

Certification Test Report

Heatmor Wood Fired Hydronic Heater Model: 350X

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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Portland, OR 97230
(503) 643-3788

Test Period: 10/8/14 – 11/7/14

Report Date: December 2014

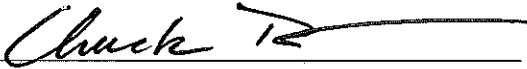
Report Number: 0275WB011E.AD01

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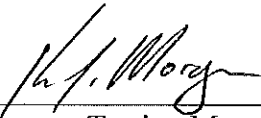
Model: 350X
Heatmor
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AUTHORIZED SIGNATORIES

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



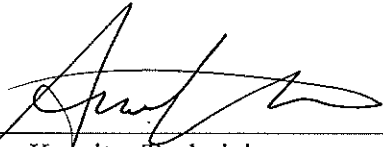
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Section 1

Introduction/Appliance Description/Photographs/Drawings

INTRODUCTION

Heatmor retained OMNI-Test Laboratories, Inc. (*OMNI*) to perform certification emissions testing on the 350X boiler using the EPA Method 28-WHH Test Standard. The 350X furnace meets EPA's WHH Program Phase II emissions level of 0.32 lbs/mmbtu heat output. The 350X furnace qualifies for year-round use.

Emissions (lb/mmbtu output)	
Heating Season	0.28
Year-Round Use	0.31

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 #2011 *OMNI* representatives Jeremy Clark and Aaron Kravitz conducted the certification testing and completed all testing by November 7, 2014.

The catalytic unit was conditioned for 50 hours prior to testing by operating it at a Category II heat output rate.

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

This test report shall not be reproduced, except in full, without written approval from *OMNI*. The test results presented herein apply only to the specific appliance tested.

APPLIANCE DESCRIPTION

The 350X 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 350X 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 350X 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 350X is approximately 36" deep, 31" wide, and 27" high. Firebox intrusions including spacer bars and air supply box shrouds reduce usable firebox volume considerably. This volume is 13.72 ft³. The dry weight of the unit is 3159 lb and the approximate capacity of the water jacket is 260 gallons.

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Heatmor
350X
Test Dates: 10/8/14 – 11/7/14

Appliance Front



Appliance Right Side



Appliance Rear



Appliance Left Side



Run 1 Fuel



Run 1 Fuel Loaded



Run 2 Fuel



Run 2 Fuel Loaded



Run 3 Fuel



Run 3 Fuel Loaded



Run 4 Fuel

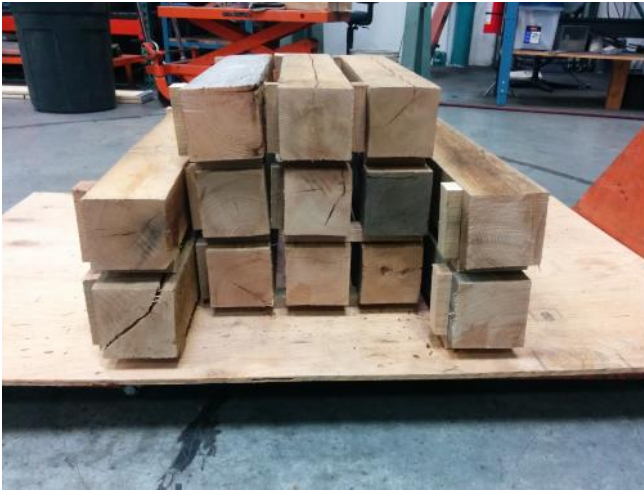


Run 4 Fuel Loaded



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Run 5 Fuel



Run 5 Fuel Loaded



*Model: 350X
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Manufacturer Design Drawings

CONFIDENTIAL

Model: 350X
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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 350X 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: 350X
Heatmor
105 Industrial Park Ct. NE, P.O. Box 787
Warroad, MN 56763

Sample Analysis

Analysis Worksheets

Tared Filter and Probe Data

Hydronic Heating Appliances - Test Method 28 WHH Results

Manufacturer: Heatmor
 Model: 350X
 Tracking No.: 2011
 Project No.: 0275WB011E.AD01
 Run #: 1
 Date: 10/8/14

Equipment Numbers: _____

TRAIN 1

Sample Component	Reagent	Filter, Probe or Dish #	Weights		
			Final, mg	Tare, mg	Particulate, mg
A. Front filter catch	Filter	274,78,83,86,8	569.4	554.6	14.8
B. Rear filter catch	Filter	B275, 79, 87	337.5	329.9	7.6
C. Probe catch*	Probe	35/53	237257.8	237257.5	0.3
D. Filter seals catch*	Seals	R199/R201	6702.5	6701.3	1.2

Total Particulate, mg:	23.9
------------------------	------

TRAIN 2

Sample Component	Reagent	Filter, Probe or Dish #	Weights		
			Final, mg	Tare, mg	Particulate, mg
A. Front filter catch	Filter	276,80,84,85,8	570.1	555.0	15.1
B. Rear filter catch	Filter	B277, 82	225.5	221.7	3.8
C. Probe catch*	Probe	38/66	237317.0	237316.0	1.0
D. Filter seals catch*	Seals	R200/202	7512.8	7511.4	1.4

Total Particulate, mg:	21.3
------------------------	------

AMBIENT

Sample Component	Reagent	Filter # or Probe #	Weights		
			Final, mg	Tare, mg	Particulate, mg
A. Front filter catch*	Filter	B281	115.4	110.0	5.4

Total Particulate, mg:	5.4
------------------------	-----

*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: 350X
 Tracking No.: 2011
 Project No.: 0275WB011E.AD01
 Run #: 2
 Date: 10/8/14

Equipment Numbers: _____

TRAIN 1

Sample Component	Reagent	Filter, Probe or Dish #	Weights		
			Final, mg	Tare, mg	Particulate, mg
A. Front filter catch	Filter	B290, B297	229.6	218.9	10.7
B. Rear filter catch	Filter	B291, B298	223.3	220.9	2.4
C. Probe catch*	Probe	68, OES 4	227297.1	227296.3	0.8
D. Filter seals catch*	Seals	R203, R205	6684.9	6684.6	0.3

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	B292, 95, 99	342.7	331.7	11.0
B. Rear filter catch	Filter	B293, B296	221.6	219.2	2.4
C. Probe catch*	Probe	69, OES 5	236631.0	236629.9	1.1
D. Filter seals catch*	Seals	R204, R206	7497.6	7495.6	2.0

Total Particulate, mg:	16.5
------------------------	------

AMBIENT

Sample Component	Reagent	Filter # or Probe #	Weights		
			Final, mg	Tare, mg	Particulate, mg
A. Front filter catch*	Filter	B294	110.3	109.7	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: 350X
 Tracking No.: 2011
 Project No.: 0275WB011E.AD01
 Run #: 3
 Date: 10/9/14

Equipment Numbers: _____

TRAIN 1

Sample Component	Reagent	Filter, Probe or Dish #	Weights		
			Final, mg	Tare, mg	Particulate, mg
A. Front filter catch	Filter	300, 05, 07, 0	455.9	439.3	16.6
B. Rear filter catch	Filter	B301	112.7	111.1	1.6
C. Probe catch*	Probe	8	115595.7	115594.3	1.4
D. Filter seals catch*	Seals	R207	3287.9	3287.8	0.1

Total Particulate, mg:	19.7
------------------------	------

TRAIN 2

Sample Component	Reagent	Filter, Probe or Dish #	Weights		
			Final, mg	Tare, mg	Particulate, mg
A. Front filter catch	Filter	B302, 06, 08	344.8	328.0	16.8
B. Rear filter catch	Filter	B303	109.2	109.0	0.2
C. Probe catch*	Probe	9	115692.7	115691.9	0.8
D. Filter seals catch*	Seals	R208	3426.6	3425.2	1.4

Total Particulate, mg:	19.2
------------------------	------

AMBIENT

Sample Component	Reagent	Filter # or Probe #	Weights		
			Final, mg	Tare, mg	Particulate, mg
A. Front filter catch*	Filter	B304	112.2	111.0	1.2

Total Particulate, mg:	1.2
------------------------	-----

*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: 350X
 Tracking No.: 2011
 Project No.: 0275WB011E.AD01
 Run #: 4
 Date: 10/10/14

Equipment Numbers: _____

TRAIN 1

Sample Component	Reagent	Filter, Probe or Dish #	Weights		
			Final, mg	Tare, mg	Particulate, mg
A. Front filter catch	Filter	310, 15, 17, 1	456.7	439.5	17.2
B. Rear filter catch	Filter	B311	109.9	109.1	0.8
C. Probe catch*	Probe	11	114181.7	114181.3	0.4
D. Filter seals catch*	Seals	R209	3340.8	3340.8	0.0

Total Particulate, mg:	18.4
------------------------	------

TRAIN 2

Sample Component	Reagent	Filter, Probe or Dish #	Weights		
			Final, mg	Tare, mg	Particulate, mg
A. Front filter catch	Filter	B312, 16, 19	346.4	330.7	15.7
B. Rear filter catch	Filter	B313	112.5	111.2	1.3
C. Probe catch*	Probe	21	114392.9	114392.4	0.5
D. Filter seals catch*	Seals	R210	3540.6	3540.5	0.1

Total Particulate, mg:	17.6
------------------------	------

AMBIENT

Sample Component	Reagent	Filter # or Probe #	Weights		
			Final, mg	Tare, mg	Particulate, mg
A. Front filter catch*	Filter	B314	111.5	109.4	2.1

Total Particulate, mg:	2.1
------------------------	-----

*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: 350X
 Tracking No.: 2011
 Project No.: 0275WB011E.AD01
 Run #: 5
 Date: 11/7/14

Equipment Numbers: _____

TRAIN 1

Sample Component	Reagent	Filter, Probe or Dish #	Weights		
			Final, mg	Tare, mg	Particulate, mg
A. Front filter catch	Filter	2,B404,B407,B	709.3	702.3	7.0
B. Rear filter catch	Filter	398,B406,B41	356.3	353.5	2.8
C. Probe catch*	Probe	35	114329.5	114329.8	0.0
D. Filter seals catch*	Seals	R237	3369.3	3369.2	0.1

Total Particulate, mg:	9.9
------------------------	-----

TRAIN 2

Sample Component	Reagent	Filter, Probe or Dish #	Weights		
			Final, mg	Tare, mg	Particulate, mg
A. Front filter catch	Filter	3,B405,B409,B	720.5	713.7	6.8
B. Rear filter catch	Filter	0,B408,B412,B	470.5	468.8	1.7
C. Probe catch*	Probe	56	123087.2	123087.6	0.0
D. Filter seals catch*	Seals	R238	3312.9	3312.6	0.3

Total Particulate, mg:	8.8
------------------------	-----

AMBIENT

Sample Component	Reagent	Filter # or Probe #	Weights		
			Final, mg	Tare, mg	Particulate, mg
A. Front filter catch*	Filter	B401	116.8	116.2	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: _____

Method 28 Hydronic Heater Run Sheets

Client: Heatmor Project Number: 0275WH011E.AD01 Run Number: 1
 Model: 350x Tracking Number: 2011 Date: 10/8/14
 Test Crew: A. Kravitz, J. Clark
 OMNI Equipment ID numbers: : 428A, 428B, 132, 209, 410, 417, 419, 513, 533, 559, 296-T55, 340, 353, 431, 23, 131, 343

ASTM E2515 Lab Sheet

Train: A
 Assembled By: A. Kravitz

Train Element	ID #	Tare Weight (mg)	D/T In Dessicator	Preliminary Weight (mg)
Front Filter	B274/B278	113.4, 138.2, 110.8, 111.3, 110.9	10/8/14 1430	N/A
Rear Filter	B275/B279	107.2, 113.2, 109.5		
Probe	35/53	114330.5, 122927.0		
O-Ring Set	R199/R201	3366.8, 3334.5		

Date: 10/12/14 Time: 1245 RH (%): 16.8
 Temp (F): 75.6 Audit: 0.5001 Initials: A

Element #	Weight (mg)
274 at a1	569.4
275 at a1	337.6
R199/201	6703.1
35/53	114330.5 / 122927.3

Date: _____ Time: _____ RH (%): _____
 Temp (F): _____ Audit: _____ Initials: _____

Element #	Weight (mg)

Date: 10/13/14 Time: 0830 RH (%): 17.1
 Temp (F): 73.2 Audit: 0.5001 Initials: A

Element #	Weight (mg)
274 at a1	569.4
275 at a1	337.6
R199/201	6702.7
35/53	114330.6 / 122927.2

Date: _____ Time: _____ RH (%): _____
 Temp (F): _____ Audit: _____ Initials: _____

Element #	Weight (mg)

Date: 10/15/14 Time: 1230 RH (%): 14.9
 Temp (F): 72.7 Audit: 0.5001 Initials: A

Element #	Weight (mg)
R199/201	6702.5

Date: _____ Time: _____ RH (%): _____
 Temp (F): _____ Audit: _____ Initials: _____

Element #	Weight (mg)

Technician Signature: [Signature]
 Control No. P-SFDJ-0001, Effective Date: 10/8/2014

Date: 10/16/14

Method 28 Hydronic Heater Run Sheets

Client: **Heatmor**Project Number: **0275WH011E.AD01** Run Number: **1**Model: **350x**Tracking Number: **2011**Date: **10/8/14**Test Crew: **A. Kravitz, J. Clark**

OMNI Equipment ID numbers: 428A, 428B, 132, 209, 410, 417, 419, 513, 533, 559, 296-T55, 340, 353, 431, 23, 131, 343

ASTM E2515 Lab Sheet

Train: **B**Assembled By: **A. Kravitz**

Train Element	ID #	Tare Weight (mg)	D/T In Dessicator	Preliminary Weight (mg)
Front Filter	B276 / B280	112.8, 114.0, 109.6, 109.6, 109.0	10/8/14 1430	N/A
Rear Filter	B277 / B282	112.9, 108.4	↓	↓
Probe	38 / 66	114151.9, 123164.1	↓	↓
O-Ring Set	R200 / R202	4150.9, 3360.5	↓	↓

Date: **10/12/14** Time: **1245** RH (%): **16.8**
 Temp (F): **75.6** Audit: **0.5001** Initials: **A**

Element #	Weight (mg)
B276 et al	571.2
B277 et al	225.7
R200/R202	7513.6
38/66	114151.9 / 123165.1

Date: _____ Time: _____ RH (%): _____
 Temp (F): _____ Audit: _____ Initials: _____

Element #	Weight (mg)

Date: **10/13/14** Time: **0830** RH (%): **17.1**
 Temp (F): **73.2** Audit: **0.5001** Initials: **A**

Element #	Weight (mg)
B276 et al	570.2
B277 et al	225.5
R200/R202	7513.0
38/66	114152.0 / 123165.0

Date: _____ Time: _____ RH (%): _____
 Temp (F): _____ Audit: _____ Initials: _____

Element #	Weight (mg)

Date: **10/16/14** Time: **1230** RH (%): **14.9**
 Temp (F): **72.3** Audit: **0.5001** Initials: **A**

Element #	Weight (mg)
B276 et al	570.1
R200/R202	7512.8

Date: _____ Time: _____ RH (%): _____
 Temp (F): _____ Audit: _____ Initials: _____

Element #	Weight (mg)

Technician Signature: **A. Kravitz**

Control No. P-SFDJ-0001, Effective Date: 10/8/2014

Date: **10/16/14**

Method 28 Hydronic Heater Run Sheets

Client: **Heatmor**Project Number: **0275WH011E.AD01** Run Number: **1**Model: **350x**Tracking Number: **2011**Date: **10/8/14**Test Crew: **A. Kravitz, J. Clark**

OMNI Equipment ID numbers: : 428A, 428B, 132, 209, 410, 417, 419, 513, 533, 559, 296-T55, 340, 353, 431, 23, 131, 343

ASTM E2515 Background Lab Sheet

Train: **Background**Assembled By: **A. Kravitz**Background Sample Volume (ft³): **53.235**

Train Element	ID #	Tare Weight (mg)	D/T In Dessicator	Preliminary Weight (mg)
Front Filter	B281	110.0	10/8/14	N/A

Date: **10/12/14** Time: **12:45** RH (%): **16.8**
Temp (F): **75.1** Audit: **0.5001** Initials: **A**

Element #	Weight (mg)
B281	115.5

Date: **10/13/14** Time: **0830** RH (%): **17.1**
Temp (F): **73.2** Audit: **0.5001** Initials: **A**

Element #	Weight (mg)
B281	115.4

Date: _____ Time: _____ RH (%): _____
Temp (F): _____ Audit: _____ Initials: _____

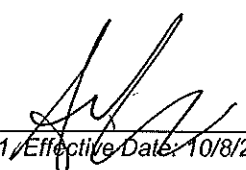
Element #	Weight (mg)

Date: _____ Time: _____ RH (%): _____
Temp (F): _____ Audit: _____ Initials: _____

Element #	Weight (mg)

Date: _____ Time: _____ RH (%): _____
Temp (F): _____ Audit: _____ Initials: _____

Element #	Weight (mg)

Technician Signature: 
Control No. P-SFDJ-0001 Effective Date: 10/8/2014Date: **10/13/14**

Method 28 Hydronic Heater Run Sheets

Client: **Heatmor**Project Number: **0275WH011E.AD01** Run Number: **2**Model: **350x**Tracking Number: **2011**Date: **10/8/14**Test Crew: **A. Kravitz, J. Clark**

OMNI Equipment ID numbers: : 428A, 428B, 132, 209, 410, 417, 419, 513, 533, 559, 296-T55, 340, 353, 431, 23, 131, 343

ASTM E2515 Lab Sheet

Train: **A**Assembled By: **A. Kravitz**

Train Element	ID #	Tare Weight (mg)	D/T In Dessicator	Preliminary Weight (mg)
Front Filter	B2A0, B2A7	109.6, 109.3	10/8/14 2315	N/A
Rear Filter	B2A1, B2A8	109.6, 111.3	↓	↓
Probe	68, OES 4	112439.3, 114857.0	↓	↓
O-Ring Set	R203, R205	3370.3, 3314.3	↓	↓

Date: **10/13/14** Time: **0845** RH (%): **12.3**
 Temp (F): **75.9** Audit: **05001** Initials: **A**

Element #	Weight (mg)
~~B2A0 et al~~	~~230.4~~
~~B2A1 et al~~	~~223.9~~
68/OES 4	112440.3/114857.0
R203/205	6685.1

Date: **10/16/14** Time: **1230** RH (%): **17.8**
 Temp (F): **73.0** Audit: **5001** Initials: **A**

Element #	Weight (mg)
~~B2A0 et al~~	~~230.5~~
~~B2A1 et al~~	~~224.0~~
68/OES 4	112440.1/114857.0
R203/205	6684.9

Date: _____ Time: _____ RH (%): _____
 Temp (F): _____ Audit: _____ Initials: _____

Element #	Weight (mg)

Date: _____ Time: _____ RH (%): _____
 Temp (F): _____ Audit: _____ Initials: _____

Element #	Weight (mg)

Date: _____ Time: _____ RH (%): _____
 Temp (F): _____ Audit: _____ Initials: _____

Element #	Weight (mg)

Date: _____ Time: _____ RH (%): _____
 Temp (F): _____ Audit: _____ Initials: _____

Element #	Weight (mg)

Technician Signature: _____

Control No. P-SFDJ-0001, Effective Date: 10/8/2014

Date: **10/16/14**

Page 4 of 5

Method 28 Hydronic Heater Run Sheets

Client: **Heatmor**Project Number: **0275WH011E.AD01** Run Number: **2**Model: **350x**Tracking Number: **2011**Date: **10/8/14**Test Crew: **A. Kravitz, J. Clark**

OMNI Equipment ID numbers: : 428A, 428B, 132, 209, 410, 417, 419, 513, 533, 559, 296-T55, 340, 353, 431, 23, 131, 343

ASTM E2515 Lab Sheet

Train: **B**Assembled By: **A. Kravitz**

Train Element	ID #	Tare Weight (mg)	D/T In Dessicator	Preliminary Weight (mg)
Front Filter	B292, B295, B299	110.6, 111.2, 109.9	10/8/14 2315	N/A
Rear Filter	B293, B296	109.4, 109.8		
Probe	69, 5 [OES]	123080.5, 113549.4		
O-Ring Set	R204, R206	4155.5, 3340.1		

