66793	0.11	0.10	0.94	1.21	0	85	85	81	1.02	0.30	174	0.017	107	104	12.1	0.60	1.12		91.6	161.4	155.3	69.5	161.1	467	82	82	81	0.000	1.001	9.319	855				
176	18.770	17.615	69.06032																																			

Elapsed Time	Particulate Sampling Data																Fuel Weight, lb		Flow, gpm		Temperature Data, oF												Stack	Specific Heat of Inlet Water (BTU/lb-°F)	Mass Flow Rate of Inlet Water (lb/min)	Heat Output, Btu
	Gas Meter Cubic Feet (1)	Gas Meter Cubic Feet (2)	Gas Meter Cubic Feet (amb)	Sample Rate, cfm (1)	Sample Rate, cfm (2)	Orifice dH (1)	Orifice dH (2)	Orifice dH (amb)	Meter oF (1)	Meter oF (2)	Meter oF (amb)	Meter Vac. In. Hg. (1)	Meter Vac. In. Hg. (2)	Dilution Tunnel Temp.	Dilution Tunnel dP	Pro. Rate (%) (1)	Pro. Rate (%) (2)	Scale Reading	Weight Change	Load Side Liquid Flow Rate	Boiler Side Liquid Flow Rate (optional)	Thermopile ΔT	Boiler to Heat Exch. Temp.	Heat Exch to Boiler Temp.	Inlet Load Temp.	Outlet Load Temp.	Stack	Filter (1)	Filter (2)	Ambient	Draft In. H2O					
205	21.910	20.587	80.43957	0.11	0.10	0.98	1.26	0	86	86	81	1.07	0.30	89	0.017	99	99	4.7	0.10	1.69		101.8	172.9	163.7	71.0	172.7	284	74	75	81	0.000	1.001	14.059	1433		
206	22.020	20.690	80.83196	0.11	0.10	0.98	1.27	0	86	86	81	1.07	0.40	88	0.017	99	99	4.7	0.00	1.73		101.6	172.5	163.1	70.8	172.4	279	74	75	81	0.000	1.001	14.392	1464		
207	22.130	20.793	81.22435	0.11	0.10	0.98	1.27	0	86	86	81	1.07	0.40	88	0.017	99	99	4.8	-0.10	1.78		101.3	172.1	162.7	70.6	171.9	274	74	75	81	0.000	1.001	14.809	1502		
208	22.240	20.896	81.61674	0.11	0.10	0.98	1.27	0	86	86	81	1.07	0.40	88	0.017	99	99	4.8	0.00	1.69		101.5	171.6	162.3	70.1	171.6	269	74	74	81	0.000	1.001	14.061	1428		
209	22.350	21.000	82.00913	0.11	0.10	0.98	1.28	0	86	86	81	1.07	0.40	88	0.017	99	99	4.7	0.10	1.71		101.3	171.1	161.8	69.8	171.1	264	74	74	81	0.000	1.001	14.228	1443		
210	22.460	21.103	82.40151	0.11	0.10	0.98	1.27	0	86	86	81	1.07	0.40	88	0.017	99	99	4.8	-0.10	1.83		101.0	170.8	160.9	69.7	170.7	260	75	74	81	0.000	1.001	15.227	1540		
211	22.570	21.206	82.7939	0.11	0.10	0.99	1.26	0	86	86	81	1.07	0.40	87	0.017	99	99	4.8	0.00	1.82		100.6	170.4	160.4	69.6	170.2	256	74	74	81	0.000	1.001	15.144	1525		
212	22.670	21.309	83.18629	0.10	0.10	0.99	1.28	0	86	86	82	1.07	0.40	87	0.017	90	99	4.8	0.00	1.83		100.0	169.9	160.0	69.6	169.7	251	74	74	82	0.000	1.001	15.227	1525		
213	22.780	21.413	83.57868	0.11	0.10	0.98	1.27	0	86	86	82	1.07	0.40	87	0.017	99	99	4.8	0.00	1.85		99.5	169.2	159.5	69.7	169.2	247	74	74	82	0.000	1.001	15.393	1534		
214	22.890	21.516	83.97107	0.11	0.10	0.98	1.27	0	86	86	82	1.07	0.40	87	0.017	99	99	4.7	0.10	1.84		99.0	168.9	159.2	69.7	168.7	243	74	74	82	0.000	1.001	15.310	1517		
215	23.000	21.619	84.36345	0.11	0.10	0.98	1.27	0	86	86	82	1.08	0.40	87	0.017	99	99	4.8	-0.10	1.87		98.5	168.3	158.8	69.8	168.2	239	74	74	82	0.000	1.001	15.559	1534		
216	23.110	21.723	84.75584	0.11	0.10	0.98	1.27	0	86	86	82	1.08	0.40	87	0.017	99	99	4.8	0.00	1.84		97.9	168.1	158.5	70.0	167.9	236	74	73	82	0.000	1.001	15.309	1501		
217	23.220	21.826	85.14823	0.11	0.10	0.98	1.28	0	86	86	82	1.08	0.40	87	0.017	99	99	4.7	0.10	1.79		97.3	167.5	157.9	70.0	167.3	232	74	73	82	0.000	1.001	14.893	1451		
218	23.330	21.929	85.54062	0.11	0.10	0.98	1.28	0	86	86	82	1.08	0.40	86	0.017	99	99	4.7	0.00	1.81		96.9	167.0	157.6	70.1	166.9	228	74	73	82	0.000	1.001	15.060	1460		
219	23.440	22.032	85.93301	0.11	0.10	0.98	1.28	0	86	86	82	1.08	0.40	86	0.017	99	99	4.7	0.00	1.87		96.3	166.6	157.1	70.1	166.4	225	74	73	82	0.000	1.001	15.559	1500		
220	23.550	22.136	86.32539	0.11	0.10	0.98	1.27	0	86	86	82	1.08	0.40	86	0.017	99	99	4.8	-0.10	1.87		95.8	166.0	156.7	70.1	165.8	222	74	73	82	0.000	1.001	15.559	1492		
221	23.660	22.239	86.71778	0.11	0.10	0.98	1.27	0	86	86	82	1.07	0.40	86	0.017	99	99	4.8	0.00	1.87		95.3	165.5	156.1	70.1	165.4	219	74	73	82	0.000	1.001	15.559	1485		
222	23.770	22.342	87.11017	0.11	0.10	0.99	1.28	0	86	86	81	1.08	0.40	86	0.017	99	99	4.8	0.00	2.08		94.9	165.0	154.6	70.1	165.0	216	74	73	81	0.000	1.001	17.306	1644		
223	23.880	22.446	87.50256	0.11	0.10	0.99	1.27	0	86	86	81	1.07	0.40	86	0.017	99	99	4.7	0.10	2.06		94.3	164.4	153.9	70.0	164.3	212	73	73	81	0.000	1.001	17.140	1617		
224	23.990	22.549	87.89495	0.11	0.10	0.99	1.27	0	86	86	82	1.07	0.40	86	0.017	99	99	4.8	-0.10	2.05		93.8	164.0	153.6	70.0	163.8	209	73	73	82	0.000	1.001	17.057	1601		
225	24.100	22.652	88.28734	0.11	0.10	0.99	1.28	0	86	86	82	1.08	0.40	86	0.017	99	99	4.7	0.10	2.09		93.2	163.4	153.3	70.0	163.2	207	73	73	82	0.000	1.001	17.389	1622		
226	24.210	22.755	88.67972	0.11	0.10	0.98	1.27	0	86	86	82	1.08	0.40	86	0.017	99	99	4.7	0.00	2.03		92.8	162.9	152.7	70.0	162.7	204	73	73	82	0.000	1.001	16.890	1569		
227	24.320	22.859	89.07211	0.11	0.10	0.99	1.26	0	86	86	82	1.08	0.40	86	0.017	99	99	4.8	-0.10	2.12		92.3	162.4	152.3	70.0	162.2	201	73	72	82	0.000	1.001	17.639	1629		
228	24.430	22.962	89.4645	0.11	0.10	0.99	1.28	0	86	86	82	1.08	0.40	86	0.017	99	99	4.8	0.00	2.06		91.6	161.7	151.6	70.0	161.6	199	73	72	82	0.000	1.001	17.140	1572		
229	24.540	23.065	89.85689	0.11	0.10	0.98	1.27	0	86	86	82	1.08	0.40	86	0.017	99	99	4.8	0.00	2.06		91.1	161.3	151.3	70.0	161.0	196	73	72	82	0.000	1.001	17.140	1562		
230	24.650	23.169	90.24928	0.11	0.10	0.99	1.26	0	86	86	82	1.08	0.40</																							

Elapsed Time	Particulate Sampling Data																Fuel Weight, lb		Flow, gpm		Temperature Data, oF												Stack	Specific Heat of Inlet Water (BTU/lb-°F)	Mass Flow Rate of Inlet Water (lb/min)	Heat Output, Btu
	Gas Meter Cubic Feet (1)	Gas Meter Cubic Feet (2)	Gas Meter Cubic Feet (amb)	Sample Rate, cfm (1)	Sample Rate, cfm (2)	Orifice dH (1)	Orifice dH (2)	Orifice dH (amb)	Meter oF (1)	Meter oF (2)	Meter oF (amb)	Meter Vac. In. Hg. (1)	Meter Vac. In. Hg. (2)	Dilution Tunnel Temp.	Dilution Tunnel dP	Pro. Rate (%) (1)	Pro. Rate (%) (2)	Scale Reading	Weight Change	Load Side Liquid Flow Rate	Boiler Side Liquid Flow Rate (optional)	Thermopile ΔT	Boiler to Heat Exch. Temp.	Heat Exch to Boiler Temp.	Inlet Load Temp.	Outlet Load Temp.	Stack	Filter (1)	Filter (2)	Ambient	Draft In. H2O					
259	27.830	26.167	101.6285	0.11	0.10	0.99	1.27	0	86	86	82	1.08	0.40	84	0.017	99	99	4.9	0.00	2.28		76.4	146.0	137.0	69.3	145.7	146	73	72	82	0.000	1.001	18.972	1451		
260	27.940	26.271	102.0209	0.11	0.10	0.99	1.27	0	87	86	82	1.08	0.40	84	0.017	99	99	4.9	0.00	2.18		75.9	145.6	136.8	69.3	145.2	145	73	72	82	0.000	1.001	18.140	1378		
261	28.050	26.374	102.4133	0.11	0.10	0.99	1.28	0	86	86	82	1.08	0.40	84	0.017	99	99	4.8	0.10	2.30		75.4	145.0	135.8	69.3	144.7	144	73	72	82	0.000	1.001	19.139	1445		
262	28.160	26.478	102.8057	0.11	0.10	1.00	1.28	0	87	86	82	1.08	0.40	84	0.017	99	99	4.8	0.00	2.30		75.0	144.4	135.5	69.3	144.3	143	73	72	82	0.000	1.001	19.139	1438		
263	28.270	26.581	103.1981	0.11	0.10	0.99	1.27	0	87	86	82	1.08	0.40	84	0.017	99	99	4.9	-0.10	2.30		74.5	143.9	135.0	69.2	143.7	142	73	72	82	0.000	1.001	19.139	1427		
264	28.380	26.685	103.5905	0.11	0.10	0.99	1.28	0	87	86	82	1.08	0.4	84	0.017	99	99	4.8	0.10	2.30		74.0	143.5	134.7	69.3	143.3	141	73	72	82	0.000	1.001	19.139	1418		
265	28.490	26.788	103.9829	0.11	0.10	1	1.27	0	87	86	82	1.08	0.4	84	0.017	99	99	4.8	0.00	2.28		73.6	143.0	134.2	69.2	142.8	140	73	72	82	0.000	1.001	18.972	1397		
266	28.600	26.892	104.3753	0.11	0.10	1	1.28	0	87	86	82	1.08	0.4	84	0.017	99	99	4.9	-0.10	2.26		73.1	142.8	133.9	69.2	142.3	139	73	72	82	0.000	1.001	18.806	1376		
267	28.710	26.995	104.7676	0.11	0.10	0.99	1.28	0	87	86	82	1.08	0.4	84	0.017	99	99	4.8	0.10	2.26		72.6	142.2	133.4	69.2	141.8	139	73	72	82	0.000	1.001	18.806	1367		
268	28.820	27.099	105.16	0.11	0.10	0.99	1.27	0	87	86	82	1.08	0.4	84	0.017	99	99	4.8	0.00	2.26		72.2	141.8	133.1	69.2	141.4	138	73	72	82	0.000	1.001	18.806	1359		
269	28.930	27.202	105.5524	0.11	0.10	0.99	1.28	0	87	86	82	1.08	0.4	84	0.017	99	99	4.9	-0.10	2.30		71.7	141.2	132.6	69.2	140.9	137	73	73	82	0.000	1.001	19.139	1374		
270	29.040	27.306	105.9448	0.11	0.10	0.99	1.27	0	87	86	82	1.08	0.4	84	0.017	99	99	4.8	0.10	2.29		71.3	140.7	132.2	69.2	140.5	136	73	73	82	0.000	1.001	19.056	1360		
271	29.150	27.409	106.3372	0.11	0.10	0.99	1.27	0	87	86	81	1.08	0.4	84	0.017	99	99	4.9	-0.10	2.36		70.8	140.3	131.5	69.2	140.0	135	73	73	81	0.000	1.001	19.638	1391		
272	29.260	27.513	106.7296	0.11	0.10	0.99	1.27	0	87	86	82	1.08	0.4	84	0.017	99	99	4.9	0.00	2.41		70.2	139.8	131.0	69.3	139.5	135	73	73	82	0.000	1.001	20.054	1410		
273	29.370	27.616	107.122	0.11	0.10	0.99	1.27	0	87	86	81	1.08	0.4	84	0.017	99	99	4.9	0.00	2.38		69.8	139.4	130.7	69.3	139.2	134	73	73	81	0.000	1.001	19.804	1384		
274	29.480	27.719	107.5144	0.11	0.10	0.99	1.27	0	87	86	81	1.07	0.4	84	0.017	99	98	4.9	0.00	2.35		69.2	138.9	130.4	69.3	138.6	133	73	73	81	0.000	1.001	19.555	1355		
275	29.590	27.821	107.9067	0.11	0.10	0.99	1.28	0	86	86	81	1.08	0.4	84	0.017	99	98	4.8	0.10	2.37		68.8	138.5	130.0	69.3	138.1	132	73	73	81	0.000	1.001	19.721	1359		