Date: **10/13/14** Time: **0845** RH (%): **12.3**Temp (F): **75.9** Audit: **0.5001** Initials: **A**

Element #	Weight (mg)
~~B292~~ <i>at al</i>	~~243.8~~
~~B293~~ <i>at al</i>	~~222.6~~
69 / OES 5	123081.2 / 113549.4
R204 / 206	7497.6

Date: **10/16/14** Time: **1230** RH (%): **17.8**Temp (F): **72.0** Audit: **0.5001** Initials: **A**

Element #	Weight (mg)
~~B292~~ <i>at al</i>	~~343.9~~
~~B293~~ <i>at al</i>	~~222.7~~
69 / OES 5	123081.5 / 113549.5
R204 / 206	7497.6

Date: _____ Time: _____ RH (%): _____

Temp (F): _____ Audit: _____ Initials: _____

Element #	Weight (mg)

Date: _____ Time: _____ RH (%): _____

Temp (F): _____ Audit: _____ Initials: _____

Element #	Weight (mg)

Date: _____ Time: _____ RH (%): _____

Temp (F): _____ Audit: _____ Initials: _____

Element #	Weight (mg)

Date: _____ Time: _____ RH (%): _____

Temp (F): _____ Audit: _____ Initials: _____

Element #	Weight (mg)

Technician Signature: _____

Control No. P-SFDJ-0001, Effective Date: 10/8/2014

Date: **10/16/14**

Page 5 of 5

Method 28 Hydronic Heater Run Sheets

Client: Heatmor Project Number: 0275WH011E,AD01 Run Number: 2
 Model: 350x Tracking Number: 2011 Date: 16/8/14
 Test Crew: A. Kravitz, J. Clark
 OMNI Equipment ID numbers: : 428A, 428B, 132, 209, 410, 417, 419, 513, 533, 559, 296-T55, 340, 353, 431, 23, 131, 343

ASTM E2515 Background Lab Sheet

Train: Background Assembled By: A. KravitzBackground Sample Volume (ft³): 128.939

Train Element	ID #	Tare Weight (mg)	D/T In Dessicator	Preliminary Weight (mg)
Front Filter	B294	109.7	10/8/14 2315	N/A

Date: 10/13/14 Time: 0845 RH (%): 12.3Temp (F): 75.9 Audit: 0.5001 Initials: A

Element #	Weight (mg)
B294	111.1

Date: 10/16/14 Time: 1230 RH (%): 17.8Temp (F): 73.0 Audit: .5001 Initials: A

Element #	Weight (mg)
~~B294~~	~~111.1~~

Date: _____ Time: _____ RH (%): _____

Temp (F): _____ Audit: _____ Initials: _____

Element #	Weight (mg)

Date: _____ Time: _____ RH (%): _____

Temp (F): _____ Audit: _____ Initials: _____

Element #	Weight (mg)

Date: _____ Time: _____ RH (%): _____

Temp (F): _____ Audit: _____ Initials: _____

Element #	Weight (mg)

Technician Signature: [Signature]
 Control No. P-SFDJ-0001, Effective Date: 10/8/2014

Date: 10/16/14

Method 28 Hydronic Heater Run Sheets

Client: HeatmorProject Number: 0275W001/E. AD01 Run Number: 2Model: 350XTracking Number: 2011Date: 10/8/14Test Crew: AU, JC

OMNI Equipment ID numbers: _____

ASTM E2515 Lab Sheet

Assembled By: _____

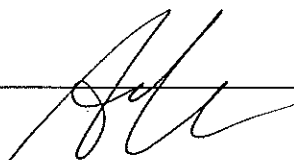
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Date/Time In Dessicator: _____

11/26/14 0800

				Weighing #1	Weighing #2	Weighing #3	Weighing #4	Weighing #5
				Date:	Date:	Date:	Date:	Date:
				12/1/14	12/2/14			
				Time:	Time:	Time:	Time:	Time:
				0930	0800			
				R/H %:	R/H %:	R/H %:	R/H %:	R/H %:
				1.3	1.0			
				Temp:	Temp:	Temp:	Temp:	Temp:
				73.4	74.3			
				Audit:	Audit:	Audit:	Audit:	Audit:
				500.1	500.1			
				Initials:	Initials:	Initials:	Initials:	Initials:
				A	A			
Train	Element	ID #	Tare (mg)	Weight (mg)	Weight (mg)	Weight (mg)	Weight (mg)	Weight (mg)
A	F	B290	109.6	118.6	118.6			
A	R	B291	109.6	111.0	111.0			
B	F	B292	110.6	112.9	112.8			
B	R	B293	109.4	111.1	111.1			
B6	F	B294	109.7	110.3	110.3			
B	F	B295	111.2	112.7	112.8			
B	R	B296	109.8	110.5	110.5			
A	F	B297	109.3	111.1	111.0			
A	R	B298	111.3	112.2	112.3			
B	F	B299	109.9	117.1	117.1			

Technician Signature: _____

Date: 12/2/14

Method 28 Hydronic Heater Run Sheets

Client: **Heatmor**Project Number: **0275WH011E.AD01** Run Number: **3**Model: **350x**Tracking Number: **2011**Date: **10/9/14**Test Crew: **A. Kravitz, J. Clark**

OMNI Equipment ID numbers: ; 428A, 428B, 132, 209, 410, 417, 419, 513, 533, 559, 296-T55, 340, 353, 431, 23, 131, 343

ASTM E2515 Lab Sheet

Train: **A**Assembled By: **A. Kravitz**

Train Element	ID #	Tare Weight (mg)	D/T In Dessicator	Preliminary Weight (mg)
Front Filter	B300, 305, 307, 309	109.1, 109.6, 111.5, 109.1	10/9/14	N/A
Rear Filter	B301	111.1	↓	↓
Probe	8	115544.3		
O-Ring Set	R207	3287.9	↓	↓

Date: **10/13/14** Time: **0815** RH (%): **12.3**
 Temp (F): **75.9** Audit: **0.5001** Initials: **A**

Element #	Weight (mg)
~~B300~~ at wt	~~456.4~~
~~B301~~	~~112.2~~
8	115545.6
R207	3288.1

Date: **10/16/14** Time: **1230** RH (%): **17.8**
 Temp (F): **73.0** Audit: **.5001** Initials: **A**

Element #	Weight (mg)
~~B300~~ at wt	~~456.5~~
~~B301~~	~~112.1~~
8	115545.7
R207	3287.9

Date: _____ Time: _____ RH (%): _____
 Temp (F): _____ Audit: _____ Initials: _____

Element #	Weight (mg)

Date: _____ Time: _____ RH (%): _____
 Temp (F): _____ Audit: _____ Initials: _____

Element #	Weight (mg)

Date: _____ Time: _____ RH (%): _____
 Temp (F): _____ Audit: _____ Initials: _____

Element #	Weight (mg)

Date: _____ Time: _____ RH (%): _____
 Temp (F): _____ Audit: _____ Initials: _____

Element #	Weight (mg)

Technician Signature: _____

Control No. P-SFDJ-0001, Effective Date: 10/8/2014

Date: **10/16/14**

Method 28 Hydronic Heater Run Sheets

Client: **Heatmor**Project Number: **0275WH011E.AD01** Run Number: **3**Model: **350x**Tracking Number: **2011**Date: **10/9/14**Test Crew: **A. Kravitz, J. Clark**

OMNI Equipment ID numbers: : 428A, 428B, 132, 209, 410, 417, 419, 513, 533, 559, 296-T55, 340, 353, 431, 23, 131, 343

ASTM E2515 Lab Sheet

Train: **B**Assembled By: **A. Kravitz**

Train Element	ID #	Tare Weight (mg)	D/T In Dessicator	Preliminary Weight (mg)
Front Filter	B302, 306, 308	109.4, 109.4, 109.2	10/9/14	N/A
Rear Filter	B303	109.0	↓	↓
Probe	9	115691.1		
O-Ring Set	R208	3425.2	↓	↓

Date: **10/13/14** Time: **0845** RH (%): **12.3**
 Temp (F): **75.9** Audit: **ASB** Initials: **A**

Element #	Weight (mg)
~~B302~~ at at	~~213.8~~
~~B303~~	~~109.75~~
9	115692.7
R208	3426.8

Date: **10/16/14** Time: **1230** RH (%): **17.8**
 Temp (F): **73.0** Audit: **ASB** Initials: **A**

Element #	Weight (mg)
~~B302~~ at at	~~343.9~~
~~B303~~	~~109.6~~
9	115692.7
R208	3426.6

Date: _____ Time: _____ RH (%): _____
 Temp (F): _____ Audit: _____ Initials: _____

Element #	Weight (mg)

Date: _____ Time: _____ RH (%): _____
 Temp (F): _____ Audit: _____ Initials: _____

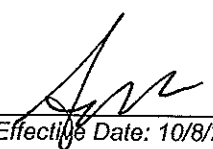
Element #	Weight (mg)

Date: _____ Time: _____ RH (%): _____
 Temp (F): _____ Audit: _____ Initials: _____

Element #	Weight (mg)

Date: _____ Time: _____ RH (%): _____
 Temp (F): _____ Audit: _____ Initials: _____

Element #	Weight (mg)

Technician Signature: 
 Control No. P-SFDJ-0001, Effective Date: 10/8/2014

Date: **10/16/14**

Method 28 Hydronic Heater Run Sheets

Client: **Heatmor**Project Number: **0275WH011E.AD01** Run Number: **3**Model: **350x**Tracking Number: **2011**Date: **10/1/14**Test Crew: **A. Kravitz, J. Clark**

OMNI Equipment ID numbers: : 428A, 428B, 132, 209, 410, 417, 419, 513, 533, 559, 296-T55, 340, 353, 431, 23, 131, 343

ASTM E2515 Background Lab Sheet

Train: **Background**Assembled By: **A. Kravitz**Background Sample Volume (ft³): **277.727**

Train Element	ID #	Tare Weight (mg)	D/T In Dessicator	Preliminary Weight (mg)
Front Filter	B304	111.0	10/9/14	N/A

Date: **10/13/14** Time: **0845** RH (%): **12.3**Temp (F): **75.9** Audit: **0.5001** Initials: **A**

Element #	Weight (mg)
B304	111.4

Date: **10/16/14** Time: **1230** RH (%): **17.8**Temp (F): **73.0** Audit: **0.5001** Initials: **A**

Element #	Weight (mg)
B304	111.6

Date: _____ Time: _____ RH (%): _____

Temp (F): _____ Audit: _____ Initials: _____

Element #	Weight (mg)

Date: _____ Time: _____ RH (%): _____

Temp (F): _____ Audit: _____ Initials: _____

Element #	Weight (mg)

Date: _____ Time: _____ RH (%): _____

Temp (F): _____ Audit: _____ Initials: _____

Element #	Weight (mg)

Technician Signature: **A. Kravitz**

Control No. P-SFDJ-0001, Effective Date: 10/8/2014

Date: **10/13/14**

Method 28 Hydronic Heater Run Sheets

Client: Heatmor Project Number: 0275WBO11E.A1001 Run Number: 3
 Model: 350X Tracking Number: 2011 Date: 10/2/14
 Test Crew: AU, JC
 OMNI Equipment ID numbers: _____

ASTM E2515 Lab Sheet

Assembled By:

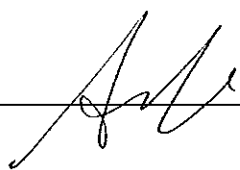
AK

Date/Time In Dessicator:

11/26/14 0800

				Weighing #1	Weighing #2	Weighing #3	Weighing #4	Weighing #5
				Date:	Date:	Date:	Date:	Date:
				12/1/14	12/2/14			
				Time:	Time:	Time:	Time:	Time:
				0930	0800			
				R/H %:	R/H %:	R/H %:	R/H %:	R/H %:
				1.3	1.0			
				Temp:	Temp:	Temp:	Temp:	Temp:
				73.4	79.3			
				Audit:	Audit:	Audit:	Audit:	Audit:
				500.1	500.1			
				Initials:	Initials:	Initials:	Initials:	Initials:
				A	A			
Train	Element	ID #	Tare (mg)	Weight (mg)	Weight (mg)	Weight (mg)	Weight (mg)	Weight (mg)
A	F	B300	109.1	115.8	115.8			
A	R	B301	111.1	112.6	112.7			
B	F	B302	109.4	113.6	113.5			
B	R	B303	109.8	109.3	109.2			
B6	F	B304	111.0	112.2	112.2			
A	F	B305	109.6	113.3	113.2			
B	F	B306	109.4	117.2	117.2			
A	F	B307	111.5	112.5	112.4			
B	F	B308	109.2	114.0	114.1			
A	F	B309	109.1	114.6	114.5			

Technician Signature: _____

Date: 12/2/14

Method 28 Hydronic Heater Run Sheets

Client: HeatmorProject Number: 0275WH011E.AD01 Run Number: 4Model: 350xTracking Number: 2011Date: 10/10/14Test Crew: A. Kravitz, J. Clark

OMNI Equipment ID numbers: : 428A, 428B, 132, 209, 410, 417, 419, 513, 533, 559, 296-T55, 340, 353, 431, 23, 131, 343

ASTM E2515 Lab Sheet

Train: AAssembled By: STC

Train Element	ID #	Tare Weight (mg)	D/T In Dessicator	Preliminary Weight (mg)
Front Filter	B310; B315; B317; B318	0.1112; 0.1089; 0.1098, 102.6	10/11/14	N/A
Rear Filter	B311	0.1091		
Probe	11	114.1813		
O-Ring Set	R209	3.3408		

Date: 10/13/14 Time: 0845 RH (%): 12.3
 Temp (F): 75.4 Audit: AS Initials: AS

Element #	Weight (mg)
~~B310 et al~~	~~458.7~~
~~B311~~	~~109.8~~
11	114.181.6
R209	3341.0

Date: 10/16/14 Time: 1230 RH (%): 17.8
 Temp (F): 73.0 Audit: 5001 Initials: AS

Element #	Weight (mg)
~~B310 et al~~	~~458.6~~
~~B311~~	~~109.9~~
11	114.181.7
R209	3340.8

Date: _____ Time: _____ RH (%): _____
 Temp (F): _____ Audit: _____ Initials: _____

Element #	Weight (mg)

Date: _____ Time: _____ RH (%): _____
 Temp (F): _____ Audit: _____ Initials: _____

Element #	Weight (mg)

Date: _____ Time: _____ RH (%): _____
 Temp (F): _____ Audit: _____ Initials: _____

Element #	Weight (mg)

Date: _____ Time: _____ RH (%): _____
 Temp (F): _____ Audit: _____ Initials: _____

Element #	Weight (mg)

Technician Signature: [Signature]
 Control No. P-SFDJ-0001, Effective Date: 10/8/2014

Date: 10/16/14

Method 28 Hydronic Heater Run Sheets

Client: HeatmorProject Number: 0275WH011E.AD01 Run Number: 4Model: 350xTracking Number: 2011Date: 10/10/14Test Crew: A. Kravitz, J. Clark

OMNI Equipment ID numbers: : 428A, 428B, 132, 209, 410, 417, 419, 513, 533, 559, 296-T55, 340, 353, 431, 23, 131, 343

ASTM E2515 Lab Sheet

Train: BAssembled By: jc

Train Element	ID #	Tare Weight (mg)	D/T In Dessicator	Preliminary Weight (mg)
Front Filter	B312; B316, B314	0.1086; 0.1113, 110.8	10/11/14	NA
Rear Filter	B313	0.1112		
Probe	21	114.3924		
O-Ring Set	R210	3.5405		

Date: 10/13/14 Time: 0845 RH (%): 123Temp (F): 75.9 Audit: 0.5001 Initials: jc

Element #	Weight (mg)
~~B312~~ <u>ct</u>	~~348.7~~
~~B313~~	~~112.8~~
21	114392.9
R210	3540.8

Date: 10/16/14 Time: 1230 RH (%): 17.8Temp (F): 73.0 Audit: .5001 Initials: jc

Element #	Weight (mg)
~~B312~~ <u>ct</u>	~~348.5~~
~~B313~~	~~112.9~~
21	114392.9
R210	3540.6

Date: _____ Time: _____ RH (%): _____

Temp (F): _____ Audit: _____ Initials: _____

Element #	Weight (mg)

Date: _____ Time: _____ RH (%): _____

Temp (F): _____ Audit: _____ Initials: _____

Element #	Weight (mg)

Date: _____ Time: _____ RH (%): _____

Temp (F): _____ Audit: _____ Initials: _____

Element #	Weight (mg)

Technician Signature: jc

Control No. P-SFDJ-0001, Effective Date: 10/8/2014

Date: 10/16/14

Page 2 of 36

Method 28 Hydronic Heater Run Sheets

Client: Heatmor Project Number: 0275WH011E.AD01 Run Number: 4
 Model: 350x Tracking Number: 2011 Date: 10/10/14
 Test Crew: A. Kravitz, J. Clark
 OMNI Equipment ID numbers: : 428A, 428B, 132, 209, 410, 417, 419, 513, 533, 559, 296-T55, 340, 353, 431, 23, 131, 343

ASTM E2515 Background Lab Sheet

Train: Background Assembled By: jcBackground Sample Volume (ft³): 225.350

Train Element	ID #	Tare Weight (mg)	D/T In Dessicator	Preliminary Weight (mg)
Front Filter	B 314	0.1094	10/11/14	N/A

Date: 10/13/14 Time: 0645 RH (%): 12.3
 Temp (F): 75.9 Audit: 0.5001 Initials: A

Element #	Weight (mg)
B 314	11.0

Date: 10/16/14 Time: 1230 RH (%): 17.8
 Temp (F): 73.0 Audit: 0.5001 Initials: A

Element #	Weight (mg)
~~B 314~~	~~11.2~~

Date: _____ Time: _____ RH (%): _____
 Temp (F): _____ Audit: _____ Initials: _____

Element #	Weight (mg)

Date: _____ Time: _____ RH (%): _____
 Temp (F): _____ Audit: _____ Initials: _____

Element #	Weight (mg)

Date: _____ Time: _____ RH (%): _____
 Temp (F): _____ Audit: _____ Initials: _____

Element #	Weight (mg)

Technician Signature: [Signature]
 Control No. P-SFDJ-0001, Effective Date: 10/8/2014

Date: 10/13/14

Method 28 Hydronic Heater Run Sheets

Client: Heater Project Number: 0275WB011 E. Adol Run Number: 21
 Model: 350X Tracking Number: 2011 Date: 10/10/14
 Test Crew: AM, JC
 OMNI Equipment ID numbers: _____

ASTM E2515 Lab Sheet

Assembled By:

JC

Date/Time In Dessicator:

11/26/14 0800

Weighing #1	Weighing #2	Weighing #3	Weighing #4	Weighing #5
Date:	Date:	Date:	Date:	Date:
12/1/14	12/2/14			
Time:	Time:	Time:	Time:	Time:
0930	0800			
R/H %:	R/H %:	R/H %:	R/H %:	R/H %:
1.3	1.0			
Temp:	Temp:	Temp:	Temp:	Temp:
73.4	74.3			
Audit:	Audit:	Audit:	Audit:	Audit:
500.1	500.1			
Initials:	Initials:	Initials:	Initials:	Initials:
A	A			

Train	Element	ID #	Tare (mg)	Weight (mg)	Weight (mg)	Weight (mg)	Weight (mg)	Weight (mg)
A	F	B310	111.2	116.4	116.3			
A	R	B311	109.1	109.8	109.9			
B	F	B312	108.6	112.7	112.6			
B	R	B313	111.2	112.4	112.5			
BG	F	B314	109.4	111.5	111.5			
A	F	B315	108.9	112.3	112.2			
B	F	B316	111.3	118.0	118.0			
A	F	B317	109.8	114.6	114.5			
A	F	B318	109.6	113.9	113.7			
B	F	B319	110.8	115.8	115.8			

Technician Signature: _____

Date: 12/2/14

Method 28 Hydronic Heater Run Sheets

Client: **Heatmor**Project Number: **0275WB011E.AD01** Run Number: **5**Model: **350X**Tracking Number: **2011**Date: **11/14/14**Test Crew: **A. Kravitz J. Clark**

OMNI Equipment ID numbers:

ASTM E2515 Lab Sheet

Assembled By:

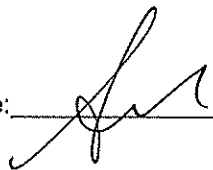
A. Kravitz

Date/Time In Dessicator:

11/7/14

Weighing #1	Weighing #2	Weighing #3	Weighing #4	Weighing #5
Date: 11/10/14	Date: 11/11/14	Date: 11/12/14	Date: 11/14/14	Date:
Time: 0900	Time: 0915	Time: 0900	Time: 0930	Time:
R/H %: 8.4	R/H %: 4.0	R/H %: 3.9	R/H %: 4.0	R/H %:
Temp: 64.2	Temp: 68.1	Temp: 69.5	Temp: 72.1	Temp:
Audit: 500.1	Audit: 500.1	Audit: 500.1	Audit: 500.1	Audit:
Initials: A	Initials: A	Initials: A	Initials: A	Initials:

Train	Element	ID #	Tare (mg)	Weight (mg)	Weight (mg)	Weight (mg)	Weight (mg)	Weight (mg)
A	Front Filter	B397	115.2	118.1	117.0	116.9	-	
A	Rear Filter	B398	116.5	118.0	117.2	117.2	-	
A	Probe	35	114329.8	114329.6	114329.5	-	-	
A	O-Rings	R237	3369.2	3371.9	3370.0	3369.5	3369.3	
B	Front Filter	B399	122.0	124.8	123.5	123.4	-	
B	Rear Filter	B400	115.4	116.6	116.0	115.9	-	
B	Probe	56	123087.6	123087.2	123087.0	-	-	
B	O-Rings	R238	3312.6	3315.7	3313.5	3313.0	3312.9	
BG	Filter	B401	116.2	117.0	116.8	-	-	
A	FF	B402	121.9	124.4	123.2	123.2	-	
B	FF	B403	115.6	117.7	116.8	116.7	-	
A	FF	B404	115.4	117.1	116.5	116.4	-	
B	FF	B405	121.9	123.9	123.1	123.0	-	

Technician Signature: Date: 11/14/14

Method 28 Hydronic Heater Run Sheets

Client: Hentma Project Number: 0275W3011 E. A901 Run Number: 5
 Model: 350X Tracking Number: 2011 Date: 11/7/14
 Test Crew: A. Krawitz, J. Clark
 OMNI Equipment ID numbers: _____

ASTM E2515 Lab Sheet

Assembled By:

A. Krawitz

Date/Time In Dessicator:

11/7/14

Weighing #1	Weighing #2	Weighing #3	Weighing #4	Weighing #5
Date:	Date:	Date:	Date:	Date:
<u>11/10/14</u>	<u>11/11/14</u>	<u>11/12/14</u>		
Time:	Time:	Time:	Time:	Time:
<u>0900</u>	<u>0915</u>	<u>0900</u>		
R/H %:	R/H %:	R/H %:	R/H %:	R/H %:
<u>8.4</u>	<u>4.0</u>	<u>3.4</u>		
Temp:	Temp:	Temp:	Temp:	Temp:
<u>64.2</u>	<u>68.4</u>	<u>64.5</u>		
Audit:	Audit:	Audit:	Audit:	Audit:
<u>500.1</u>	<u>500.1</u>	<u>500.1</u>		
Initials:	Initials:	Initials:	Initials:	Initials:
<u>A</u>	<u>A</u>	<u>A</u>		

Train	Element	ID #	Tare (mg)	Weight (mg)	Weight (mg)	Weight (mg)	Weight (mg)	Weight (mg)
<u>A</u>	<u>R</u>	<u>B406</u>	<u>115.4</u>	<u>116.7</u>	<u>116.1</u>	<u>116.2</u>		
<u>A</u>	<u>F</u>	<u>B407</u>	<u>116.5</u>	<u>117.1</u>	<u>116.6</u>	<u>116.5</u>		
<u>B</u>	<u>R</u>	<u>B408</u>	<u>121.6</u>	<u>122.7</u>	<u>122.0</u>	<u>122.1</u>		
<u>B</u>	<u>F</u>	<u>B409</u>	<u>116.4</u>	<u>117.4</u>	<u>116.8</u>	<u>116.7</u>		
<u>A</u>	<u>F</u>	<u>B410</u>	<u>116.0</u>	<u>117.0</u>	<u>116.4</u>	<u>116.4</u>		
<u>B</u>	<u>F</u>	<u>B411</u>	<u>121.6</u>	<u>122.6</u>	<u>121.8</u>	<u>121.8</u>		
<u>B</u>	<u>R</u>	<u>B412</u>	<u>114.8</u>	<u>116.0</u>	<u>115.4</u>	<u>115.3</u>		
<u>A</u>	<u>F</u>	<u>B413</u>	<u>117.3</u>	<u>121.2</u>	<u>120.0</u>	<u>119.9</u>		
<u>A</u>	<u>R</u>	<u>B414</u>	<u>121.6</u>	<u>123.8</u>	<u>122.9</u>	<u>122.9</u>		
<u>B</u>	<u>F</u>	<u>B415</u>	<u>116.2</u>	<u>119.9</u>	<u>119.1</u>	<u>118.9</u>		
<u>B</u>	<u>R</u>	<u>B416</u>	<u>117.0</u>	<u>117.6</u>	<u>117.2</u>	<u>117.2</u>		

Technician Signature: A. KrawitzDate: 11/14/14

FILTER TARES

Date Placed in Desiccator: 10/2/14

Technician: A. Kowitz

Balance ID # 23

Thermo/Hygro meter ID #: 131 A 343

Audit Weight ID # 131

(Balance audit mfr. Std.: 500 ± 0.72)

Filter Size/ID#	Date: 10/5/14 Time: 10:00 RH%: 14.3 T (F): 75.9 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 55								
B267	0.1676							
B268	0.1133							
B269	0.1122							
B270	0.1070							
B271	0.1131							
B272	0.1076							
B273	0.1126							
B274	0.1134				Hestner	350X	62543011E Adon	1
B275	0.1072							
B276	0.1128							
B277	0.1129							
B278	0.1082							
B279	0.1132							
B280	0.1140							

Final Technician signature: [Signature]

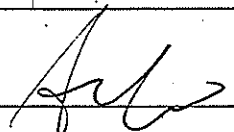
Date: 12/3/14

FILTER TARES

Date Placed in Desiccator: 10/6/14 Technician: A. Kravitz Balance ID # 23

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

Filter Size/ID#	Date: 10/6/14 Time: 1106 RH%: 5.3 T (F): 76.1 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 ⑦ 110 55								
B281	0.1100				Hector	350x	025WBAIE-ARD1	1
B282	0.1088							
B283	* 0.1116 0.1108							
B284	0.1096							
B285	0.1090							
B286	0.1113							
B287	0.1095							
B288	0.1096							
B289	0.1109							
B290	0.1096							2
B291	0.1096							
B292	0.1106							
B293	0.1094							
B294	0.1097							

Final Technician signature: 

Date: 10/8/14

FILTER TARES

Date Placed in Desiccator: 10/6/14 Technician: A. Krawitz Balance ID # 23

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

Filter Size/ID#	Date: 10/6/14 Time: 1:00 RH%: 5.3 T (F): 75.1 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								
B295	0.1112				Heetmor	350x	0275WBOLE ADI	2
B296	0.1098				↓	↓	↓	↓
B297	0.1093				↓	↓	↓	↓
B298	0.1113				↓	↓	↓	↓
B299	0.1099				↓	↓	↓	↓
B300	0.1091				↓	↓	↓	3
B301	0.1111				↓	↓	↓	↓
B302	0.1094				↓	↓	↓	↓
B303	0.1090				↓	↓	↓	↓
B304	0.1110				↓	↓	↓	↓
B305	0.1096				↓	↓	↓	↓
B306	0.1094				↓	↓	↓	↓
B307	0.1115				↓	↓	↓	↓
B308	0.1092				↓	↓	↓	↓

Final Technician signature: A. Krawitz

Date: 10/8/14

FILTER TARES

Balance ID # 23

(Balance audit mfr. Std.: 500 ± 0.72)

Filter Size/ID#	Date: 10/8/11+ Time: 1100 RH%: 15.3 T (F): 76.1 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.
B309	0.1091				Hestmor	350x	0275 WH ONE ADG	3
B310	0.1112							4
B311	0.1091							
B312	0.1086							
B313	0.1112							
B314	0.1094							
B315	0.1089							
B316	0.1113							
B317	0.1098							
B318	0.1096							
B319	0.1108							
B320	0.1085							
B321	0.1139							
B322	0.1140							

Date: 16/8/14

FILTER TARES

$$u(3/14)$$

Date Placed in Desiccator: Over 10:00, Desk 13:00

Technician: A. Kravitz

Balance ID # 23

Thermo/Hygro meter ID #: 343

Audit Weight ID # 131

(Balance audit mfr. Std.: 500 ± 0.72)

Filter Size/ID#	Date: 11/4/14 Time: 1015 RH%: 33 T (F): 72.5 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.
B393	121.5							
B394	115.4							
B395	116.2							
B396	122.1							
B397	115.2				Hatmer	350X		5
B398	116.5							
B399	122.0							
B400	115.4							
B401	116.6 ⁴							
B402	121.9							
B403	115.6							
B404	115.4							
B405	121.9							
B406	115.4							

Final Technician signature:

Date: 11/4/14

FILTER TARES

11/3/14

Date Placed in Desiccator: Open 10:00, Desc. 13:00

Technician: A. Kravitz

Balance ID # 23

Thermo/Hygro meter ID #: 343

Audit Weight ID # 131

(Balance audit mfr. Std.: 500 ± 0.72)

Filter Size/ID#	Date: 11/6/14 Time: 09:15 RH%: 9.4 T (F): 73.0 Initials: L	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								
B407	116.5				Heating	350x		5
B408	121.6							
B409	116.4							
B410	116.0							
B411	121.6							
B412	114.8							
B413	117.3							
B414	121.6							
B415	116.2							
B416	117.0							
B417	122.2							
B418	115.5							
B419	116.5							
B420	122.6							

Final Technician signature: [Signature]

Date: 11/6/14

PROBE TARES

Date Placed in Desiccator: 9/22/14

Technician: A. Krawitz

Balance ID # 23

Thermo/Hygro meter ID #: 343

Audit Weight ID # 131

(Balance audit mfr. Std.: 500 ± 0.72)

Probe Size/ID# (47)	Date: 9/25/14 Time: 0900 RH%: 18.9 T (F): 74.3 Initials: A	Date: 9/26/14 Time: 1006 RH%: 11.9 T (F): 76.1 Initials: A	Date: 10/2/14 Time: 1030 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.
01	114.7328	114.7323	114.7314	114.7315				
7	114.9817	114.9816	-	-				
23	114.0771	114.0767	114.0765	-	↓	↓	↓	8
24	114.1256	114.1251	114.1249	-				
25	114.2982	114.2980	-	-				
27	114.2881	114.2872	114.2872	-				
32	114.7406	114.7404	-	-				
35	114.3313	114.3308	114.3303	114.3305	Heatmor	350x	0275WOLLE ADOL	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	-	-				
68	122.4403	122.4395	122.4393	-	Heatmor	350x	0275WOLLE ADOL	2
69	123.0816	123.0809	123.0804	123.0805	↓	↓	↓	↓

Final Technician signature: A. Krawitz

Date: 10/2/14

Probe
A FILTER TARES

Date Placed in Desiccator: 10/2/14 Technician: A. Kowitz Balance ID # 23
Thermo/Hygro meter ID #: 343 Audit Weight ID # 131 (Balance audit mfr. Std.: 500 ± 0.72)

Probe Filter A Size/ID# 102 (47) 110 55	Date: 10/4/14 Time: 1330 RH%: 11.1 T (F): 76.1 Initials: A	Date: 10/5/14 Time: 1106 RH%: 14.3 T (F): 75.4 Initials: A	Date: 10/6/14 Time: 1330 RH%: 12.9 T (F): 76.1 Initials: A	Date: Time: RH%: T (F): Initials:	Manufacturer	Appliance	Project No.	Run No.
4	114.8569	114.8570	-	-	Hantec	350X	025N601E ADU	2
0ES 5	113.5497	113.5493	113.5494	-	↓	↓	↓	↓
8	115.5943	115.5943	-	-	↓	↓	↓	3
9	115.6920	115.6919	-	-	↓	↓	↓	↓
11	114.1814	114.1813	-	-	↓	↓	↓	4
21	114.3924	114.3924	-	-				
28	114.7456	114.7457	-	-				
30	114.3238	114.3234	114.3236	-	↓	↓	↓	↓
34	115.8677	115.8675	-	-	↓	↓	↓	3
50	121.7586	121.7585	-	-	↓	↓	↓	↓
54	122.8250	122.8252	-	-	↓	↓	↓	4
55	123.2321	123.2321	-	-	↓	↓	↓	↓
60	121.8522	121.8524	-	-				
65	122.1934	122.1934	-	-	↓	↓	↓	↓

Final Technician signature: A. Kowitz

Date: 10/6/14

FILTER TARES

Probe

Date Placed in Desiccator: 11/3/14 1000

Technician: A. Krawitz

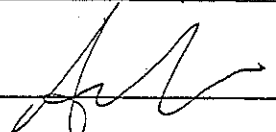
Balance ID # 23

Thermo/Hygro meter ID #: 343

Audit Weight ID # 131

(Balance audit mfr. Std.: 500 ± 0.72)

Filter Size/ID#	Date: 11/9/14 Time: 1015 RH%: 3.3 T (F): 72.5 Initials: <u>A</u>	Date: 11/5/14 Time: 0900 RH%: 4.5 T (F): 72.5 Initials: <u>A</u>	Date: 11/6/14 Time: 0830 RH%: 4.8 T (F): 72.6 Initials: <u>A</u>	Date: Time: RH%: T (F): Initials:	Manufacturer	Appliance	Project No.	Run No.
102 <u>47</u> 110 55								
4	114.8568	114.8569	—					
8	115.5949	115.5950	—		↓	↓	↓	↓
01	114.7333	114.7331	—		↓	↓	↓	7
28	114.7503	114.7499	114.7499		↓	↓	↓	4
OES 5	113.5496	113.5494	—		↓	↓	↓	8
23	114.0777	114.0773	114.0772		↓	↓	↓	↓
35	114.3299	114.3296	114.3298		Hentao	350X		5
56	123.0880	123.0876	123.0876		↓	↓	↓	↓
67	122.9660	122.9650	122.9649					
66	123.1660	123.1654	123.1656		↓	↓	↓	↓
69	123.0872	123.0819	123.0819		↓	↓	↓	2
68	122.4411	122.4407	122.4408		↓	↓	↓	↓
53	122.9283	122.9278	122.9279		↓	↓	↓	3
21	114.3940	114.3935	114.3935		↓	↓	↓	↓

Final Technician signature: 

Date: 11/6/14

O-RING TARES

Date Placed in Desiccator: 10/2/14

Technician: A. Kowitz

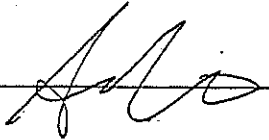
Balance ID # 23

Thermo/Hygro meter ID #: 343

Audit Weight ID #: 131

(Balance audit mfr. Std.: 500 ± 0.72)

O-Ring Size/ID# 47	Date: 10/4/14 Time: 1330 RH%: 16.1 T (F): 76.1 Initials: A	Date: 10/5/14 Time: 1100 RH%: 14.3 T (F): 75.9 Initials: A	Date: 10/6/14 Time: 1330 RH%: 12.9 T (F): 76.7 Initials: A	Date: Time: RH%: T (F): Initials:	Manufacturer	Appliance	Project No.	Run No.
R197	4.1179	4.1180	—					
R198	3.4033	3.4028	3.4030					
R199	3.3690	3.3669	3.3668		Heatmap	350x	0275WB01(E. ADD)	1
R200	4.1509	4.1509	—		↓	↓	↓	↓
R201	3.3346	3.3345	—		↓	↓	↓	↓
R202	3.3607	3.3605	—		↓	↓	↓	↓
R203	3.3705	3.3703	—		↓	↓	↓	2
R204	4.1557	4.1553	4.1555		↓	↓	↓	↓
R205	3.3144	3.3140	3.3143		↓	↓	↓	↓
R206	3.3403	3.3401	—		↓	↓	↓	↓
R207	3.2879	3.2878	—		↓	↓	↓	3
R208	3.4255	3.4250	3.4252		↓	↓	↓	↓
R209	3.3410	3.3408	—		↓	↓	↓	4
R210	3.5406	3.5405	—		↓	↓	↓	↓

Final Technician signature: 

Date: 10/6/14

O-RING TARES

Date Placed in Desiccator: 10/23/14

Technician: A. Kravitz

Balance ID # 23

Thermo/Hygro meter ID #: 343

Audit Weight ID # 131

(Balance audit mfr. Std.: 500 ± 0.72)

O-Ring Size/ID#	Date: 10/27/14 Time: 0830 RH%: 7.4 T (F): 72.3 Initials: <u>AK</u>	Date: 11/3/14 Time: 0900 RH%: 5.1 T (F): 70.8 Initials: <u>A</u>	Date: Time: RH%: T (F): Initials:	Date: Time: RH%: T (F): Initials:	Manufacturer	Appliance	Project No.	Run No.
R225	4154.5	4154.6						
R226	3310.8	3310.9						
R227	3391.6	3391.4						
R228	4115.0	4115.0						
R229	3536.7	3536.8						
R230	3340.1	3340.1						
R231	3400.1	3400.0						
R232	3333.8	3333.7						
R233	3358.7	3358.6						
R234	3456.7	3456.6						
R235	4150.4	4150.4						
R236	3539.9	3539.9						
R237	3369.4	3369.2						
R238	3312.5	3312.6						

Final Technician signature:

Date: 11/3/14

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	Delmhorst Wood Moisture Meter	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
417	Anemometer	Calibration Certificate
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	Wood Moisture Meter Calibrator	Calibration Log
443	Stopwatch	Calibration Log
513	Omega Low Flow Magmeter	Calibration Log
533	DaqPro 5300 Data Logger	Calibration Certificate

*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
PO NUMBER: OTL-14-049
INST. MANUFACTURER: ROCKWELL
INST. DESCRIPTION: P.D. METER
MODEL NUMBER: S-275
SERIAL NUMBER: 684390L
RATED UNCERTAINTY: +/- .5 % RD.
UNCERTAINTY GIVEN: FLOW measurement uncertainty: +/- .101 % RD. K=2
NOTES: AS RECEIVED/AS LEFT WITHIN SPECS. REFERENCE CONDITIONS ARE: 760 mm HGA 70 F **OMNI-00001**

CALIBRATION DATE: 10/23/14
CALIBRATION DUE: 10/23/15
PROCEDURE: NAVAIR 17-20MG-02
CALIBRATION FLUID: AIR @ 14.7 PSIA 70 F
STANDARD(S) USED: A4, A24, A321 DUE 02-2015
NIST TRACE #' S: 1329407628, 1361269184, 1390386562
AMBIENT CONDITIONS: 760 mm HGA 51 % RH 72 F
CERTIFICATE FILE #: 426663.14

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

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

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

This Calibration Certificate shall not be reproduced, 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:

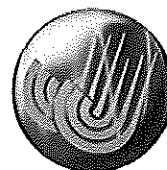
Approved By:

Calibration Technician:

Certificate of Calibration

Certificate Number: **567521**

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



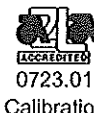
JJ Calibrations, Inc.
7007 SE Lake Rd
Portland, OR 97267-2105
Phone 503.786.3005
FAX 503.786.2994

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						Accredited = ✓	
Force	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.

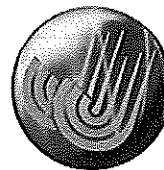
Reviewer

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**

2-40 of 2-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

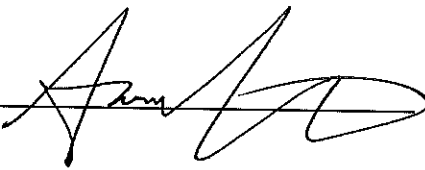
Date: 2/19/13

By: A. Kravitz

Standard Weight (A) (Lb.)	Weight Verified (B) (Lb.)	Difference (A - B)	% Error
10.0	10.0	0.0	0

*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 $\frac{1}{8}$ ".

[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:

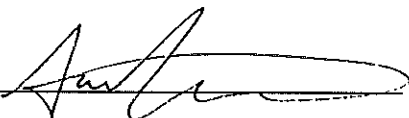
Date: 9/22/14 Technician: A. Kravitz

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 prevent 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.