276	29.700	27.923	108.2991	0.11	0.10	0.99	1.27	0	87	86	81	1.08	0.4	84	0.017	99	97	4.9	-0.10	2.92		68.2	138.1	127.9	69.2	137.4	131	73	73	81	0.000	1.001	24.298	1660		
277	29.810	28.023	108.6915	0.11	0.10	0.99	1.27	0	87	86	81	1.08	0.4	84	0.017	99	97	4.9	0.00	3.47		67.1	137.0	125.0	69.1	136.2	131	73	73	81	0.000	1.001	28.875	1938		
278	29.920	28.124	109.0839	0.11	0.10	0.99	1.28	0	87	86	81	1.08	0.4	84	0.017	99	96	4.8	0.10	3.47		66.5	136.5	124.5	69.0	135.5	130	73	73	81	0.000	1.001	28.876	1922		
279	30.030	28.224	109.4763	0.11	0.10	1	1.27	0	87	86	81	1.08	0.4	84	0.017	99	96	4.9	-0.10	3.27		65.8	135.7	124.4	68.9	134.8	129	73	73	81	0.000	1.001	27.212	1794		
280	30.140	28.323	109.8687	0.11	0.10	0.99	1.28	0	87	86	81	1.08	0.4	83	0.017	99	95	4.9	0.00	2.50		66.1	135.4	126.8	68.9	135.0	129	73	73	81	0.000	1.001	20.804	1377		
281	30.250	28.421	110.2611	0.11	0.10	0.99	1.28	0	87	86	81	1.08	0.4	88	0.017	99	95	4.8	0.10	2.48		65.7	134.9	126.4	68.9	134.6	145	73	73	81	0.000	1.001	20.638	1358		
282	30.360	28.519	110.6535	0.11	0.10	1	1.27	0	87	86	81	1.08	0.4	93	0.017	99	95	4.8	0.00	2.46		65.3	134.5	126.1	68.9	134.1	165	73	73	81	0.000	1.001	20.471	1338		
283	30.470	28.617	111.0458	0.11	0.10	0.97	1.22	0	87	86	82	1.09	0.4	96	0.017	100	94	4.8	0.00	2.50		64.8	134.2	125.5	68.9	133.7	174	73	73	82	0.000	1.001	20.804	1349		
284	30.570	28.714	111.4382	0.10	0.10	0.95	1.15	0	87	86	81	1.09	0.4	98	0.017	91	95	4.5	0.30	2.49		64.5	133.8	125.4	68.9	133.4	184	74	73	81	0.000	1.001	20.721	1338		
285	30.670	28.812	111.8306	0.10	0.10	0.94	1.15	0	87	86	82	1.09	0.4	101	0.017	91	95	4.4	0.10	2.51		64.1	133.4	125.1	68.9	132.9	194	74	73	82	0.000	1.001	20.887	1339		
286	30.770	28.909	112.223	0.10	0.10	0.95	1.16	0	87	86	82	1.09	0.4	103	0.017	91	95	4.2	0.20	2.48		63.7	133.0	124.8	68.9	132.6	204	74	74	82	0.000	1.001	20.638	1317		
287	30.870	29.007	112.6154	0.10	0.10	0.95	1.16	0	87	86	82	1.09	0.4	105	0.017	91	95	4.0	0.20	2.52		63.4	132.6	124.5	68.9	132.3	214	74	74	82	0.000	1.001	20.970	1330		
288	30.980	29.105	113.0078	0.11	0.10	0.94	1.16	0	87	86	81	1.09	0.4	107	0.017	101	95	3.8	0.20	2.50		63.0	132.5	124.2	69.0	132.0	225	74	74	81	0.000	1.001	20.804	1312		
289	31.090	29.202	113.4002	0.11	0.10	0.95	1.16	0	87	86	81	1.09	0.4	110	0.017	101	96	3.7	0.10	2.51		62.8	132.2	123.9	69.0	131.8	238	74	74	81	0.000	1.001	20.887	1313		
290	31.200	29.300	113.7926	0.11	0.10	0.95	1.17	0	87	86	82	1.09	0.4	113	0.017	101	96	3.4	0.30	2.53		62.7	132.1	124.0	69.1	131.7	251	74	74	82	0.000	1.001	21.053	1321		
291	31.310	29.397	114.185	0.11	0.10	0.95	1.17	0	87	86	81	1.09	0.4	116	0.017	101	96	3.3	0.10	2.48		62.4	132.0	123.9	69.1	131.6	265	74	74	81	0.000	1.001	20.637	1290		
292	31.420	29.494	114.5773	0.11	0.10	0.95	1.16	0	87	86	82	1.08	0.4	118	0.017	102	96	3.1	0.20	2.48		62.5	132.0	123.9	69.1	131.5	278	74	75	82	0.000	1.001	20.637	1290		
293	31.530	29.592	114.9697	0.11	0.10	0.95	1.15	0	87	86	82	1.09	0.4	121	0.017	102	96	2.8	0.30	2.51		62.4	131.8	123.7	69.1	131.4	292	75	75	82	0.000	1.001	20.887	1304		
294	31.640	29.689	115.3621	0.11	0.10	0.95	1.16	0	87	86	81	1.09	0.4	125	0.017	102	97	2.6	0.20	2.14		62.5	131.9	124.8	69.1	131.5	311	75	75	81	0.000	1.001	17.808	1114		
295	31.740	29.787	115.7545	0.10	0.10	0.95	1.15	0	87	86	81	1.08	0.4	128	0.017	93	97	2.3	0.30	2.17		62.7	132.2	125.0	69.1	131.8	323	75	75	81	0.000	1.001	18.057	1134		
296	31.840	29.884	116.1469	0.10	0.10	0.95	1.17	0	87	86	81	1.08	0.4	130	0.017	93	97	2.1	0.20	2.12		63.0	132.3	125.3	69.1	132.0	333	75	75	81	0.000	1.001	17.641	1112		
297	31.940	29.982	116.5393	0.10	0.10	0.94	1.16	0	87	86	81	1.08	0.4	132	0.017	94	98	1.8	0.30	2.18		63.2	132.5	125.5	69.1	132.2	339	75	75	81	0.000	1.001	18.141	1147		
298	32.050	30.0																																		