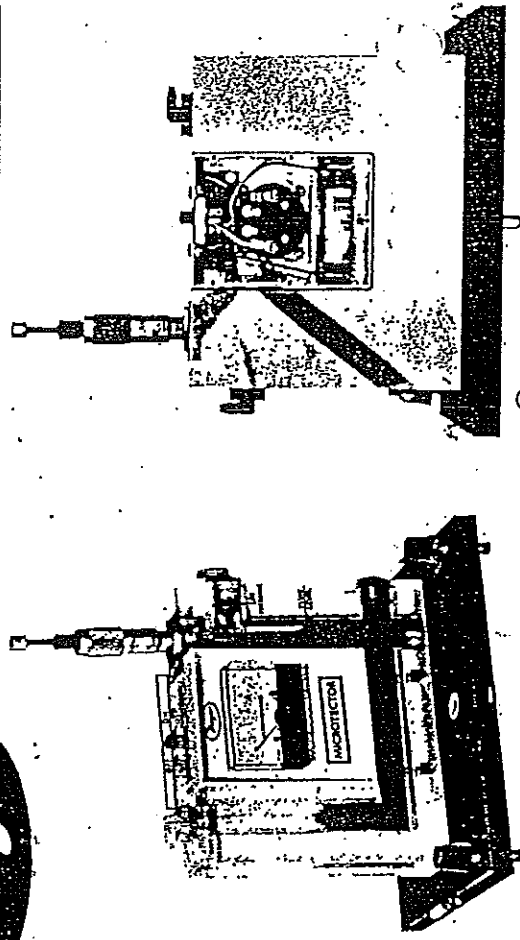
"The Low Pressure People"

Copyright © 1970, Dwyer Instruments, Inc. ®

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

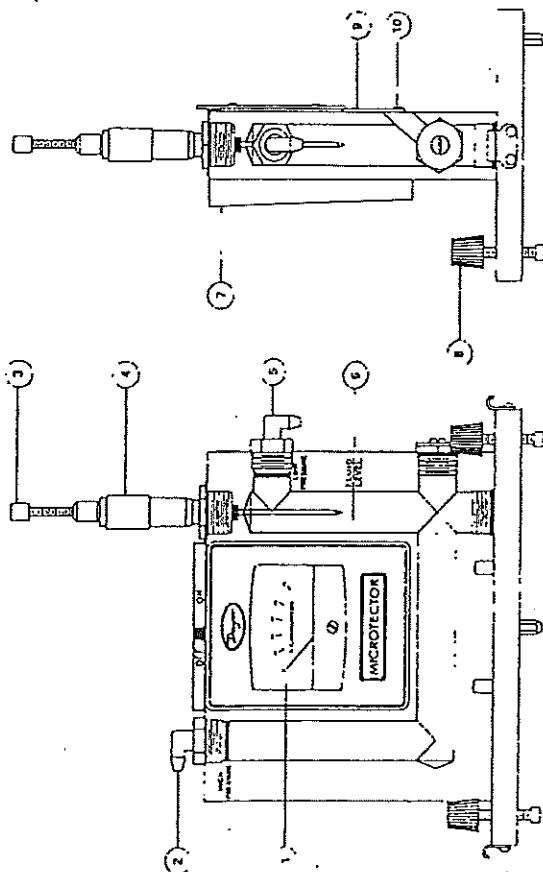


DWYER INSTRUMENTS, INC.

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, relevel 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.

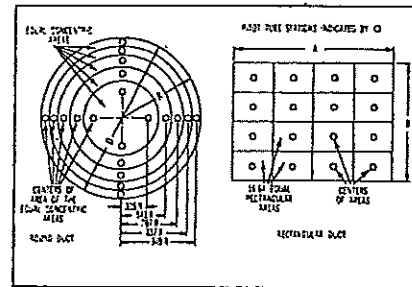
AIR VELOCITIES WITH THE DWYER PITOT TUBE

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

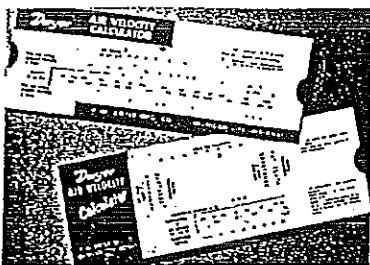
D = Air density in #/cu. ft.

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

where P_B = Barometric Pressure in inches of mercury

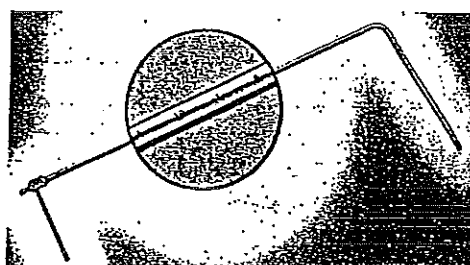
T = Absolute Temperature (indicated temperature °F plus 460)

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



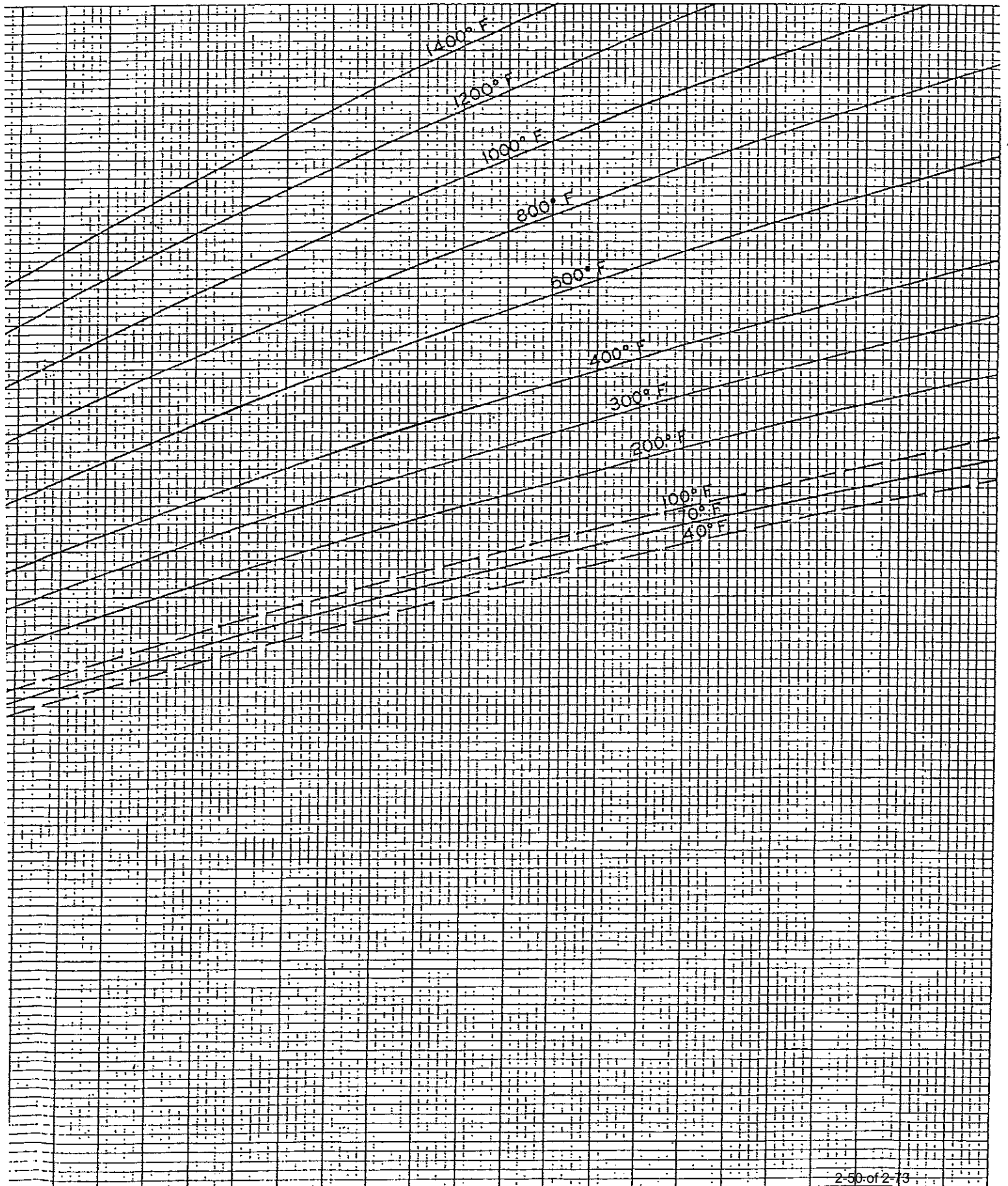
AIR VELOCITY CALCULATOR

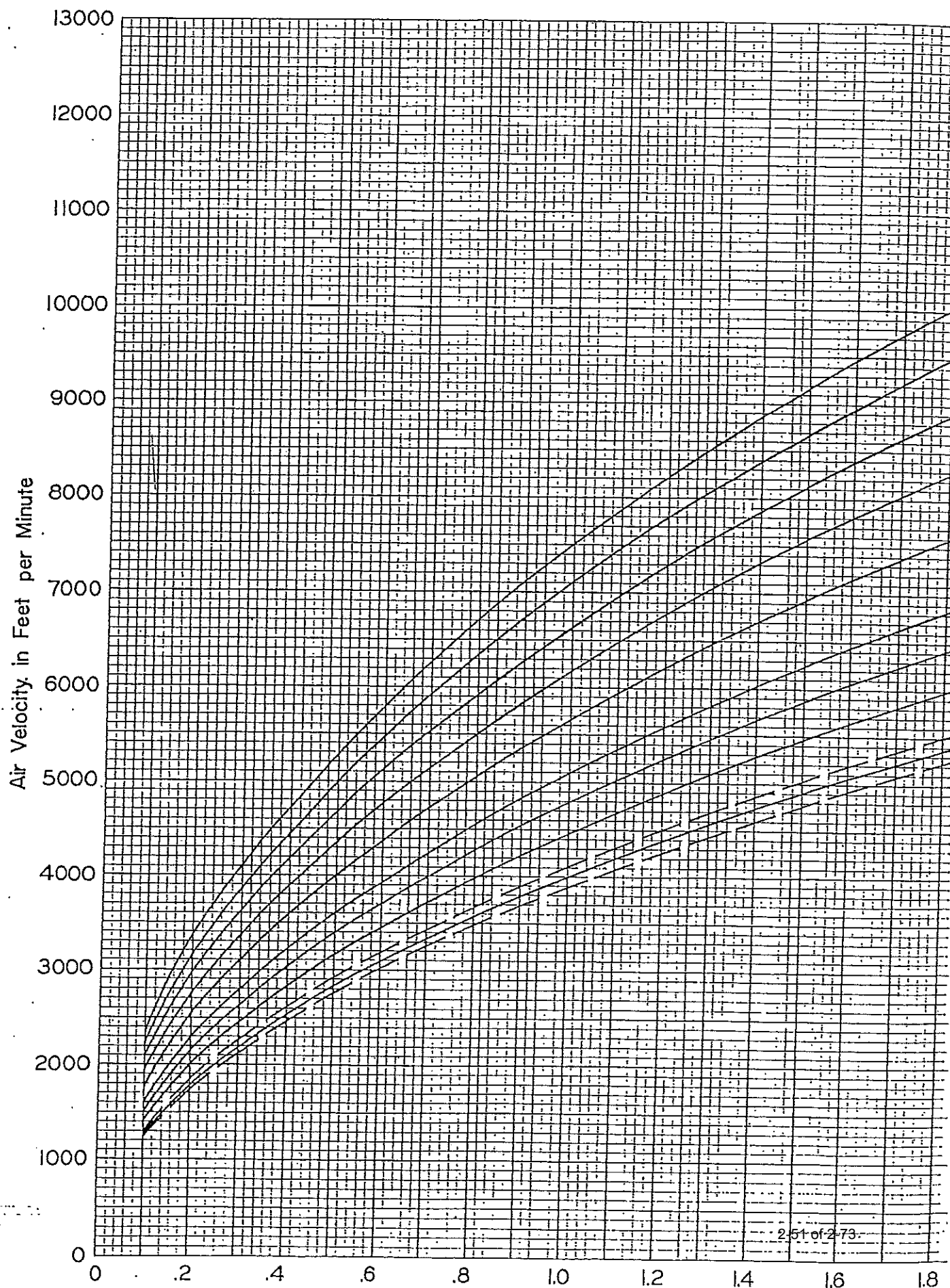
Computes velocity based on air density corrected for conditions of temperature and pressure. Eliminates tedious calculations. Ranges from .01 to 10" water corresponding to 400 to 20,000 FPM. Furnished with each pitot tube.

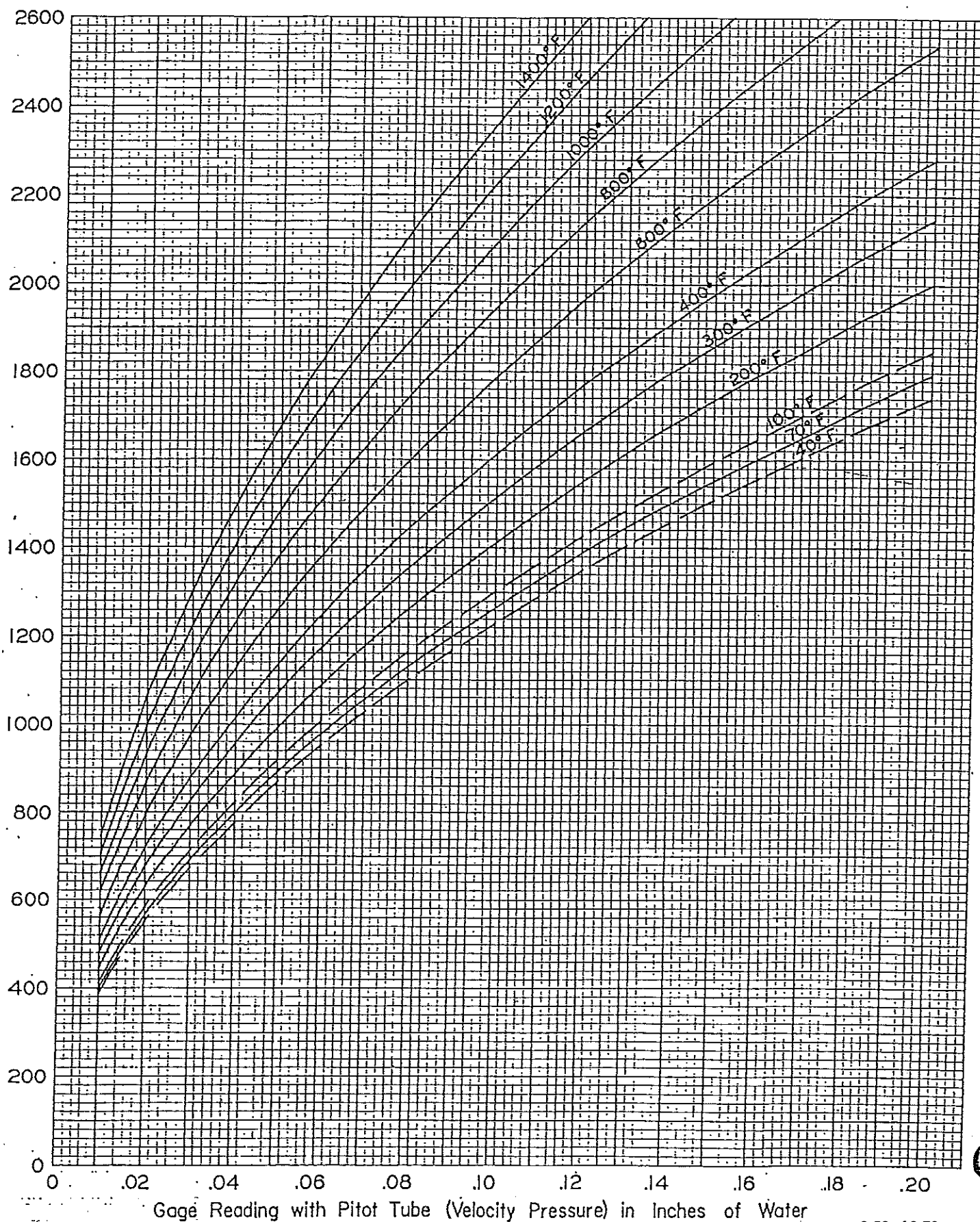


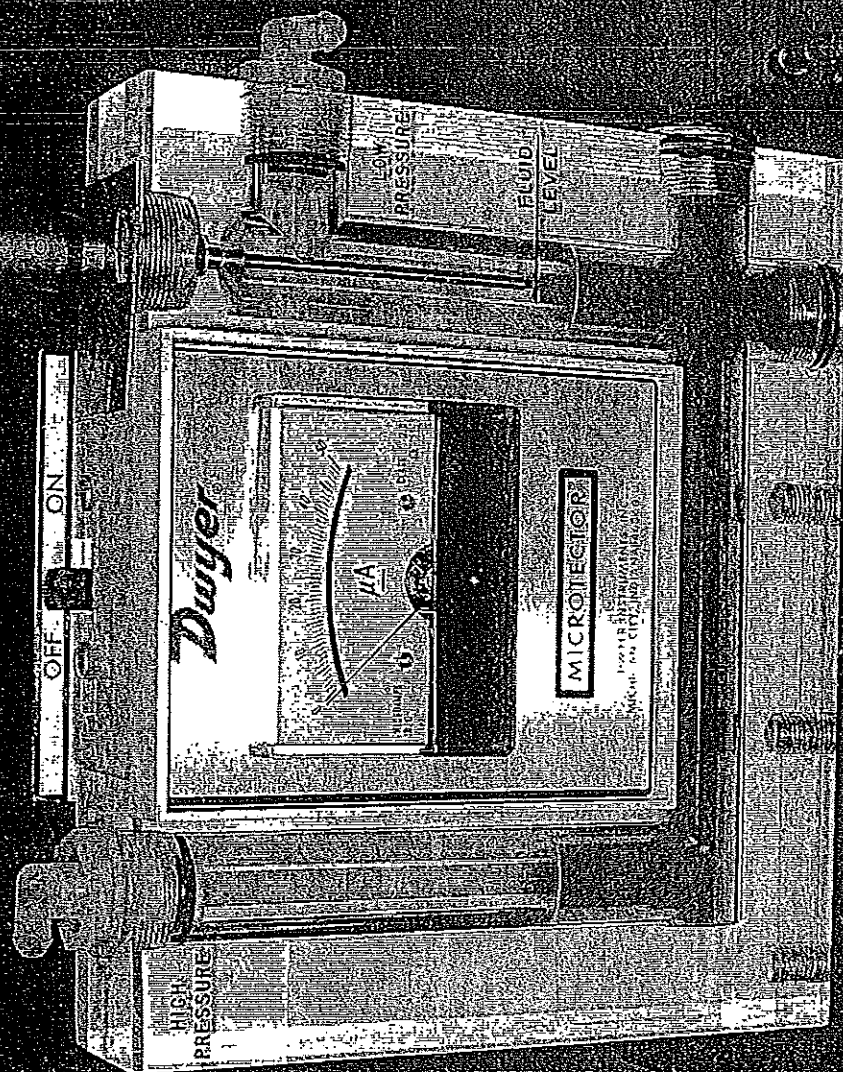
STAINLESS STEEL PITOT TUBES

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.



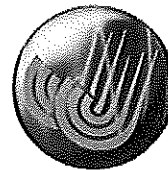






Certificate of Calibration

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/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

Issued 05/20/2014

Rev # 14


Inspector

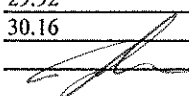
Thermal Metering System Calibration

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

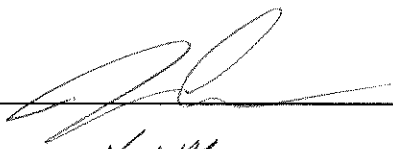
Date: 7/23/14 By: J. Clark

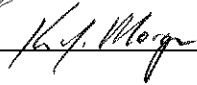
This form is to be used only in conjunction with Standard Procedure C-SPC.

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 oF
 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

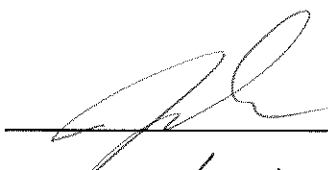
Date: 7/23/14 By: J. Clark

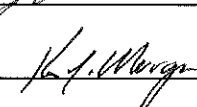
This form is to be used only in conjunction with Standard Procedure C-SPC.

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

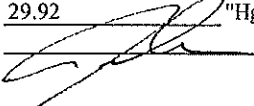
Thermal Metering System Calibration

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.

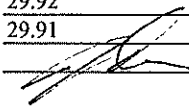
Thermal Metering System Calibration

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.

Thermal Metering System Calibration

Y Factor

Manufacturer: Apex
 Model: XC-60
 Serial Number: N/A
 OMNI Tracking No.: OMN-428A
 Calibrated Orifice: ☐ Yes

Average Gas Meter y
 Factor
0.994

Orifice
 Meter
 dH@
 N/A

Calibration Date: 11/26/14
 Calibrated by: A. Kravitz
 Calibration Frequency: Post-Test
 Next Calibration Due: N/A
 Instrument Range: 1.000 cfm
 Standard Temp.: 68 °F
 Standard Press.: 29.92 "Hg
 Barometric Press., Pb: 30.25 "Hg
 Signature/Date: [Signature] 12/1/14

Previous Calibration Comparison

Date		Acceptable Deviation (5%)	Deviation
y Factor	1.007	0.05035	0.013
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	1
	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	0.57	0.57	0.57
Initial Reference Meter	398.76	403.731	408.845
Final Reference Meter	403.731	408.845	414.108
Initial DGM	0	0	0
Final DGM	5.019	5.169	5.321
Temp. Ref. Meter (°F), Tr	67.0	67.0	67.0
Temperature DGM (°F), Td	71.0	71.0	70.0
Time (min)	61.0	62.8	64.3
Net Volume Ref. Meter, Vr	4.971	5.114	5.263
Net Volume DGM, Vd	5.019	5.169	5.321
Gas Meter y Factor =	0.995	0.994	0.992
Gas Meter y Factor Deviation (from avg.)	0.001	0.000	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-60
 Serial Number: N/A
 OMNI Tracking No.: OMN-428B
 Calibrated Orifice: ☐ Yes

Average Gas Meter y Factor
0.992

Orifice Meter dH@
N/A

Calibration Date: 12/01/14
 Calibrated by: A. Kravitz
 Calibration Frequency: Post-Test
 Next Calibration Due: N/A
 Instrument Range: 1.000 cfm
 Standard Temp.: 68 °F
 Standard Press.: 29.92 "Hg
 Barometric Press., Pb: 30.25 "Hg
 Signature/Date: *[Signature]* 12/1/14

Previous Calibration Comparison

Date		Acceptable Deviation (5%)	Deviation
y Factor	1.012	0.0506	0.020
Acceptance	Acceptable		

Current Calibration

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

Reference Standard *

Standard	Model	Standard Test Meter
Calibrator	S/N	1
	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	0.86	0.86	0.86
Initial Reference Meter	414.108	419.427	424.442
Final Reference Meter	419.427	424.442	429.463
Initial DGM	0	0	0
Final DGM	5.338	5.054	5.066
Temp. Ref. Meter (°F), Tr	64.0	65.0	58.0
Temperature DGM (°F), Td	64.0	65.0	61.0
Time (min)	65.3	61.8	61.5
Net Volume Ref. Meter, Vr	5.319	5.015	5.021
Net Volume DGM, Vd	5.338	5.054	5.066
Gas Meter y Factor =	0.993	0.989	0.993
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. $y = [V_r \times (y \text{ factor (ref)}) \times (P_b + (P_r / 13.6)) \times (T_d + 460)] / [V_d \times (P_b + (P_d / 13.6)) \times (T_r + 460)]$
- ** 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.

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 % [# 431]		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: 15.00 seconds #1 Measured time: 15.02 #2 Measured time: 15.01 #3 Measured time: 14.98

Target time: 30.00 seconds #1 Measured time: 29.98 #2 Measured time: 29.97 #3 Measured time: 30.00

Target time: 45.00 seconds #1 Measured time: 45.00 #2 Measured time: 45.01 #3 Measured time: 44.98

Target time: 60.00 seconds #1 Measured time: 60.00 #2 Measured time: 59.98 #3 Measured time: 60.02

Target time: 10.00 minutes #1 Measured time: 9.59.98 #2 Measured time: 9.59.98 #3 Measured time: 10.00.01

Target time: 30.00 minutes #1 Measured time: 30.00.03 #2 Measured time: 29.59.98 #3 Measured time: 30.00.01

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.

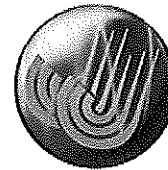
Technician Signature: [Signature] Date: 2/14/14

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

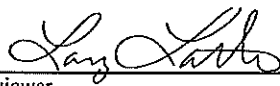
Parameter

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

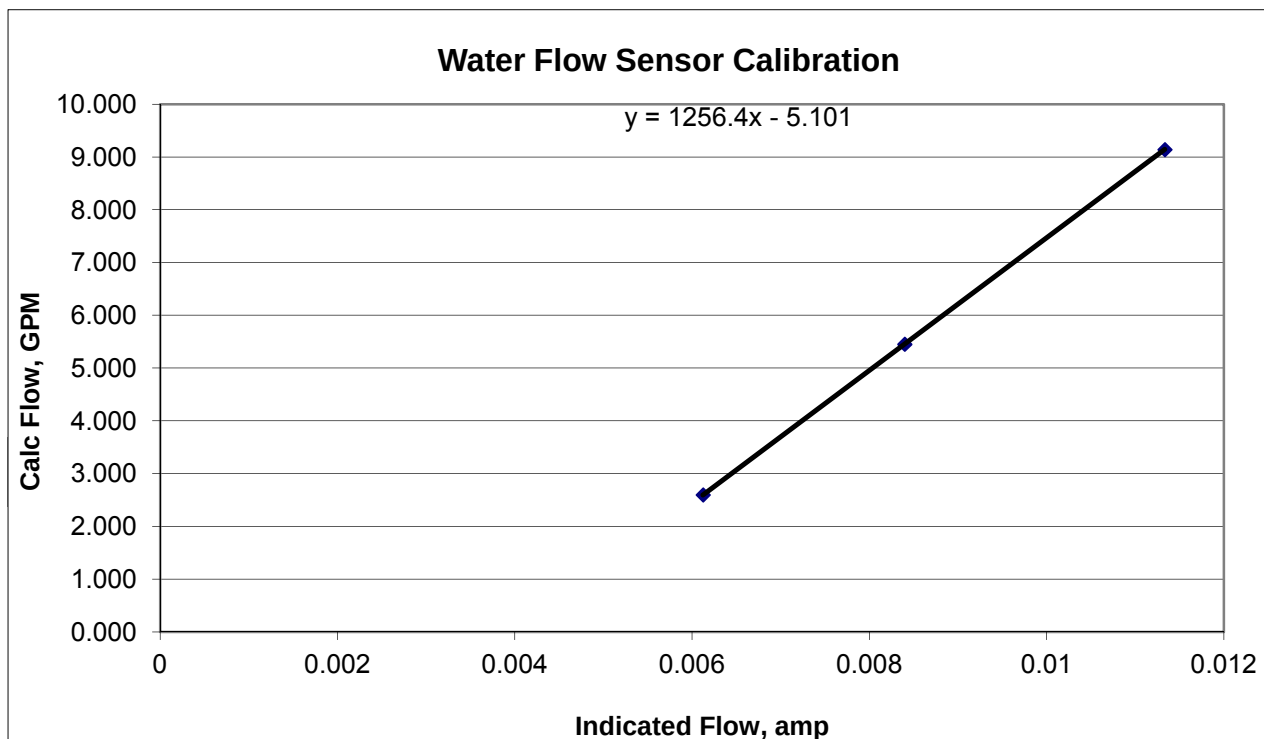
Rev # 14


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 350x Run 1 10/8/2014

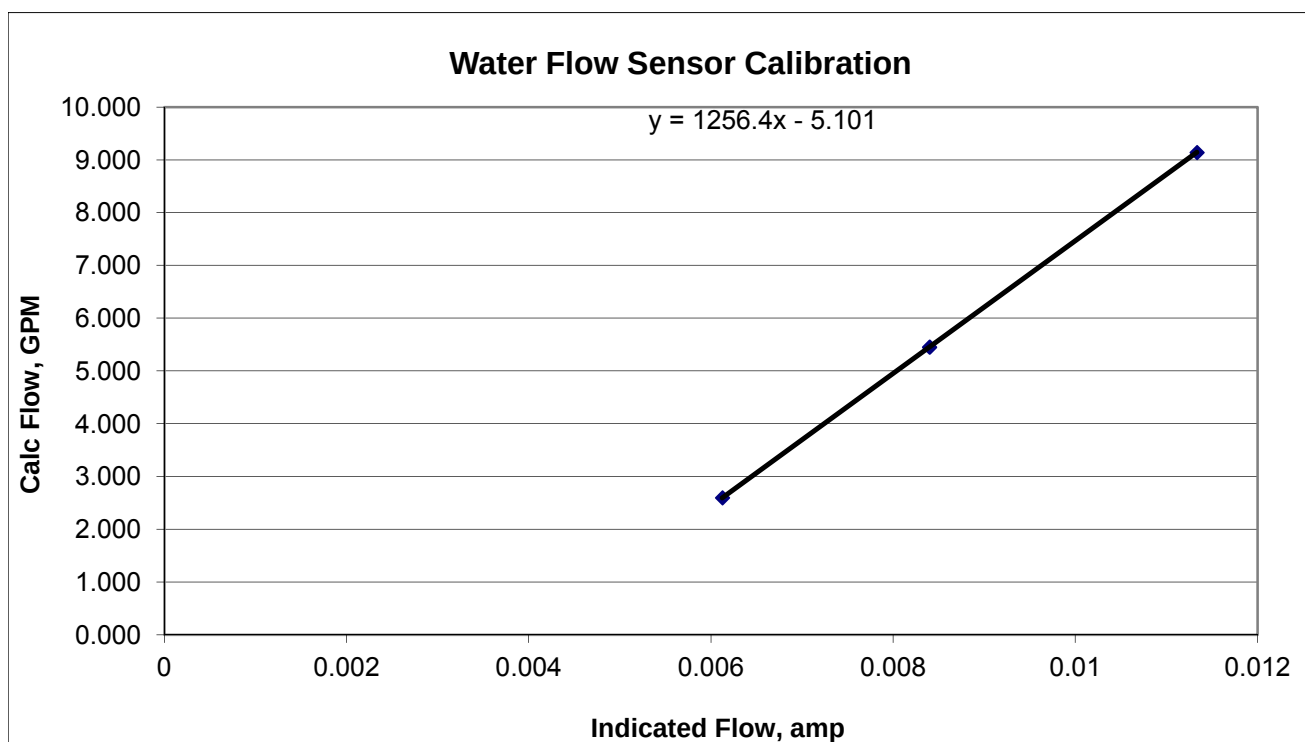
Time (min)	Water T (°F)	Water T (°C)	Density (kg/m ³)	Density (lb/gal)	Weight (lb)	Calc Flow (gpm)	Indicated Flow	Elapsed Test Time
2.31	66.96	19.4	998.351	8.332	100.4	5.22	5.19	Preburn
1.62	66.92	19.4	998.356	8.332	75	5.566	5.53	86 min
2.04	67.15	19.5	998.330	8.331	81.8	4.822	4.8	Post



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 350x Run 2 10/8/2014

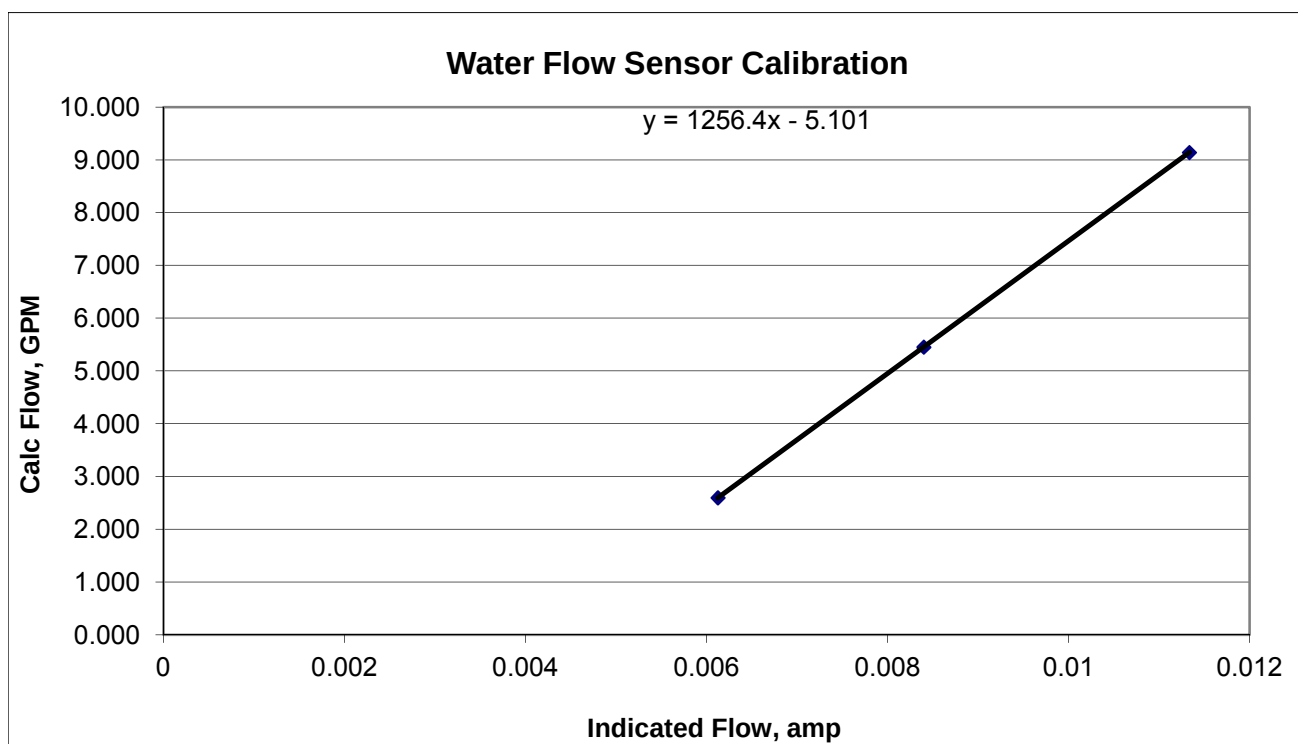
Time (min)	Water T (°F)	Water T (°C)	Density (kg/m ³)	Density (lb/gal)	Weight (lb)	Calc Flow (gpm)	Indicated Flow	Elapsed Test Time
3.46	67.69	19.8	998.269	8.331	73.7	2.56	2.56	Preburn
2.50	67.87	19.9	998.249	8.331	59.3	2.847	2.8	29 min
5.43	68.43	20.2	998.184	8.330	112.3	2.481	2.46	80 min
5.25	68.95	20.5	998.123	8.330	63.4	1.450	1.42	165 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 350x Run 3 10/9/2014

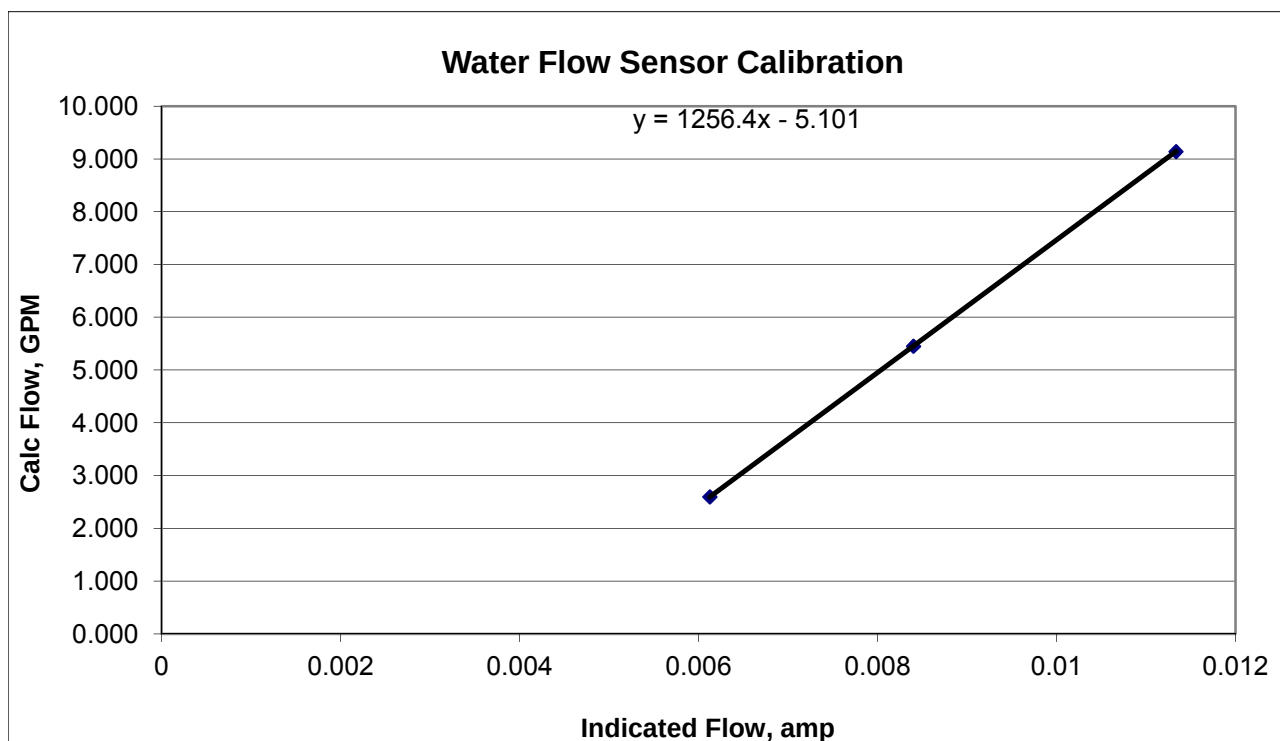
Time (min)	Water T (°F)	Water T (°C)	Density (kg/m ³)	Density (lb/gal)	Weight (lb)	Calc Flow (gpm)	Indicated Flow	Elapsed Test Time
8.12	68.8	20.4	998.141	8.330	66	0.98	0.97	Preburn
6.99	69.7	20.9	998.034	8.329	38	0.653	0.65	80 min
30.96	70.28	21.3	997.964	8.328	226.3	0.878	0.87	240 min
6.00	30.38	-0.9	999.799	8.344	33	0.659	0.65	600 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 350x Run 4 10/10/2014

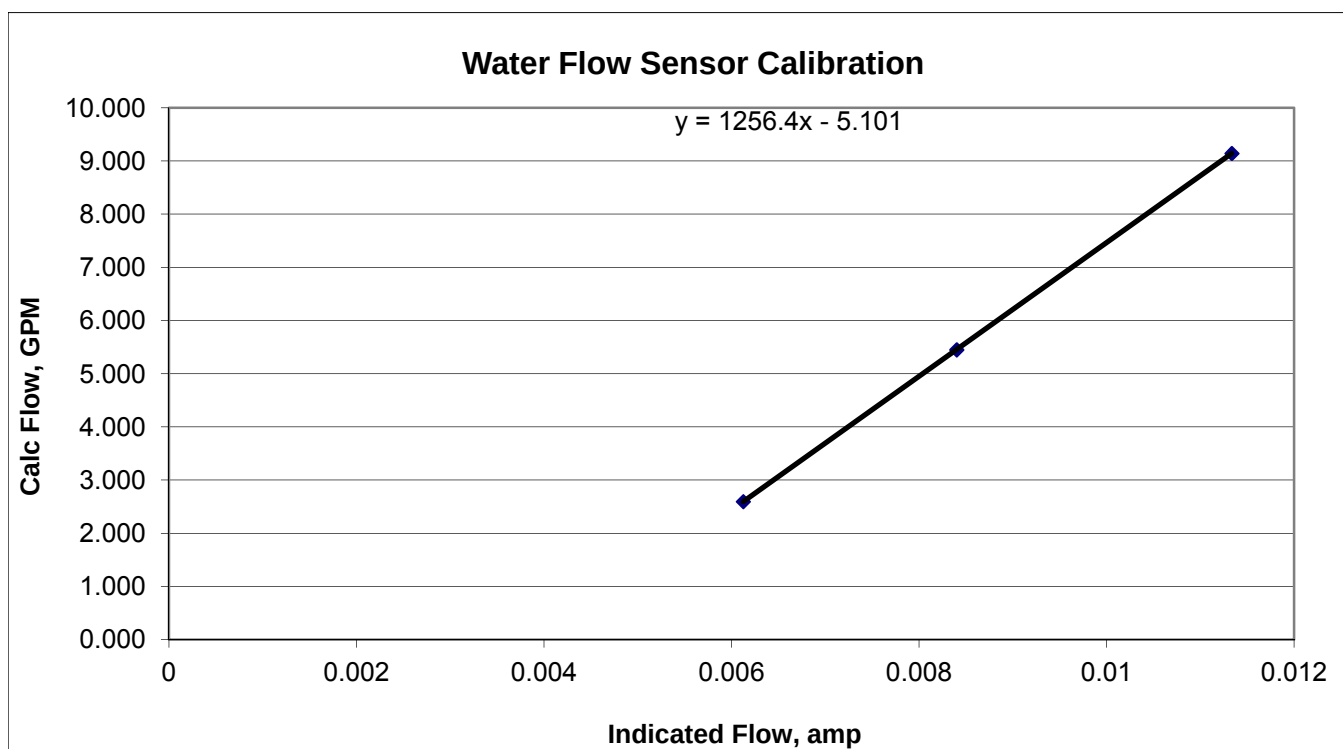
Time (min)	Water T (°F)	Water T (°C)	Density (kg/m ³)	Density (lb/gal)	Weight (lb)	Calc Flow (gpm)	Indicated Flow	Elapsed Test Time
8.37	67.28	19.6	998.315	8.331	90.4	1.30	1.29	Preburn
8.00	66.34	19.1	998.419	8.332	87.2	1.31	1.3	End