Page 1 of 1

200X OWHH Spreadsheet for report
4-63 of 4-66

[illegible]

Total Weight of Load (lb): 88.8

Total Moisture of Load (%): 21.7

Equipment Numbers:

340, 431, 353

* Not 7.0 lb of water lost from boiler during preburn. Loading weight adjusted accordingly

Run Notes

Client: HeatmorModel: 200XProject #: 0275WB011ETracking #: 1997Run #: 8Date: 10/6/14Test Crew: A. Kravitz, J. Clark, S. ButtonOMNI Equipment ID #(s): 428A, 428B, 356

PREBURN

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

PRIMARY:

Target Output: 25 - 49%

SECONDARY: N/ATERTIARY: N/AFAN: Auto

PREBURN SETTINGS AND ACTIVITIES

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

TEST

TEST FUEL CONFIGURATION SKETCH
(INDICATE VIEW ANGLE)

See fuel photographs

START UP PROCEDURES

BYPASS: N/AFUEL LOADING: Done @ 1:10DOOR: Closed @ 1:20PRIMARY AIR: Set @ 1:20OTHER: N/A

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

PRIMARY:

Target Output:

SECONDARY: N/ATERTIARY: N/AFAN: AutoTechnician signature: [Signature]Date: 10/6/14

Supplemental Data EPA 5G/5H

Client: Heatmor

Model: 200X

Project #: 0275WB011E

Tracking #: 1997

Date: 10/6/14 Run #: 6 Booth: E3

Test Crew: A. Krawitz, J. Clark, S. Botton Start Time: _____ Stop Time: _____

OMNI Equipment #(s): 132, wa, 410, 417, 419, 559, 513, 533

Stack Gas Leak Check:

Initial: Ø

Final: Ø

Dilution Tunnel Gas Leak Check (5H only):

Initial: N/A

Final: N/A

Calibrations: Span Gas CO₂: 16.80 O₂: N/A CO: 4.245 CO₂(DT): N/A

Mid Gas CO₂: 9.87 O₂: N/A CO: 2.493 CO₂(DT): N/A

Time	O ₂	CO ₂	CO	CO ₂ (DT)

Pre Test		
Zero	Span	Mid
10:20	10:22	10:24
N/A		
6.00	16.80	10.28
6.000	4.245	2.539
N/A		

Post Test		
Zero	Span	Mid
10:10	10:12	10:14
N/A		
0.23	16.91	10.25
0.011	4.243	2.488
N/A		

Air Velocity (ft/min): Initial: 250 Final: <50

Scale Audit (lbs): Initial: 10.0 Final: 10.0

Pitot Tube Leak Test: Initial: Ø Final: Ø

Stack Diameter (inches): 8

Induced Draft: Ø

% Smoke Capture: 100

Flue Pipe Cleaned Prior to First Test in Series:

Date: 9/23/14 Initials: AK

	Initial	Middle	Ending
P _b (in/Hg)	30.04	29.96	29.94
Ambient (°F)	76	80	81

Tunnel Traverse	
dP (in H ₂ O)	T(°F)
0.012	76
0.020	
0.022	
0.022	
0.018	
0.068	
0.010	
0.018	
0.022	
0.022	
0.018	
0.006	
Static P:	-0.26

Technician signature: AK

Date: 10/6/14

OMNI-Test Laboratories, Inc.

Manufacturer: Heatmor
Model: 200X
Date: 10/02/14
Run: 8
Control #: 0275WB011E
Test Duration: 304
Output Category: III

Technicians: A. Kravitz
S. Button

Test Results in Accordance with CSA B415.1-09

	HHV Basis	LHV Basis
Overall Efficiency	73.6%	79.3%
Combustion Efficiency	96.7%	96.7%
Heat Transfer Efficiency	76%	81.9%

Output Rate (kJ/h)	101,465	96,250	(Btu/h)
Burn Rate (kg/h)	6.93	15.28	(lb/h)
Input (kJ/h)	137,848	130,763	(Btu/h)

Test Load Weight (dry kg)	35.12	77.40	dry lb
MC wet (%)	17.83		
MC dry (%)	21.70		
Particulate (g)	0		
CO (g)	1,670		
Test Duration (h)	5.07		

Emissions	Particulate	CO
g/MJ Output	0.00	3.25
g/kg Dry Fuel	0.00	47.55
g/h	0.00	329.61
lb/MM Btu Output	0.00	7.55

Air/Fuel Ratio (A/F)	9.07
----------------------	------

VERSION:

2.3

3/23/2010

*Model: 200X
Heatmor
105 Industrial Park Ct. NE, P.O. Box 787
Warroad, MN 56763*

Section 5

Testing Results

Table 1A J Data Summary Part A

						θ	W_{fuel}	MC_{ave}	Q_{inLHV}	Q_{inHHV}	Q_{out}
Category	Run No	Load % Capacity	Target Load	Actual Load	Actual Load	Test Duration	Wood Weight as-fired	Wood Moisture	Heat Input (LHV)	Heat Input (HHV)	Heat Output
			Btu/hr	Btu/hr	% of max ¹	hrs	lb	% DB	Btu	Btu	Btu
II	6	16-24% of max	32,000-48,000	43952	22.0%	9.15	94.2	22.70	613242	660225	402159
II	7	16-24% of max	32,000-48,000	48678	24.3%	8.60	93.6	22.05	612579	659512	418630
III	8	25-50% of max	50,000-100,000	80128	40.1%	5.07	93.8	21.71	615638	662805	405982
IV	2	Max capacity	N/A	184459	92.2%	2.30	96.1	22.07	628872	677053	424256

¹ Percent of max based on manufacturer's rated capacity of 200,000 BTU/hr

Table 1B - Data Summary Part B

			T2 Min	E_T	E	E	E_g/hr	E_g/kg	η_{del}	η_{SLM}
Category	Run No	Load % Capacity	Min Return Water Temp.	Total PM Emissions	PM Output Based	PM Output Based	PM Rate	PM Factor	Delivered Efficiency (HHV)	Stack Loss Efficiency (HHV)
			°F	g	lb/MMBtu Out	g/MJ	g/hr	g/kg	%	%
II	6	< 15% of max	113.5	55.3	0.30	0.13	6.0	1.6	60.9	71.5
II	7	16-24% of max	123.6	64.0	0.34	0.14	7.4	1.8	63.5	73.8
III	8	25-50% of max	123.2	52.8	0.29	0.12	10.4	1.5	61.3	73.6
IV	2	Max capacity	121.6	33.4	0.17	0.07	14.5	0.9	62.7	72.1

Model: 200X
Heatmor
105 Industrial Park Ct. NE, P.O. Box 787
Warroad, MN 56763

Table 1C J Hang Tag Information

MANUFACTURER:	Heatmor		
MODEL NUMBER:	200X		
8-HOUR OUTPUT RATING:	$Q_{out-8hr}$	54019	Btu/hr
8-HOUR AVERAGE EFFICIENCY:	$\eta_{avg-8hr}$	63.1%	(Using higher heating value)
		67.9%	(Using lower heating value)
ANNUAL EFFICIENCY RATING:	η_{avg}	62.0%	(Using higher heating value)
		66.7%	(Using lower heating value)
PARTICLE EMISSIONS:	E_{avg}	8.1	GRAMS/HR (average)
		0.30	LBS/MILLION Btu OUTPUT

Table 2. Year Round Use Weighting

Category	Weighting Factor (F_i)	$\eta_{del,i} \times F_i$	$E_{g/MJ,i} \times F_i$	$E_{g/kg,i} \times F_i$	$E_{lb/MMBtu Out,i} \times F_i$	$E_{g/hr,i} \times F_i$
II	0.3375	20.6	0.04	0.52	0.10	2.00
II	0.3375	21.4	0.05	0.62	0.11	2.49
III	0.275	16.8	0.03	0.42	0.08	2.88
IV	0.05	3.1	0.00	0.05	0.01	0.73
Totals	1	62.0	0.13	1.6	0.30	8.1

TEST RESULTS AND DISCUSSION

A total of eight test runs were performed on the 200X boiler. Two test runs (tests 1 and 4) ended due to equipment failure and are not included in this report. Another two test runs (tests 3 and 5) ended due to ceased combustion prior to consumption of the full test load. Partial data from these runs is included as evidence that two attempts were made to run the unit at 15% or less of maximum capacity.

Four applicable test runs were conducted in the following categories based on the manufacturer's rated heat capacity: two in the 16-24% of capacity (category II); one in the 25-50% of capacity (category III); and one at the manufacturer's rated heat capacity (category IV). Emissions data from these runs was used to calculate all reported average values.

Weighting	Emissions (lb/mmbtu output)
Heating Season	0.29
Year-Round Use	0.30

The 200X furnace meets EPA's WHH Program Phase II emissions level of 0.32 lbs/mmbtu heat output. The 200X furnace qualifies for year-round use.

The average Btu/hr for 8-hour burn time was measured to be **54019 Btu/hr**. The average efficiency for 8-hour burn time was measured to be **63.1%**.

Section 6

Example Calculations

Equations and Sample Calculations – Wood-fired Hydronic Heater

Manufacturer: Heatmor
 Model: 200X
 Run: 6
 Category: I

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.

BR	Dry burn rate, kg/hr
m_n	Total particulate matter collected, mg
$V_{m(std)}$	Volume of gas sampled corrected to standard conditions, dscf
v_s	Average dilution tunnel gas velocity, ft/sec
C_s	Particulate concentration, g/dscf
Q_{sd}	Dilution tunnel gas flow rate, dscf/min
E	Particulate emission rate, lbs/hr
E_T	Total particulate emissions, grams
MC_{avg}	Average fuel load moisture content, %
PR	Proportional rate variation, %
Q_{in}	Heat input, Btu
Q_{out}	Heat output, Btu
	Heat output rate, Btu/hr
$E_{g/MJ}$	Emission rate, g/MJ
$E_{lb/MMBtu\ input}$	Emission rate, lb/MMBtu input
$E_{lb/MMBtu\ output}$	Emission rate, lb/MMBtu output
$E_{g/kg}$	Emission rate, g/kg
$E_{g/hr}$	Emission rate, g/hr
$E_{g/hr\ 10,000\ BTU}$	Emission rate, g/hr 10,000 Btu
η_{del}	Delivered efficiency, %
E_{avg}, η_{avg}	Weighted average emissions and efficiency, g/kg, %
	Average Btu/hr for 8 hour burn time, Btu/hr

BR – Dry Burn Rate, kg/hr

Using EPA Method 28 equation 28-3:

$$BR = \frac{60 \times W_{wd}}{\theta} \times \frac{100 - \%M_w}{100}$$

Where,

- BR = Dry burn rate, kg/hr
- W_{wd} = Mass of wood burned (wet basis) during test run, lb
- θ = Total time of test run, minutes
- $\%M_w$ = Average moisture content of test fuel charge, wet basis percent

Sample Calculation:

Using the equation 28-2 for converting dry basis moisture to wet basis moisture,

$$\%M_w = \frac{\%M_D \times 100}{\%M_D + 100}$$

$$\%M_w = \frac{22.70 \times 100}{22.70 + 100}$$

$$\%M_w = 18.50 \%$$

$$W_{wd} = 94.2 \text{ lbs}$$

$$W_{wd} = 94.2 \times 0.4536 \text{ kg/lb}$$

$$W_{wd} = 42.7 \text{ kg}$$

$$BR = \frac{60 \times 42.7}{549} \times \frac{100 - 18.50}{100}$$

$$BR = 3.81 \text{ kg/hr}$$

m_n – Total Particulate Matter Collected, mg

ASTM E2515 Equation (9)

$$m_n = m_p + m_f + m_g$$

Where:

- m_n = Total particulate matter collected, mg
- m_p = Particulate matter from probe, mg
- m_f = Particulate matter from filters, mg
- m_g = Particulate matter from filter seals, mg

Sample Calculation:

Using equation for Train 1:

$$m_n = \underline{0.5} + \underline{12.6} + \underline{1.1}$$

$$m_n = \underline{14.2} \text{ mg}$$

Using equation for Train 2:

$$m_n = \underline{0.7} + \underline{9.0} + \underline{3.1}$$

$$m_n = \underline{12.8} \text{ mg}$$

$V_{m(std)}$ – Volume of Gas Sampled Corrected to Dry Standard Conditions, dscf
 ASTM E2515 equation (4), EPA Method 5 equation 5-1

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

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_b = Barometric pressure at the testing site, in. Hg
- ΔH = Average pressure differential across the orifice meter, in. H₂O
- T_m = Absolute average dry gas meter temperature, °R

Sample Calculation:

Using equation for Train 1:

$$V_{m(std)} = \underline{57.054} \times \underline{1.01} \times 17.64 \times \frac{(\underline{30.29} + \underline{0.93})}{(\underline{76.27} + 460)}$$

$$V_{m(std)} = \underline{57.38} \text{ ft}^3$$

Using equation for Train 2:

$$V_{m(std)} = \underline{54.987} \times \underline{1.01} \times 17.64 \times \frac{(\underline{30.29} + \underline{1.22})}{(\underline{75.89} + 460)}$$

$$V_{m(std)} = \underline{55.65} \text{ ft}^3$$

Using equation for ambient train:

$$V_{m(std)} = \underline{213.05} \times \underline{0.99} \times 17.64 \times \frac{(\underline{30.29} + \underline{0.00})}{(\underline{70.5} + 460)}$$

$$V_{m(std)} = \underline{212.25} \text{ ft}^3$$

v_s – Dilution Tunnel Gas Velocity, ft/sec

ASTM E2515 equation (7), EPA Method 2 equations 2-6 and 2-7

$$v_s = F_p \times k_p \times C_p \times (\sqrt{\Delta P})_{avg} \times \sqrt{\frac{T_{s(avg)}}{P_s \times M_s}}$$

$$M_s = M_d \times (1 - B_{ws}) + 18.0 \times B_{ws}$$

Where:

- v_s = *Average dilution tunnel gas velocity, ft/sec
- k_p = Pitot tube constant: $85.49 \frac{ft}{sec} \left[\frac{(lb/lb-mole) \times (inchesHg)}{(R) \times (inchesH_2O)} \right]^{1/2}$
- F_p = **Adjustment factor for center of tunnel pitot tube placement:
 $v_{strav}/v_{scent} = \Delta P_{trav}/\Delta P_{cent}$
- v_{strav} = Dilution tunnel velocity calculated after the multi-point pitot traverse
- v_{scent} = Dilution tunnel velocity calculated after the multi-point pitot traverse at the center
- ΔP_{trav} = $(\sqrt{\Delta P})_{avg}$ calculated after the multi-point pitot traverse
- ΔP_{cent} = $\sqrt{\Delta P}$ measured at the center of the dilution tunnel during the multi-point pitot traverse
- C_p = Standard pitot tube coefficient: 0.99, unitless
- ΔP = Velocity pressure in the dilution tunnel, mm H₂O
- P_b = Barometric pressure at test site, in. Hg
- P_g = Static pressure of tunnel, in. Hg
- P_s = Absolute tunnel pressure, = $P_b + P_g$
- M_s = ***Molecular weight of tunnel gas (wet); assume $M_d=29$ lb/lb-mole (dry)
- B_{ws} = Moisture content of dilution tunnel gas, ratio; assume 2%
- T_s = Dilution tunnel temperature, °R; (°R = °F + 460)

Sample calculation:

$$M_s = 29 \times (1 - 0.02) + 18.0 \times 0.02 = 28.78$$

$$V_s = \frac{1}{1} \times 85.49 \times \frac{0.99}{1} \times \frac{0.142}{1} \times \left(\frac{\frac{95.365}{30.293} + \frac{460}{13.6}}{\frac{-0.26}{13.6}} \right)^{1/2} \times 28.78$$

$$V_s = \underline{9.62} \text{ ft/s}$$

*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.

** F_p is equal to 1 if the pitot tube is placed at $(\sqrt{\Delta P})_{avgtrav}$ after the initial traverse data is collected.

**The ASTM test standard mistakenly identifies M_s as the dry molecular weight. It should be the wet molecular weight as indicated in EPA Method 2.