Density = $1000(1 - (T+288.9414)/(508929.2*(T+68.12963))*(T-3.9863)^2)$ kg/m³
 1 kg/m³ = 0.008345404 lb/gal

Heatmor 350x Run 5 11/7/2014

Time (min)	Water T (°F)	Water T (°C)	Density (kg/m ³)	Density (lb/gal)	Weight (lb)	Calc Flow (gpm)	Indicated Flow	Elapsed Test Time
1.99	60.55	15.9	998.994	8.337	102.9	6.21	6.16	Preburn
2.00	61.08	16.2	998.947	8.337	68.5	4.108	4.08	24 min
2.00	60.64	15.9	998.986	8.337	96.6	5.785	5.76	53 min
2.08	60.7	15.9	998.981	8.337	89.1	5.139	5.09	End



Section 3

Owner's Manual

Go To
Heatmor.com
for the most recent
Owners Manual

*Model: 350X
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: 350X
 Tracking No.: 2011
 Project No.: 0275WB011E.AD01
 Technician: A. Kravitz
 Comments:

Adjustable Parameters:	Category I	Category II	Category III	Category IV
Run Number:	3	4	2	5
Test Date:	10/9/14	10/10/14	10/8/14	11/7/14
Total Fuel Weight (lb):	147.2	146.8	149.6	155.6
Average Moisture of Fuel (% dry):	21.5	22.6	22.6	23.1
Average Temperature of Appliance Water at Start of Test:	144.2	138.2	128.8	146.5
Average Temperature of Appliance Water at End of Test:	166.6	144.0	158.7	143.9
Average Thermopile Reading:	83.6	95.5	89.8	103.4
Average Load Side Liquid Flow Rate (gal/min):	0.8	1.2	2.4	5.0
Time Interval (min):	920	645	328	156
Burn Rate (kg/hr):	3.58	5.05	10.13	22.05
Emissions (g):	92.5	89.0	75.9	43.9

Constant Parameters:	Fuel Heating Value:	8600	Btu/lb	Higher Heating Value
	Heating Season Weighting			
	Category I Weighting Factor:	0.175		
	Category II Weighting Factor:	0.275		
	Category III Weighting Factor:	0.450		
	Category IV Weighting Factor:	0.100		
	Year Round Use Weighting			
	Category I Weighting Factor:	0.437		
	Category II Weighting Factor:	0.238		
	Category III Weighting Factor:	0.275		
	Category IV Weighting Factor:	0.050		

Calculations:	Category I	Category II	Category III	Category IV	Totals
Heat Input (Btu):	1042137	1030082	1049504	1086744	
Heat Input Rate (Btu/hr):	67965	95822	191982	417978	
Appliance Water Specific Heat (Btu/lb°F):	1.001	1.001	1.001	1.001	
Heat Output (Btu):	558936	626580	649111	664513	
Heat Output Rate (Btu/hr):	36452	58287	118740	255582	
Total Particulate Emissions (g):	92.5	89.0	75.9	43.9	
Time Interval (hr):	15.3	10.8	5.5	2.6	
Emissions (g/kg):	1.7	1.6	1.4	0.8	
Heating Season Weighting:	0.294	0.451	0.617	0.077	1.4
Year Round Use Weighting:	0.735	0.390	0.377	0.038	1.5
Total Particulate Emissions Rate (g/MJ):	0.16	0.13	0.11	0.06	
Heating Season Weighting:	0.027	0.037	0.050	0.006	0.12
Year Round Use Weighting:	0.069	0.032	0.030	0.003	0.13
Total Particulate Emissions Rate (lbs/mmbtu input):	0.20	0.19	0.16	0.09	
Heating Season Weighting:	0.034	0.052	0.072	0.009	0.17
Year Round Use Weighting:	0.085	0.045	0.044	0.004	0.18
Total Particulate Emissions Rate (lbs/mmbtu output):	0.365	0.313	0.258	0.146	
Heating Season Weighting:	0.064	0.086	0.116	0.015	0.28
Year Round Use Weighting:	0.159	0.075	0.071	0.007	0.31
Total Particulate Emissions Rate (g/hr 10,000BTU):	0.11	0.13	0.21	0.25	
Heating Season Weighting:	0.019	0.036	0.096	0.025	0.18
Year Round Use Weighting:	0.047	0.031	0.059	0.013	0.15
Emissions (g/hr):	6.0	8.3	13.9	16.9	
Heating Season Weighting:	1.06	2.28	6.25	1.69	11.3
Year Round Use Weighting:	2.64	1.97	3.82	0.84	9.3
Efficiency (%):	53.6	60.8	61.8	61.1	
Heating Season Weighting:	9.4	16.7	27.8	6.1	60.1
Year Round Use Weighting:	23.4	14.5	17.0	3.1	58.0
Target Load High:	38337	61340	127791	255582	
Target Load Low:	NA	40893	63895	NA	

Weighted Emissions		8 Hr Burn Load		8 Hr Efficiency Rating	
Heating Season Use:	0.17 lbs/mmbtu input	X1 =	58287	X1 =	60.8
Year Round Use:	0.18 lbs/mmbtu input	Y1 =	10.8	Y1 =	10.8
Heating Season Use:	0.2805 lbs/mmbtu output	X2 =	118740	X2 =	61.8
Year Round Use:	0.3121 lbs/mmbtu output	Y2 =	5.5	Y2 =	5.5

Weighted Efficiency		8 Hr Burn Load =		8 Hr Efficiency =	
Heating Season Use:	60.1 %	89753 Btu/hr			
Year Round Use:	58.0 %	61.4 %			

EPA Method 28 WHH Test Standard

Manufacturer: Heatmor
 Model: 350X
 Tracking No.: 2011
 Project No.: 0275WB011E.AD01
 Technician: A. Kravitz
 Comments: _____

Adjustable Parameters:	Category I	Category II	Category III	Category IV
Run Number:	3	4	2	5
Test Date:	10/9/14	10/10/14	10/8/14	11/7/14
Total Fuel Weight (lb):	147.2	146.8	149.6	155.6
Average Moisture of Fuel (% dry):	21.5	22.6	22.6	23.1
Average Temperature of Appliance Water at Start of Test:	144.2	138.2	128.8	146.5
Average Temperature of Appliance Water at End of Test:	166.6	144.0	158.7	143.9
Average Thermopile Reading:	83.6	95.5	89.8	103.4
Average Load Side Liquid Flow Rate (gal/min):	0.8	1.2	2.4	5.0
Time Interval (min):	920	645	328	156
Burn Rate (kg/hr):	3.58	5.05	10.13	22.05
Emissions (g):	92.5	89.0	75.9	43.9

Constant Parameters:	Fuel Heating Value: <u>7988</u>	Btu/lb	Lower Heating Value
	Heating Season Weighting		
	Category I Weighting Factor: <u>0.175</u>		
	Category II Weighting Factor: <u>0.275</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>0.437</u>		
	Category II Weighting Factor: <u>0.238</u>		
	Category III Weighting Factor: <u>0.275</u>		
	Category IV Weighting Factor: <u>0.050</u>		

Calculations:	Category I	Category II	Category III	Category IV	Totals
Heat Input (Btu):	967976	956779	974818	1009408	
Heat Input Rate (Btu/hr):	63129	89003	178320	388234	
Appliance Water Specific Heat (Btu/lb°F):	1.001	1.001	1.001	1.001	
Heat Output (Btu):	558936	626580	649111	664513	
Heat Output Rate (Btu/hr):	36452	58287	118740	255582	
Total Particulate Emissions (g):	92.5	89.0	75.9	43.9	
Time Interval (hr):	15.3	10.8	5.5	2.6	
Emissions (g/kg):	1.7	1.6	1.4	0.8	
Heating Season Weighting:	0.294	0.451	0.617	0.077	1.4
Year Round Use Weighting:	0.735	0.390	0.377	0.038	1.5
Total Particulate Emissions Rate (g/MJ):	0.16	0.13	0.11	0.06	
Heating Season Weighting:	0.027	0.037	0.050	0.006	0.12
Year Round Use Weighting:	0.069	0.032	0.030	0.003	0.13
Total Particulate Emissions Rate (lbs/mmbtu input):	0.21	0.21	0.17	0.10	
Heating Season Weighting:	0.037	0.056	0.077	0.010	0.18
Year Round Use Weighting:	0.092	0.049	0.047	0.005	0.19
Total Particulate Emissions Rate (lbs/mmbtu output):	0.36	0.31	0.26	0.15	
Heating Season Weighting:	0.064	0.086	0.116	0.015	0.28
Year Round Use Weighting:	0.159	0.075	0.071	0.007	0.31
Total Particulate Emissions Rate (g/hr 10,000BTU):	0.11	0.13	0.21	0.25	
Heating Season Weighting:	0.019	0.036	0.096	0.025	0.18
Year Round Use Weighting:	0.047	0.031	0.059	0.013	0.15
Emissions (g/hr):	6.0	8.3	13.9	16.9	
Heating Season Weighting:	1.06	2.28	6.25	1.69	11.3
Year Round Use Weighting:	2.64	1.97	3.82	0.84	9.3
Efficiency (%):	57.7	65.5	66.6	65.8	
Heating Season Weighting:	10.1	18.0	30.0	6.6	64.7
Year Round Use Weighting:	25.2	15.6	18.3	3.3	62.4
Target Load High:	38337	61340	127791	255582	
Target Load Low:	NA	40893	63895	NA	

Weighted Emissions	
Heating Season Use:	0.18 lbs/mmbtu input
Year Round Use:	0.19 lbs/mmbtu input
Heating Season Use:	0.28 lbs/mmbtu output
Year Round Use:	0.31 lbs/mmbtu output

8 Hr Efficiency Rating	
X1 =	65.5
Y1 =	10.8
X2 =	66.6
Y2 =	5.5

Weighted Efficiency %		8 Hr Efficiency =	66.1 %
Heating Season Use:	64.7 %		
Year Round Use:	62.4		

Hydronic Heating Appliances - Test Method 28 WHH Conditioning

Manufacturer: Heatmor
 Model: 350X
 Tracking No.: 2011
 Project No.: 0275WB011E.AD01
 Test Date: _____
 Technician: A. Kravitz
 Operation Category: II

 Stove Weight (lb): 3159
 Water Weight (lb): 2170

Elapsed Time (hr)	Flue Gas Temp (degrees F)
0	388.0
1	462.0
2	380.0
3	178.0
4	503.0
5	445.0
6	535.0
7	180.0
8	132.0
9	406.0
10	144.0
11	128.0
12	285.0
13	144.0
14	124.0
15	437.0
16	245.0
17	138.0
18	121.0
19	342.0
20	293.0
21	252.0
22	221.0
23	186.0
24	156.0
25	126.0
26	355.0
27	208.0
28	120.0
29	409.0
30	314.0
31	157.0
32	127.0
33	215.0
34	164.0
35	142.0
36	122.0
37	544.0
38	275.0
39	147.0
40	127.0
41	509.0
42	191.0
43	137.0
44	121.0
45	442.0
46	281.0
47	145.0
48	125.0
49	145.0
50	225.0

*Model: 350X
Heatmor
105 Industrial Park Ct. NE, P.O. Box 787
Warroad, MN 56763*

Run 1

Hydronic Heating Appliances - Test Method 28 WHH Results

Manufacturer: Heatmor
 Model: 350X
 Tracking No.: 2011
 Project No.: 0275WB011E.AD01
 Run: 1
 Test Date: October 8, 2014

Burn Rate	24.43 kg/hr dry
Average Tunnel Temperature	236 degrees Fahrenheit
Average Gas Velocity in Dilution Tunnel - vs	11.0 feet/second
Average Gas Flow Rate in Dilution Tunnel - Qsd	23219 dscf/hour
Average Delta p	0.021 inches H2O
Average Delta H	0.86 inches H2O
Total Time of Test	136 minutes

	SAMPLE TRAIN 1	SAMPLE TRAIN 2	AMBIENT SAMPLE TRAIN
Total Sample Volume - Vm	13.40 cubic feet	13.06 cubic feet	53.23 cubic feet
Average Gas Meter Temperature	76 degrees Fahrenheit	76 degrees Fahrenheit	72 degrees Fahrenheit
Total Sample Volume (Standard Conditions) - Vmstd	13.4 dscf	13.1 dscf	52.5 dscf
Total Particulates - mn	23.9 mg	21.3 mg	5.4 mg
Particulate Concentration (dry-standard)	0.00179 grams/dscf	0.00162 grams/dscf	0.000103 grams/dscf
Particulate Emission Rate	88.59 grams	80.08 grams	
Difference from Average	4.26 grams	4.26 grams	
Results Are Acceptable			

AVERAGE	
Total Sample Volume - Vm	13.23 cubic feet
Average Gas Meter Temperature	76 degrees Fahrenheit
Total Sample Volume (Standard Conditions) - Vmstd	13.2 dscf
Total Particulates - mn	
Particulate Concentration (dry-standard)	0.00160 grams/dscf
Particulate Emission Rate	84.34 grams
7.5% of the average emission rate	6.33 grams

Hydronic Heating Appliances - Test Method 28 WHH
Test Data

Run: 1

Manufacturer: Heatmor

Model: 350X

Tracking No.: 2011

Project No.: 0275WB011E.AD01

Test Date: October 8, 2014

Technician: A. Kravitz

Beginning Clock Time: 11:33

Recording Interval: 1 min.

Total Sampling Time: 136 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	0.014	0.026	0.026	0.028	0.024	0.014	0.016	0.022	0.024	0.028	0.022	0.012	*H2O
Initial Temp.	205	205	205	205	205	205	205	205	205	205	205	205	oF
Air Velocity: Initial: <50 Final: <50													
Scale Audit: Pre: 10.0 Post: 10.0													
Pitot Tube Leak Test: Pre: 0 Post: 0 Induced Draft: 0													
Flue Pipe Cleaned Prior to First Test in Series: % Smoke Capture: 100													
Date: 10/7/2014													

PM Control Module:

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: -0.300 "H2O

Pitot Tube Cp: 0.99

Meter Box Y Factor: (1) 1.007 (2) 1.012 (amb) 0.989

Barometric Pressure: Begin Middle End Average 30.08 30.07 30.06 30.07 "Hg

Signature/Date:

Tunnel Velocity: 11.00 ft/sec.