C_s – Particulate Concentration, g/dscf

ASTM E2515 equation (10), EPA Method 5G equation 5G-2

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

Where:

K ₂	=	Constant, 0.001 g/mg
C _s	=	Concentration of particulate matter in stack gas, dry basis, corrected to standard conditions, g/dscf
m _n	=	Total mass of particulate matter collected in the sampling train, mg
V _{m(std)}	=	Volume of gas sampled corrected to dry standard conditions, dscf

Sample calculation:

For Train 1:

$$C_s = 0.001 \times \frac{14.2}{57.38}$$

$$C_s = \underline{0.000247} \text{ g/dscf}$$

For Train 2

$$C_s = 0.001 \times \frac{12.8}{55.65}$$

$$C_s = \underline{0.000230} \text{ g/dscf}$$

For Ambient Train

$$C_s = 0.001 \times \frac{0.6}{212.25}$$

$$C_s = \underline{0.000003} \text{ g/dscf}$$

Q_{sd} – Average Dilution Tunnel Gas Flow Rate, dscf/hr

ASTM equation (2), EPA Method 2 equation 2-8

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

Where:

Q _{sd}	=	Gas flow rate corrected to dry, standard conditions, dscf/hr
3600	=	Conversion from seconds to hours (ASTM method uses 60 to convert in minutes)
B _{ws}	=	Moisture content of dilution tunnel gas, ratio; assume 2%
v _s	=	Average dilution tunnel gas velocity, ft/sec
A	=	Cross sectional area of dilution tunnel, ft ²
T _{std}	=	Standard absolute temperature, 528 °R
T _{s(avg)}	=	Average absolute dilution tunnel temperature, °R, (°R = °F + 460)
P _b	=	Barometric pressure at test site, in. Hg
P _g	=	Dilution tunnel static pressure, in. Hg
P _s	=	Absolute dilution tunnel gas pressure, in Hg, (Hg = P _b + P _g)
P _{std}	=	Standard absolute pressure, 29.92 in Hg

Sample calculation:

$$Q_{sd} = 3600 \times (1 - 0.02) \times \underline{9.62} \times \underline{0.785} \times \frac{528}{\underline{95.37} + 460} \times \frac{\underline{30.293} + \frac{-0.26}{13.6}}{29.92}$$

$$Q_{sd} = \underline{25617.41} \text{ dscf/hr}$$

E, E_T – Particulate Emissions

ASTM E2515 equation (12) section, Test Method 28 WHH section 13.2

$$E_T = (c_s - c_r) \times Q_{std} \times \theta$$

Where:

E _T	=	Particulate emissions, g
C _s	=	Concentration of particulate matter in the stack, g/dscf
C _r	=	Concentration of ambient particulate matter, g/dscf
Q _{std}	=	Average dilution tunnel gas flow rate, dscf/hr
θ	=	Total time of test run, minutes

Sample calculation:

For Train 1

$$E_T = (0.000247 - 0.000003) \times 25617.41 \times 549 / 60$$

$$E_T = 57.35 \text{ g}$$

For Train 2

$$E_T = (0.000230 - 0.000003) \times 25617.4 \times 549 / 60$$

$$E_T = 53.25 \text{ g}$$

Average

$$E = 55.30 \text{ g}$$

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

$$7.5\% \text{ of the average} = 4.15$$

$$\text{Train 1 difference} = 2.05$$

$$\text{Train 2 difference} = 2.05$$

MC_{avg} – Average Fuel Load Moisture Content, %

Test Method 28 WHH section 13.3

$$MC_{avg} = \left[\left(\sum W_i \times MC_i \right) + \left(W_{sp} \times MC_{sp} \right) \right] \div W_{fuel}$$

Where:

- W_i = Weight of individual fuel pieces, lbs
- MC_i = Average moisture of individual fuel pieces, % dry
- W_{sp} = Weight of spacers, lbs (Total fuel weight - Total weight of individual pieces)
- MC_{sp} = Average moisture of spacers, 10% dry

Sample calculation:

$$MC_{avg} = (\underline{6.4} \times \underline{25.3} + \underline{6.4} \times \underline{24.2} + \underline{6.2} \times \underline{22.4} + \underline{6.6} \times \underline{24.8} + \underline{6.5} \times \underline{22.0} + \underline{6.7} \times \underline{24.0} + \underline{8.1} \times \underline{23.5} + \underline{7.4} \times \underline{22.1} + \underline{8.1} \times \underline{22.6} + \dots + (\underline{94.2} - \underline{88.8}) \times 10) / \underline{94.2}$$

$$MC_{avg} = \underline{22.7} \%$$

PR - Proportional Rate Variation

ASTM E2515 equation (13), EPA Method 5G equation 5G-5

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

Where:

θ = Time of test, min

θ_i = Time of interval, 1 min

V_{mi} = Volume of gas sample measured by the dry gas meter during the "ith" time interval, dscf

V_m = Volume of gas sample as measured by dry gas meter, dscf

V_{si} = Average gas velocity in the dilution tunnel during the "ith" time interval, m/sec

V_s = Average gas velocity in the dilution tunnel, m/sec

T_{mi} = Average dry gas meter temperature during the "ith" time interval, °R

T_m = Average dry gas meter temperature, °R

T_{si} = Average gas temperature in the dilution tunnel during the "ith" time interval, °R

T_s = Average gas temperature in the dilution tunnel, °R

Sample calculation (for the first 10 minute interval of Train 1):

$$PR = \left(\frac{549 \times 0.105 \times 9.615 \times (76.27 + 460) \times (152.0 + 460)}{1 \times 57.05 \times 10.09 \times (75.00 + 460) \times (95.4 + 460)} \right) \times 100$$

$$PR = 106.2 \%$$

Q_{in} – Heat Input, Btu

Test Method 28 WHH section 13.4

$$Q_{in} = (W_{fuel} / (1 + (MC / 100))) \times HV$$

Where:

W_{fuel} = Fuel charge weight, lbs

MC = Moisture content, %

HHV = Higher heating value, 8600 Btu/lb

LHV = Lower heating value, 7988 Btu/lb

Sample calculation:

For the Higher heating value

$$Q_{in} = (\underline{94.2} / (1 + (\underline{22.7} / 100))) \times 8600$$

$$Q_{in} = \underline{660225} \text{ Btu}$$

For the Lower heating value

$$Q_{in} = (\underline{94.2} / (1 + (\underline{22.7} / 100))) \times 7988$$

$$Q_{in} = \underline{613242} \text{ Btu}$$

Q_{out} – Heat Output, Btu

Test Method 28 WHH section 13.5.1

$$Q_{out} = \left| \sum (C_p \times \Delta T \times M \times t) \right| + (W_{app} \times C_{steel} + C_p \times W_{water}) \times (TF_{avg} - TI_{avg})$$

$$M = V_f \times \pm$$

$$\pm = (62.56 + (-0.0003413 \times T_{3i}) + (-0.00006225 \times T_{3i}^2)) \times 0.1337$$

$$C_p = 1.0014 + (-0.000003485 \times T_{3i})$$

Where:

C _p	=	*Heat capacity of water, Btu/lb-°F
C _{steel}	=	Heat capacity of steel, 0.1 Btu/lb-°F
ΔT	=	Load Side thermopile reading, °F
M	=	Mass flow rate of water, lb/min
t	=	Elapsed time, 1 min
W _{app}	=	Weight of appliance, lbs
W _{water}	=	Weight of water, lbs
TF _{avg}	=	Final average temperature of appliance and water, °F
TI _{avg}	=	Initial average temperature of appliance and water, °F
T _{avg}	=	Average temperature of water in the load side, °F
T _{3i}	=	Load inlet temperature at interval i, °F
V _f	=	Volumetric flow rate of water, gal/min
σ	=	Density of water, lb/gal

Sample calculation, For the first 1 minute period :

$$C_p = 1.0014 + (-0.000003485 \times \underline{69.05})$$

$$C_p = \underline{1.001} \text{ Btu/lb}^\circ\text{F}$$

$$\sigma = (62.56 + (-0.0003413 \times \underline{69.05}) + (-0.00006225 \times \underline{69.1}^2)) \times 0.1337$$

$$\sigma = \underline{8.32}$$

$$\left| \sum (C_p \times \Delta T \times M \times t) \right| = 1.001 \times \underline{67.74} \times \underline{1.30} \times \underline{8.32} \times 1$$

$$\left| \sum (C_p \times \Delta T \times M \times t) \right| = 734 \text{ Btu}$$

$$\left| \sum (C_p \times \Delta T \times M \times t) \right| = \underline{380063} \text{ Btu}$$

$$Q_{out} = \underline{380063} + (\underline{2752} \times 0.1 + \underline{1.001} \times \underline{2568}) \times (\underline{140.38} - \underline{137.18})$$

$$Q_{out} = \underline{389171} \text{ Btu}$$

Heat Output Rate, Btu/hr

Test Method 28 WHH section 13.5.2

$$\text{Heat output rate} = Q_{out} / \text{test duration}$$

Sample calculation:

$$\text{Heat output rate} = \frac{389170.9}{(549 / 60)}$$

$$\text{Heat output rate} = \frac{42532}{\text{Btu/hr}}$$

Emission Rates, g/MJ, lb/MMBTU, g/kg, g/hr

Test Method 28 WHH section 13.5.3

$$E_{g/MJ} = E_T / (Q_{out} \times 0.001055)$$

$$E_{lb/MMBtu\ input} = (E_T / 453.59) / (Q_{input} \times 10^{-6})$$

$$E_{lb/MMBtu\ output} = (E_T / 453.59) / (Q_{output} \times 10^{-6})$$

$$E_{g/kg} = E_T / (W_{fuel} / (1 + MC / 100))$$

$$E_{g/hr} = E_T / \text{Test Duration}$$

$$E_{g/hr\ 10,000Btu} = \frac{E_T}{(\text{Test Duration} \times (Q_{out} / 10,000))}$$

Sample calculation:

$$E_{g/MJ} = 55.30 / (389171 \times 0.001055)$$

$$E_{g/MJ} = 0.135\ g/MJ$$

Using higher heat value

$$E_{lb/MMBtu\ input} = (55.30 / 453.59) / (660225 \times 10^{-6})$$

$$E_{lb/MMBtu\ input} = 0.185\ lb/MMBtu\ input$$

Using lower heat value

$$E_{lb/MMBtu\ input} = (55.30 / 453.59) / (613242 \times 10^{-6})$$

$$E_{lb/MMBtu\ input} = 0.199\ lb/MMBtu\ input$$

$$E_{lb/MMBtu\ output} = (55.30 / 453.59) / (402159 \times 10^{-6})$$

$$E_{lb/MMBtu\ output} = 0.303\ lb/MMBtu\ output$$

$$E_{g/kg} = 55.30 / ((94.2 \times 0.4536) / (1 + 22.7 / 100))$$

$$E_{g/kg} = 1.588\ g/kg$$

$$E_{g/hr} = 55.30 / (549 / 60)$$

$$E_{g/hr} = 6.043\ g/hr$$

$$E_{g/hr\ 10,000\ Btu} = \frac{55.30}{((549 / 60) \times (402159 / 10,000))}$$

$$E_{g/hr\ 10,000\ Btu} = 0.15\ g/hr\ 10,000\ Btu$$

η_{del} – Delivered Efficiency, %

Test Method 28 WHH section 13.5.4

$$\eta_{del} = (Q_{out} / Q_{in}) \times 100$$

$$\eta_{delLHV} = (Q_{out} / Q_{inLHV}) \times 100$$

Sample calculation:

$$\eta_{del} = (\underline{402159} / \underline{660225}) \times 100$$

$$\eta_{del} = \underline{60.91} \%$$

$$\eta_{delLHV} = (\underline{402159} / \underline{613242}) \times 100$$

$$\eta_{delLHV} = \underline{65.58} \%$$

E_{avg}, η_{avg} – Weighted Average Emissions and Efficiency, g/kg, %
Test Method 28 WHH section 13.6.1

$$E_{avg} = \sum E_i \times F_i$$

$$\eta_{avg} = \sum \eta_i \times F_i$$

Sample calculation for emissions (g/kg) seasonal use and lower heating value:

$$E_{avg} = \frac{1.59}{1000} \times 0.175 + \frac{1.84}{1000} \times 0.275 + \frac{1.51}{1000} \times 0.450 + \frac{0.94}{1000} \times 0.100$$

$$E_{avg} = \frac{1.6}{1000} \text{ g/kg}$$

Sample calculation for efficiency year round use and high heating value:

$$\eta_{avg} = \frac{60.91}{100} \times 0.437 + \frac{63.48}{100} \times 0.238 + \frac{61.25}{100} \times 0.275 + \frac{62.66}{100} \times 0.050$$

$$\eta_{avg} = \frac{61.7}{100} \%$$

Average Btu/hr for 8 Hour Burn Time, Btu/hr

Test Method 28 WHH section 13.7.2

$$\frac{Btu}{hr} = X1 + \{(8 - Y1) \times [(X2 - X1) / (Y2 - Y1)]\}$$

Where:

- Y1 = Test duration just above 8 hours
- Y2 = Test duration just below 8 hours
- X1 = Actual load for duration Y1
- X2 = Actual load for duration Y2

Sample calculation:

$$Btu/hr = 48678 + \{(8 - 8.6) \times [(80128 - 48678) / (5.06667 - 8.6)]\}$$

$$Btu/hr = 54019 \text{ for 8 hour burn time}$$