Initial Tunnel Flow: 394.8 scfm

Average Tunnel Flow: 387.0 scfm

Tunnel Area: 0.785 ft2

Post-Test Leak Check (1): 0 cfm@"Hg

Post-Test Leak Check (2): 0.009 cfm@"Hg

Fuel Moisture (dry basis %): 22.2

Total Particulate (1): 23.9

Total Particulate (2): 21.3

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			
0	0.000	0.000	0.000			0.01	0.03	0.00	72	71	71	1.62	1.00	205	0.021			149.2		4.01		84.6	153.6	135.7	67.2	151.7	455	69	71	71	0.000	1.001	33.378	
1	0.099	0.096	0.391	0.10	0.10	0.95	1.20	0.00	72	71	71	1.08	0.30	140	0.021	94	94	148.0	1.20	4.02		84.9	153.6	135.8	67.2	151.8	421	68	71	71	0.000	1.001	33.461	2844
2	0.197	0.192	0.783	0.10	0.10	0.97	1.22	0.00	72	71	71	1.06	0.30	157	0.021	95	95	147.0	1.00	4.00		84.8	153.4	135.6	67.2	151.6	407	70	72	71	0.000	1.001	33.294	2827
3	0.296	0.288	1.174	0.10	0.10	0.93	1.23	0.00	72	71	71	1.07	0.20	178	0.021	96	97	146.0	1.00	4.01		84.8	152.8	135.2	67.2	151.1	431	71	73	71	0.000	1.001	33.378	2833
4	0.394	0.384	1.566	0.10	0.10	0.93	1.23	0.00	72	71	71	1.07	0.20	191	0.021	97	98	145.0	1.00	4.05		84.0	152.7	135.2	67.2	150.9	453	72	75	71	0.000	1.001	33.711	2834
5	0.493	0.480	1.957	0.10	0.10	0.93	1.23	0.00	72	71	71	1.06	0.20	200	0.021	98	98	144.0	1.00	3.96		83.9	152.9	135.5	67.2	151.1	474	73	76	71	0.000	1.001	32.961	2770
6	0.591	0.576	2.349	0.10	0.10	0.93	1.24	0.00	72	72	71	1.06	0.20	208	0.021	99	99	142.0	2.00	4.06		84.0	153.2	135.4	67.2	151.4	496	74	77	71	0.000	1.001	33.794	2843
7	0.690	0.672	2.740	0.10	0.10	0.93	1.23	0.00	72	72	71	1.05	0.20	214	0.021	99	99	141.0	1.00	4.05		84.6	153.4	135.7	67.2	151.6	517	75	79	71	0.000	1.001	33.711	2856
8	0.788	0.768	3.131	0.10	0.10	0.92	1.24	0.00	72	72	71	1.05	0.20	220	0.021	100	100	140.0	1.00	4.03		84.7	153.6	135.8	67.2	151.8	533	75	80	71	0.000	1.001	33.544	2843
9	0.887	0.864	3.523	0.10	0.10	0.91	1.23	0.00	72	72	71	1.04	0.20	225	0.021	100	100	138.0	2.00	4.01		84.9	153.9	136.1	67.2	152.1	551	77	81	71	0.000	1.001	33.378	2835
10	0.985	0.960	3.914	0.10	0.10	0.91	1.22	0.00	72	72	71	1.04	0.20	231	0.021	100	100	136.0	2.00	4.02		85.2	154.4	136.4	67.2	152.5	574	78	82	71	0.000	1.001	33.461	2853
11	1.084	1.056	4.306	0.10	0.10	0.91	1.23	0.00	72	72	71	1.04	0.20	241	0.021	101	101	135.0	1.00	4.00		85.6	154.8	136.8	67.2	153.0	618	77	81	71	0.000	1.001	33.294	2855
12	1.182	1.153	4.697	0.10	0.10	0.91	1.22	0.00	72	72	71	1.03	0.20	248	0.021	102	102	133.0	2.00	3.97		86.1	155.6	137.4	67.3	153.8	641	75	80	71	0.000	1.001	33.044	2847
13	1.281	1.249	5.089	0.10	0.10	0.90	1.21	0.00	72	72	71	1.03	0.20	253	0.021	102	102	131.0	2.00	4.38		86.8	156.8	136.6	67.2	154.3	651	75	82	71	0.000	1.001	36.457	3166
14	1.379	1.345	5.480	0.10	0.10	0.93	1.19	0.00	73	72	71	1.01	0.10	257	0.021	102	102	130.0	1.00	4.43		87.1	157.8	137.5	67.2	155.3	660	75	83	71	0.000	1.001	36.873	3216
15	1.478	1.441	5.872	0.10	0.10	0.92	1.07	0.00	73	72	71	1.00	-0.80	259	0.021	102	102	128.0	2.00	4.60		88.2	158.8	137.4	67.2	156.0	666	76	81	71	0.000	1.001	38.288	3382
16	1.576	1.537	6.263	0.10	0.10	0.92	1.22	0.00	73	73	71	1.00	-8.60	260	0.021	102	102	126.0	2.00	5.02		89.2	159.6	136.1	67.2	155.9	671	77	78	71	0.000	1.001	41.784	3732
17	1.675	1.633	6.654	0.10	0.10	0.79	1.24	0.00	73	73	71	0.22	-8.60	262	0.021	102	102	124.0	2.00	5.06		89.1	160.5	136.7	67.2	156.8	675	76	78	71	0.000	1.001	42.118	3759
18	1.774	1.729	7.046	0.10	0.10	0.46	1.23	0.00	73	73	71	1.17	-8.60	264	0.021	103	103	122.0	2.00	5.10		89.9	161.2	137.3	67.2	157.5	679	76	79	71	0.000	1.001	42.450	3819
19	1.872	1.825	7.437	0.10	0.10	0.89	1.28	0.00	73	73	71	1.06	0.10	266	0.021	103	103	120.0	2.00	5.04		90.5	161.9	137.9	67.2	158.3	686	82	585	71	0.000	1.001	41.951	3799
20	1.971	1.921	7.829	0.10	0.10	0.89	1.23	0.00	73	73	71	1.04	0.20	267	0.021	103	103	118.0	2.00	5.08		91.4	162.6	138.4	67.2	158.9	691	83	78	71	0.000	1.001	42.284	3868
21	2.069	2.017	8.220	0.10	0.10	0.88	1.24	0.00	73	73	71	1.02	0.20	268	0.021	103	103	116.0	2.00	5.06		91.5	163.5	139.0	67.2	159.9	692	84	79	71	0.000	1.001	42.117	3858
22	2.168	2.113	8.612	0.10	0.10	0.87	1.24	0.00	73	73	71	1.00	0.20	269	0.021	103	103	114.0	2.00	5.05		92.9	164.3	139.4	67.2	160.6	693	85	78	71	0.000	1.001	42.034	3910
23	2.266	2.209	9.003	0.10	0.10	0.90	1.24	0.00	73	73	71	0.97	0.20	270	0.021	103	103	112.0	2.00	5.13		93.2	165.1	139.9	67.2	161.3	693	85	78	71	0.000	1.001	42.700	3986
24	2.365	2.305	9.394	0.10	0.10	0.88	1.23	0.00	73	74	71	0.95	0.20	269	0.021	103	103	110.0	2.00	5.45		94.4	165.9	139.1	67.2	161.4	694	84	78	71	0.000	1.001	45.364	4289
25	2.463	2.401	9.786	0.10	0.10	0.89	1.22	0.00	74	74	71	-1.20	0.20	270	0.021	103	103	108.0	2.00	5.54		94.1	166.5	139.4	67.2	161.9	695	79	80	71	0.000	1.001	46.113	4345
26	2.562	2.497	10.177	0.10	0.10	0.84	1.22	0.00	74	74	72	-8.30	0.20	270	0.021	103	103	107.0	1.00	5.49		94.9	167.1	139.8	67.2	162.5	697	79	81	72	0.000	1.001	45.697	4342
27	2.660	2.593	10.569	0.10	0.10	0.29	1.23	0.00	74	74	72	1.64	0.10	270	0.021	103	103	105.0	2.00	5.44		95.5	167.8	140.5	67.2	163.2	700	3218	82	72	0.000	1.001	45.281	4330
28	2.759	2.689	10.960	0.10	0.10	0.45	1.21	0.00	74	74	71	1.01	0.10	270	0.021	103	103	103.0	2.00	5.46		96.2	168.5	141.0	67.1	163.8	701	78	83	71	0.000	1.001	45.448	4378
29	2.857	2.785	11.352	0.10	0.10	0.90	1.22	0.00	74	74	72	0.99	0.10	271	0.021	103	103	101.0	2.00	5.48		96.7	169.1	141.2	67.1	164.4	705	84	84	72	0.000	1.001	45.614	4418
30	2.956	2.881	11.743	0.10	0.10	0.89	1.20	0.00	74	74	72	0.98	0.00	271	0.021	103	103	99.6	1.40	5.47		97.7	169.7	141.6	67.1	165.0	705	82	83	72	0.000	1.001	45.531	4455
31	3.054	2.977	12.134	0.10	0.10	0.90	0.86	0.00	74	74	72	0.93	-8.00	272	0.021	103	103	97.7	1.90	5.36		98.1	170.4	142.5	67.0	165.7	703	82	73	72	0.000	1.001	44.616	4381
32	3.153	3.073	12.526	0.10	0.10	0.90	-0.02	0.00	74	74	72	0.90	1.00	272	0.021	103	103	95.9	1.80	5.46		98.8	171.1	142.8	67.0	166.4	701	82	850	72	0.000	1.001	45.448	4494
33	3.251	3.169	12.917	0.10	0.10	0.87	0.43	0.00	74	74	71	0.85	0.20	272	0.021	103	103	94.3	1.60	5.48		99.7	171.6	142.8	67.0	166.8	699	81	76	71	0.000	1.001	45.615	4551

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	3.350	3.265	13.309	0.10	0.10	0.87	1.24	0.00	74	75	72	0.71	0.20	271	0.021	103	103	92.6	1.70	5.45		99.7	172.2	143.4	67.0	167.3	697	82	77	72	0.000	1.001	45.365	4528		
35	3.449	3.362	13.700	0.10	0.10	0.89	1.24	0.00	75	75	72	0.49	0.20	271	0.021	103	103	91.0	1.60	5.53		100.5	172.7	143.7	67.0	167.9	692	80	78	72	0.000	1.001	46.031	4634		
36	3.547	3.458	14.092	0.10	0.10	0.88	1.24	0.00	75	75	72	0.28	0.20	270	0.021	103	103	89.2	1.80	5.49		101.0	173.4	144.0	67.0	168.4	688	81	78	72	0.000	1.001	45.698	4621		
37	3.646	3.554	14.483	0.10	0.10	0.81	1.24	0.00	75	75	72	0.00	0.20	269	0.021	103	103	87.5	1.70	5.58		101.6	174.0	144.2	67.0	168.8	685	84	79	72	0.000	1.001	46.447	4726		
38	3.744	3.650	14.874	0.10	0.10	0.54	1.23	0.00	75	75	72	0.64	0.20	270	0.021	103	103	85.8	1.70	5.87		102.2	174.3	143.3	67.0	168.6	684	3218	80	72	0.000	1.001	48.861	5000		
39	3.843	3.746	15.266	0.10	0.10	0.78	1.22	0.00	75	75	72	0.00	0.20	270	0.021	103	103	84.1	1.70	5.83		101.8	174.5	143.6	67.0	168.8	684	77	81	72	0.000	1.001	48.528	4944		
40	3.941	3.842	15.657	0.10	0.10	0.91	1.22	0.00	75	75	72	0.00	0.20	270	0.021	103	103	82.4	1.70	5.94		102.1	174.9	143.5	66.9	169.2	684	74	82	72	0.000	1.001	49.444	5054		
41	4.040	3.938	16.049	0.10	0.10	0.92	1.19	0.00	75	75	72	0.01	0.10	270	0.021	103	103	80.6	1.80	6.24		102.4	175.3	142.1	66.9	168.3	684	72	84	72	0.000	1.001	51.941	5326		
42	4.138	4.034	16.440	0.10	0.10	0.91	1.14	0.00	75	75	72	0.01	-1.30	269	0.021	103	103	78.8	1.80	6.30		101.5	175.4	142.2	66.9	168.5	684	71	84	72	0.000	1.001	52.441	5327		
43	4.237	4.130	16.832	0.10	0.10	0.93	0.19	0.00	75	75	72	0.07	1.00	269	0.021	103	103	77.2	1.60	6.27		101.7	175.7	142.4	66.9	168.8	682	73	3218	72	0.000	1.001	52.191	5315		
44	4.335	4.226	17.223	0.10	0.10	0.90	0.83	0.00	75	75	72	0.09	0.10	268	0.021	102	103	75.4	1.80	6.28		102.1	175.8	142.3	66.9	168.9	679	73	86	72	0.000	1.001	52.274	5343		
45	4.434	4.322	17.615	0.10	0.10	0.91	1.24	0.00	75	76	72	0.11	0.10	268	0.021	102	102	74.0	1.40	6.27		102.2	176.1	142.6	66.9	169.2	677	75	88	72	0.000	1.001	52.191	5339		
46	4.532	4.418	18.006	0.10	0.10	0.92	1.23	0.00	75	76	73	-0.10	0.10	267	0.021	102	102	72.4	1.60	6.26		102.3	176.1	142.6	66.9	169.2	675	75	86	73	0.000	1.001	52.108	5338		
47	4.631	4.514	18.397	0.10	0.10	0.19	1.22	0.00	76	76	72	1.64	0.10	267	0.021	102	102	70.6	1.80	6.27		102.3	176.2	142.7	66.9	169.3	675	3218	85	72	0.000	1.001	52.191	5346		
48	4.729	4.610	18.789	0.10	0.10	0.01	1.23	0.00	75	76	72	1.64	0.10	266	0.021	102	102	69.2	1.40	6.30		102.5	176.3	142.9	66.9	169.4	673	3218	85	72	0.000	1.001	52.441	5380		
49	4.828	4.706	19.180	0.10	0.10	0.44	1.20	0.00	76	76	72	1.64	0.10	265	0.021	102	102	67.7	1.50	6.27		102.3	176.5	142.8	66.9	169.6	674	74	85	72	0.000	1.001	52.191	5348		
50	4.926	4.802	19.572	0.10	0.10	0.52	1.22	0.00	76	76	72	0.83	0.10	264	0.021	102	102	66.2	1.50	6.33		102.5	176.5	142.9	66.9	169.9	672	77	85	72	0.000	1.001	52.691	5406		
51	5.025	4.898	19.963	0.10	0.10	0.91	1.21	0.00	76	76	72	1.03	0.00	262	0.021	102	102	64.7	1.50	6.61		103.4	176.7	141.5	66.9	168.8	667	76	86	72	0.000	1.001	55.021	5694		
52	5.124	4.994	20.355	0.10	0.10	0.91	1.20	0.00	76	76	72	1.03	0.00	261	0.021	102	102	63.3	1.40	6.73		101.6	176.2	140.6	66.9	168.1	663	75	86	72	0.000	1.001	56.021	5696		
53	5.222	5.090	20.746	0.10	0.10	0.90	1.19	0.00	76	76	72	1.02	0.00	260	0.021	102	102	62.0	1.30	6.74		101.2	175.9	140.6	66.9	167.9	659	76	86	72	0.000	1.001	56.104	5682		
54	5.321	5.186	21.137	0.10	0.10	0.90	1.19	0.00	76	76	72	1.02	0.00	259	0.021	102	102	60.6	1.40	6.70		101.4	175.9	140.7	66.9	168.0	656	76	86	72	0.000	1.001	55.771	5659		
55	5.419	5.282	21.529	0.10	0.10	0.89	1.21	0.00	76	76	72	0.99	-0.10	258	0.021	102	102	59.4	1.20	6.78		101.2	175.6	140.0	66.9	167.4	652	77	86	72	0.000	1.001	56.437	5720		
56	5.518	5.378	21.920	0.10	0.10	0.91	1.21	0.00	76	77	73	0.97	-0.20	258	0.021	102	101	57.9	1.50	6.79		101.0	175.5	139.9	66.9	167.3	650	78	86	73	0.000	1.001	56.520	5713		
57	5.616	5.475	22.312	0.10	0.10	0.91	1.21	0.00	76	77	72	0.96	-0.20	257	0.021	102	101	56.6	1.30	6.72		100.8	175.4	140.0	66.9	167.3	646	78	86	72	0.000	1.001	55.937	5643		
58	5.715	5.571	22.703	0.10	0.10	0.90	1.18	0.00	76	77	73	0.96	-0.40	256	0.021	101	101	55.3	1.30	6.79		100.5	175.0	139.6	66.9	166.9	643	79	86	73	0.000	1.001	56.520	5689		
59	5.813	5.667	23.095	0.10	0.10	0.89	0.48	0.00	76	77	73	0.90	-7.90	255	0.021	101	101	54.0	1.30	6.78		100.4	174.8	139.5	66.8	166.6	640	79	2117	73	0.000	1.001	56.437	5675		
60	5.912	5.763	23.486	0.10	0.10	0.92	1.35	0.00	76	77	72	0.90	-1.30	254	0.021	101	101	52.7	1.30	6.75		100.0	174.5	139.4	66.8	166.4	637	80	75	72	0.000	1.001	56.187	5626		
61	6.010	5.859	23.877	0.10	0.10	0.90	1.22	0.00	76	77	73	0.88	-1.30	253	0.021	101	101	51.4	1.30	6.68		99.5	174.1	139.7	66.8	166.4	634	80	76	73	0.000	1.001	55.605	5537		
62	6.109	5.955	24.269	0.10	0.10	0.90	1.21	0.00	76	77	73	0.82	-1.30	252	0.021	101	101	50.3	1.10	6.36		99.0	174.1	141.0	66.8	167.4	631	80	75	73	0.000	1.001	52.941	5249		
63	6.207	6.051	24.660	0.10	0.10	0.90	1.22	0.00	77	77	73	0.83	-1.40	251	0.021	101	101	49.1	1.20	6.35		100.7	174.1	141.1	66.9	167.4	627	81	75	73	0.000	1.001	52.857	5327		
64	6.306	6.147	25.052	0.10	0.10	0.90	1.23	0.00	77	77	73	0.81	-1.40	251	0.021	101	101	47.8	1.30	6.32		100.4	173.9	141.0	66.8	167.1	627	81	76							

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	7.882	7.684	31.315	0.10	0.10	0.90	1.23	0.00	77	78	73	0.53	-2.40	238	0.021	100	100	30.6	0.90	6.14		97.9	170.5	139.4	66.9	164.3	591	75	79	73	0.000	1.001	51.109	5010	
81	7.981	7.780	31.706	0.10	0.10	0.90	1.23	0.00	77	78	73	0.52	-2.40	237	0.021	100	100	29.7	0.90	6.14		97.3	170.4	139.3	66.9	164.1	591	75	80	73	0.000	1.001	51.109	4978	
82	8.079	7.876	32.098	0.10	0.10	0.90	1.24	0.00	77	78	73	0.52	-2.40	237	0.021	100	100	28.7	1.00	6.15		97.1	170.1	139.1	66.9	163.9	592	75	80	73	0.000	1.001	51.192	4975	
83	8.178	7.972	32.489	0.10	0.10	0.90	1.22	0.00	77	78	73	0.52	-2.40	237	0.021	100	100	27.8	0.90	5.93		97.3	170.0	139.9	66.9	164.2	593	75	80	73	0.000	1.001	49.361	4808	
84	8.276	8.068	32.880	0.10	0.10	0.90	1.23	0.00	77	78	73	0.52	-2.40	236	0.021	100	100	26.9	0.90	5.45		96.9	170.3	142.1	66.9	165.6	590	75	80	73	0.000	1.001	45.366	4401	
85	8.375	8.164	33.272	0.10	0.10	0.90	1.23	0.00	77	78	73	0.51	-2.40	235	0.021	100	100	26.0	0.90	5.53		98.5	170.3	142.0	66.9	165.6	587	75	81	73	0.000	1.001	46.031	4538	
86	8.474	8.260	33.663	0.10	0.10	0.91	1.23	0.00	77	78	73	0.51	-2.40	234	0.021	100	100	25.1	0.90	5.49		98.7	170.4	142.0	66.9	165.7	584	75	81	73	0.000	1.001	45.698	4516	
87	8.572	8.356	34.055	0.10	0.10	0.91	1.24	0.00	77	78	73	0.51	-2.40	233	0.021	100	99	24.3	0.80	5.48		98.9	170.3	142.0	66.9	165.5	581	75	81	73	0.000	1.001	45.615	4515	
88	8.671	8.452	34.446	0.10	0.10	0.89	1.22	0.00	78	78	73	0.50	-2.40	232	0.021	99	99	23.5	0.80	5.36		98.9	170.3	142.6	66.9	165.9	579	75	81	73	0.000	1.001	44.616	4418	
89	8.769	8.548	34.838	0.10	0.10	0.90	1.23	0.00	78	78	73	0.51	-2.40	231	0.021	99	99	22.7	0.80	5.40		99.2	170.4	142.7	67.0	166.1	576	75	81	73	0.000	1.001	44.949	4462	
90	8.868	8.644	35.229	0.10	0.10	0.90	1.22	0.00	78	78	73	0.50	-2.40	230	0.021	99	99	21.9	0.80	5.53		98.8	170.2	142.0	67.0	165.6	573	75	81	73	0.000	1.001	46.031	4553	
91	8.966	8.740	35.620	0.10	0.10	0.90	1.21	0.00	78	78	73	0.51	-2.40	229	0.021	99	99	21.2	0.70	5.45		99.2	170.2	142.0	67.0	165.5	570	75	81	73	0.000	1.001	45.365	4504	
92	9.065	8.836	36.012	0.10	0.10	0.90	1.23	0.00	78	78	73	0.50	-2.40	228	0.021	99	99	20.4	0.80	5.53		98.7	170.2	142.0	66.9	165.5	571	76	81	73	0.000	1.001	46.031	4549	
93	9.163	8.932	36.403	0.10	0.10	0.90	1.22	0.00	78	78	73	0.50	-2.40	228	0.021	99	99	19.7	0.70	5.47		98.4	170.1	141.7	66.9	165.2	572	76	81	73	0.000	1.001	45.532	4487	
94	9.262	9.028	36.795	0.10	0.10	0.89	1.23	0.00	78	78	73	0.49	-2.40	228	0.021	99	99	18.9	0.80	5.25		98.6	170.1	142.7	67.0	165.7	573	76	81	73	0.000	1.001	43.700	4313	
95	9.360	9.124	37.186	0.10	0.10	0.88	1.23	0.00	78	78	73	0.49	-2.40	228	0.021	99	99	18.1	0.80	5.49		99.0	170.3	141.9	67.0	165.5	572	76	81	73	0.000	1.001	45.698	4528	
96	9.459	9.220	37.578	0.10	0.10	0.88	1.22	0.00	78	78	73	0.48	-2.40	227	0.021	99	99	17.5	0.60	5.47		98.7	170.2	142.0	67.0	165.5	571	76	81	73	0.000	1.001	45.532	4498	
97	9.557	9.316	37.969	0.10	0.10	0.89	1.24	0.00	78	78	73	0.49	-2.40	226	0.021	99	99	16.7	0.80	5.48		98.7	170.2	142.1	66.9	165.5	568	76	81	73	0.000	1.001	45.615	4508	
98	9.656	9.412	38.361	0.10	0.10	0.89	1.24	0.00	78	78	73	0.45	-2.40	225	0.021	99	99	16.2	0.50	5.45		98.8	170.0	141.9	66.9	165.3	564	76	81	73	0.000	1.001	45.365	4487	
99	9.754	9.508	38.752	0.10	0.10	0.92	1.24	0.00	78	78	73	0.44	-2.40	224	0.021	99	99	15.4	0.80	5.52		98.5	169.8	141.8	67.0	165.1	560	76	80	73	0.000	1.001	45.948	4533	
100	9.853	9.604	39.143	0.10	0.10	0.91	1.24	0.00	78	78	73	0.45	-2.30	222	0.021	99	99	14.9	0.50	5.48		98.3	169.7	141.7	67.0	165.0	554	76	80	73	0.000	1.001	45.615	4491	
101	9.951	9.700	39.535	0.10	0.10	0.92	1.24	0.00	78	78	73	0.45	-2.30	221	0.021	99	99	14.4	0.50	5.46		98.0	169.6	141.5	66.9	164.9	548	76	80	73	0.000	1.001	45.449	4460	
102	10.050	9.796	39.926	0.10	0.10	0.92	1.24	0.00	78	78	73	0.45	-2.30	220	0.021	99	99	13.8	0.60	5.53		98.1	169.3	141.3	67.0	164.5	546	76	80	73	0.000	1.001	46.031	4520	
103	10.149	9.893	40.318	0.10	0.10	0.92	1.24	0.00	78	78	73	0.45	-2.30	219	0.021	98	98	13.3	0.50	5.53		97.4	169.1	141.1	67.0	164.3	543	76	80	73	0.000	1.001	46.031	4487	
104	10.247	9.989	40.709	0.10	0.10	0.92	1.24	0.00	78	78	73	0.46	-2.30	218	0.021	98	98	12.8	0.50	5.45		97.7	168.7	140.9	67.0	164.0	539	76	80	73	0.000	1.001	45.365	4437	
105	10.346	10.085	41.101	0.10	0.10	0.92	1.25	0.00	78	78	73	0.46	-2.30	216	0.021	98	98	12.4	0.40	5.49		97.4	168.7	140.8	67.0	163.9	535	76	80	73	0.000	1.001	45.698	4457	
106	10.444	10.181	41.492	0.10	0.10	0.92	1.26	0.00	78	78	73	0.45	-2.30	215	0.021	98	98	11.8	0.60	5.48		97.3	168.1	140.5	67.0	163.4	531	76	79	73	0.000	1.001	45.615	4443	
107	10.543	10.277	41.883	0.10	0.10	0.92	1.24	0.00	78	78	73	0.46	-2.40	214	0.021	98	98	11.3	0.50	5.05		97.0	168.0	142.1	67.0	164.0	526	76	79	73	0.000	1.001	42.035	4083	
108	10.641	10.373	42.275	0.10	0.10	0.93	1.22	0.00	78	78	73	0.47	-2.40	212	0.021	98	98	10.9	0.40	5.10		97.1	167.9	142.2	67.0	164.2	522	75	79	73	0.000	1.001	42.452	4127	
109	10.740	10.469	42.666	0.10	0.10	0.93	1.22	0.00	78	78	73	0.48	-2.40	211	0.021	98	98	10.4	0.50	5.11		97.5	167.6	142.0	67.0	163.8	518	75	79	73	0.000	1.001	42.535	4150	
110	10.838	10.565	43.058	0.10	0.10	0.94	1.21	0.00	78	78	73	0.48	-2.40	211	0.021	98	98	9.9	0.50	5.08		96.9	167.5	141.9	67.0	163.7	515	75	79	73	0.000	1.001	42.285	4102	

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				
126	12.415	12.102	49.321	0.10	0.10	0.93	1.23	0.00	78	79	73	0.77	-1.90	200	0.021	97	97	3.6	0.40	4.77		93.6	163.7	140.2	67.0	160.4	480	74	77	73	0.000	1.001	39.705	3722	
127	12.513	12.198	49.712	0.10	0.10	0.93	1.26	0.00	78	79	73	0.78	-1.90	199	0.021	97	97	3.3	0.30	4.83		93.6	163.7	140.2	67.0	160.4	478	74	78	73	0.000	1.001	40.204	3768	
128	12.612	12.294	50.104	0.10	0.10	0.94	1.27	0.00	79	79	73	0.79	-1.80	198	0.021	97	97	2.9	0.40	4.82		93.3	163.3	140.0	67.0	160.1	477	74	79	73	0.000	1.001	40.121	3747	
129	12.710	12.390	50.495	0.10	0.10	0.96	1.30	0.00	79	79	73	0.80	-1.80	198	0.021	97	97	2.5	0.40	4.84		93.1	163.2	139.8	67.1	159.8	476	74	80	73	0.000	1.001	40.287	3753	
130	12.809	12.486	50.886	0.10	0.10	0.92	1.27	0.00	79	79	73	0.85	-1.40	197	0.021	97	97	2.2	0.30	4.79		92.7	163.0	139.7	67.1	159.8	474	74	80	73	0.000	1.001	39.871	3699	
131	12.907	12.582	51.278	0.10	0.10	0.90	1.20	0.00	79	79	73	0.86	-1.40	197	0.021	97	97	1.8	0.40	4.82		92.8	162.6	139.6	67.1	159.5	474	74	80	73	0.000	1.001	40.121	3727	
132	13.006	12.678	51.669	0.10	0.10	0.91	1.22	0.00	79	79	73	0.87	-1.30	197	0.021	97	97	1.6	0.20	4.81		92.6	162.5	139.2	67.1	159.2	476	74	80	73	0.000	1.001	40.037	3710	
133	13.104	12.774	52.061	0.10	0.10	0.91	1.25	0.00	79	79	73	0.88	-1.20	197	0.021	97	97	1.3	0.30	4.81		92.1	162.2	139.1	67.2	159.0	475	74	80	73	0.000	1.001	40.037	3691	
134	13.203	12.870	52.452	0.10	0.10	0.92	1.24	0.00	79	79	73	0.89	-1.10	197	0.021	97	97	0.9	0.40	4.78		92.0	162.0	139.1	67.1	158.9	476	74	80	73	0.000	1.001	39.788	3665	
135	13.301	12.966	52.844	0.10	0.10	0.94	1.24	0.00	79	79	73	0.90	-1.00	197	0.021	97	97	0.5	0.40	4.82		92.0	161.8	138.9	67.2	158.6	476	74	80	73	0.000	1.001	40.120	3696	
136	13.400	13.062	53.235	0.10	0.10	0.94	1.25	0.00	79	79	73	0.90	-0.90	197	0.021	97	97	0.0	0.50	4.81		91.7	161.5	138.6	67.2	158.3	475	74	80	73	0.000	1.001	40.037	3674	

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					
	13.400	13.062	53.235	0.10	0.10	0.86	1.16	0.00	76.07	76.29	72.36			235.90	0.02	100.00	100.00			5.46	#DIV/0!	96.2	167.9	140.3	67.0	163.1		214.15	149.53		0.00					

Page 1 of 1

350x WHH
4-12 of 4-80

[illegible]

Total Weight of Load (lb): 143.4

Total Moisture of Load (%): 22.2

Equipment Numbers:

Method 28 Hydronic Heater Run Sheets

Client: **Heatmor**Project Number: **0275WH011E.AD01** Run Number: **1**Model: **350x**Tracking Number: **2011**Date: **10/8/14**Test Crew: **A. Kravitz, J. Clark**

OMNI Equipment ID numbers: : 428A, 428B, 132, 209, 410, 417, 419, 513, 533, 559, 296-T55, 340, 353, 431, 23, 131, 343

WHH Run Notes

Preburn Settings

Target Output (%): **100%**Target Output (BTU/hr): **N/A**

Preburn Notes

TIME	NOTES
11:05	DAQ time = Computer time

Test Settings

Target Output (%): **100%**Target Output (BTU/hr): **N/A**

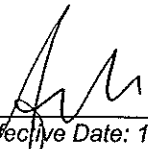
Start-Up Timeline

Fuel Loaded by: **11:15**Door Closed at: **1:24**

Notes: _____

Test Notes

TIME	NOTES
16:00 - 17:00	Filter changes for Train A & Train B (full sets)
28:00	Train A front filter swapped for B283
32:00	Train B front swapped for B284
49:00	Train A front swapped for ~~B285~~ B286
50:00	Train A back swapped for B287
70:00	Train B front swapped for B288
72:00	Train A front swapped for B289
34:00	Train B front swapped for B285

Technician Signature: 

Control No. P-SFDJ-0001, Effective Date: 10/8/2014

Date: **10/8/14**

Page 1 of 1

Method 28 Hydronic Heater Run Sheets

Client: **Heatmor**Project Number: **0275WH011E.AD01** Run Number: 1Model: **350x**Tracking Number: **2011** Date: 10/8/14Test Crew: **A. Kravitz, J. Clark**

OMNI Equipment ID numbers: : 428A, 428B, 132, 209, 410, 417, 419, 513, 533, 559, 296-T55, 340, 353, 431, 23, 131, 343

WHH Supplemental Data

Start Time: 11:33Booth #: E3Stop Time: 13:50

Stack Gas Leak Check:

Initial: 0 Final: 0

Sample Train Leak Check:

A: 0.000 @ -2 "HgB: 0.009 @ -5 "HgCalibrations: Span Gas CO₂: 16.80 O₂: N/A CO: 4.295Mid Gas CO₂: 9.87 O₂: N/A CO: 2.493

Time	Pre Test		
	Zero	Span	Mid
	<u>10:41</u>	<u>10:45</u>	<u>10:48</u>
O ₂	<u>N/A</u>	<u>N/A</u>	<u>N/A</u>
CO ₂	<u>0.06</u>	<u>16.80</u>	<u>10.26</u>
CO	<u>0.000</u>	<u>4.295</u>	<u>2.536</u>

Post Test		
Zero	Span	Mid
<u>13:54</u>	<u>13:56</u>	<u>13:52</u>
<u>N/A</u>	<u>N/A</u>	<u>N/A</u>
<u>0.76</u>	<u>15.90</u>	<u>10.67</u>
<u>0.042</u>	<u>4.301</u>	<u>2.491</u>

Air Velocity (ft/min): Initial: 450 Final: 450Scale Audit (lbs): Initial: 10.0 Final: 10.0Pitot Tube Leak Test: Initial: 0 Final: 0Stack Diameter (in): 8Induced Draft: 0% Smoke Capture: 100

Flue Pipe Cleaned Prior to First Test in Series:

Date: 10/8/14 Initials: AK

	Initial	Middle	Ending
P _b (in/Hg)	<u>30.08</u>	<u>30.07</u>	<u>30.06</u>
Ambient (°F)	<u>71</u>	<u>73</u>	<u>73</u>

Tunnel Traverse	
dP (in H ₂ O)	T (°F)
<u>0.014</u>	<u>205</u>
<u>0.026</u>	
<u>0.026</u>	
<u>0.028</u>	
<u>0.029</u>	
<u>0.014</u>	
<u>0.016</u>	
<u>0.022</u>	
<u>0.024</u>	
<u>0.026</u>	
<u>0.022</u>	
<u>0.012</u>	
Static P:	<u>-300</u>

Technician Signature: AK
Control No. P-SFDJ-0001, Effective Date: 10/8/2014Date: 10/8/14

OMNI-Test Laboratories, Inc.

Manufacturer: Heatmor
Model: 350x
Date: 11/07/14
Run: 1
Control #: 2011
Test Duration: 136
Output Category: IV

Technicians: A. Kravitz

Test Results in Accordance with CSA B415.1-09

	HHV Basis	LHV Basis
Overall Efficiency	70.3%	75.7%
Combustion Efficiency	95.8%	95.8%
Heat Transfer Efficiency	73%	79.0%

Output Rate (kJ/h)	341,731	324,168	(Btu/h)
Burn Rate (kg/h)	24.44	53.87	(lb/h)
Input (kJ/h)	486,076	461,096	(Btu/h)

Test Load Weight (dry kg)	55.40	122.11	dry lb
MC wet (%)	18.16		
MC dry (%)	22.19		
Particulate (g)	0		
CO (g)	3,207		
Test Duration (h)	2.27		

Emissions	Particulate	CO
g/MJ Output	0.00	4.14
g/kg Dry Fuel	0.00	57.88
g/h	0.00	1414.75
lb/MM Btu Output	0.00	9.62

Air/Fuel Ratio (A/F)	7.83
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VERSION:

2.3

3/23/2010

*Model: 350X
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: 350X
 Tracking No.: 2011
 Project No.: 0275WB011E.AD01
 Run: 2
 Test Date: October 8, 2014

Burn Rate	10.13 kg/hr dry
Average Tunnel Temperature	136 degrees Fahrenheit
Average Gas Velocity in Dilution Tunnel - vs	9.8 feet/second
Average Gas Flow Rate in Dilution Tunnel - Qsd	24061 dscf/hour
Average Delta p	0.019 inches H2O
Average Delta H	0.55 inches H2O
Total Time of Test	328 minutes

	SAMPLE TRAIN 1	SAMPLE TRAIN 2	AMBIENT SAMPLE TRAIN
Total Sample Volume - Vm	26.70 cubic feet	26.70 cubic feet	128.94 cubic feet
Average Gas Meter Temperature	82 degrees Fahrenheit	82 degrees Fahrenheit	76 degrees Fahrenheit
Total Sample Volume (Standard Conditions) - Vmstd	26.3 dscf	26.5 dscf	125.9 dscf
Total Particulates - mn	14.2 mg	16.5 mg	0.6 mg
Particulate Concentration (dry-standard)	0.00054 grams/dscf	0.00062 grams/dscf	0.000005 grams/dscf
Particulate Emission Rate	70.34 grams	81.40 grams	
Difference from Average	5.53 grams	5.53 grams	
Results Are Acceptable			

AVERAGE	
Total Sample Volume - Vm	26.70 cubic feet
Average Gas Meter Temperature	82 degrees Fahrenheit
Total Sample Volume (Standard Conditions) - Vmstd	26.4 dscf
Total Particulates - mn	
Particulate Concentration (dry-standard)	0.00058 grams/dscf
Particulate Emission Rate	75.87 grams
7.5% of the average emission rate	5.69 grams

Hydronic Heating Appliances - Test Method 28 WHH
Test Data

Run: 2
Manufacturer: Heatmor
Model: 350X
Tracking No.: 2011
Project No.: 0275WB011E.AD01
Test Date: October 8, 2014
Technician: A. Kravitz
Beginning Clock Time: 17:25
Recording Interval: 1 min.
Total Sampling Time: 328 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	0.024	0.024	0.016	0.014	0.012	0.022	0.024	0.026	0.022	0.012
Initial Temp.	80	80	80	80	80	80	80	80	80	80	80	80
Air Velocity:	Initial: <50				Final: <50							
Scale Audit:	Pre: 10.0				Post: 10.0				Induced Draft: 0			
Pitot Tube Leak Test:	Pre: 0				Post: 0				% Smoke Capture: 100			
Flue Pipe Cleaned Prior to First Test in Series: Date: 10/7/2014												

PM Control Module:
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: -0.280 "H2O
Pitot Tube Cp: 0.99

Meter Box Y Factor: (1) 1.007 (2) 1.012 (amb) 0.989
Barometric Pressure: Begin Middle End
30.01 30.02 30.04

Signature/Date:
Tunnel Velocity: 9.77 ft/sec.
Initial Tunnel Flow: 409.1 scfm
Average Tunnel Flow: 401.0 scfm
Tunnel Area: 0.785 ft2
Post-Test Leak Check (1): 0.001 cfm@"Hg
Post-Test Leak Check (2): 0.006 cfm@"Hg
Fuel Moisture (dry basis %): 22.6
Total Particulate (1): 14.2
Total Particulate (2): 16.5

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	0.0001			0.01	0.03	0	79	78	77	1.62	1	80.00	0.019			149.6		3.88		66.0	135.6	121.9	67.5	134.0	358	60	62	77	0.000	1.001	32.294	
1	0.081	0.081	0.393107	0.08	0.08	0.73	1.03	0	79	78	77	1.14	0.2	126	0.019	99	100	149.0	0.60	3.87		66.3	135.7	122.2	67.6	134.2	335	61	65	77	0.000	1.001	32.211	2139
2	0.163	0.163	0.786213	0.08	0.08	0.75	1.06	0	79	78	77	1.14	0.2	122	0.019	100	100	148.0	1.00	3.87		66.3	135.4	122.1	67.6	134.0	327	62	67	77	0.000	1.001	32.210	2138
3	0.244	0.244	1.17932	0.08	0.08	0.75	0.95	0	79	78	77	1.16	0.3	159	0.019	102	103	147.0	1.00	3.91		66.2	135.1	121.7	67.6	133.7	399	64	68	77	0.000	1.001	32.543	2157
4	0.326	0.326	1.572427	0.08	0.08	0.7	0.88	0	79	78	77	1.16	0.3	172	0.019	104	104	146.0	1.00	3.88		65.8	135.1	121.9	67.6	133.7	413	65	69	77	0.000	1.001	32.294	2129
5	0.407	0.407	1.965534	0.08	0.08	0.56	0.88	0	79	78	77	1.22	0.3	179	0.019	104	104	145.0	1.00	3.88		66.0	135.2	121.9	67.6	133.8	414	65	70	77	0.000	1.001	32.294	2134
6	0.488	0.488	2.35864	0.08	0.08	0.55	0.84	0	79	78	78	1.22	0.3	190	0.019	105	105	143.0	2.00	3.95		66.1	135.4	121.7	67.6	133.9	453	66	72	78	0.000	1.001	32.877	2176
7	0.570	0.570	2.751747	0.08	0.08	0.51	0.81	0	79	79	78	1.25	0.3	202	0.019	106	106	142.0	1.00	4.02		66.4	135.6	121.8	67.5	134.1	500	67	73	78	0.000	1.001	33.459	2223
8	0.651	0.651	3.144854	0.08	0.08	0.49	0.81	0	79	79	77	1.25	0.3	212	0.019	107	107	140.0	2.00	4.03		66.6	135.9	122.1	67.5	134.3	533	68	74	77	0.000	1.001	33.543	2235
9	0.733	0.732	3.53796	0.08	0.08	0.5	0.82	0	79	79	78	1.23	0.3	218	0.019	107	107	139.0	1.00	4.02		66.8	136.2	122.1	67.5	134.6	551	69	75	78	0.000	1.001	33.459	2237
10	0.814	0.814	3.931067	0.08	0.08	0.56	0.82	0	79	79	78	1.2	0.3	223	0.019	108	108	137.0	2.00	4.03		67.1	136.9	122.6	67.6	135.2	562	70	76	78	0.000	1.001	33.542	2254
11	0.895	0.895	4.324174	0.08	0.08	0.55	0.82	0	79	79	78	1.19	0.3	228	0.019	108	108	136.0	1.00	3.88		68.0	137.6	123.6	67.5	136.1	578	71	77	78	0.000	1.001	32.294	2200
12	0.977	0.977	4.71728	0.08	0.08	0.55	0.83	0	79	79	78	1.19	0.3	234	0.019	108	109	134.0	2.00	3.80		68.8	138.3	124.5	67.5	136.8	618	72	78	78	0.000	1.001	31.628	2178
13	1.058	1.058	5.110387	0.08	0.08	0.54	0.82	0	79	79	78	1.18	0.3	238	0.019	109	109	132.0	2.00	3.79		69.9	139.4	125.3	67.6	137.9	635	73	79	78	0.000	1.001	31.545	2209
14	1.140	1.139	5.503494	0.08	0.08	0.55	0.82	0	79	79	77	1.18	0.3	241	0.019	109	109	130.0	2.00	3.77		70.8	140.5	126.1	67.6	139.0	643	74	80	77	0.000	1.001	31.378	2223
15	1.221	1.221	5.896601	0.08	0.08	0.54	0.82	0	80	79	78	1.18	0.3	241	0.019	109	109	128.0	2.00	3.65		72.0	141.6	127.6	67.6	140.2	643	75	81	78	0.000	1.001	30.380	2191
16	1.302	1.302	6.289707	0.08	0.08	0.53	0.80	0	80	80	78	1.17	0.1	243	0.019	109	109	127.0	1.00	3.33		73.3	142.7	129.4	67.6	141.6	650	76	83	78	0.000	1.001	27.716	2033
17	1.384	1.384	6.682814	0.08	0.08	0.54	0.84	0	80	80	78	1.17	0.1	245	0.019	109	109	125.0	2.00	3.36		74.5	144.0	130.5	67.6	142.9	655	77	84	78	0.000	1.001	27.966	2085
18	1.465	1.465	7.075921	0.08	0.08	0.54	0.84	0	80	80	78	1.16	0.1	246	0.019	109	109	123.0	2.00	3.35		75.5	145.0	131.4	67.6	144.0	657	78	85	78	0.000	1.001	27.882	2108
19	1.547	1.546	7.469027	0.08	0.08	0.62	0.73	0	80	80	78	0.98	-0.1	246	0.019	109	109	122.0	1.00	3.38		76.7	146.3	132.4	67.7	145.2	661	79	84	78	0.000	1.001	28.132	2161
20	1.628	1.628	7.862134	0.08	0.08	0.53	0.76	0	80	80	78	1.17	0.4	247	0.019	109	109	120.0	2.00	3.36		78.2	147.6	133.5	67.7	146.5	666	80	77	78	0.000	1.001	27.966	2190
21	1.709	1.709	8.255241	0.08	0.08	0.54	0.83	0	80	80	78	1.17	0.4	249	0.019	109	109	118.0	2.00	3.23		79.2	148.9	135.0	67.7	147.8	668	82	81	78	0.000	1.001	26.883	2131
22	1.791	1.791	8.648348	0.08	0.08	0.54	0.83	0	80	80	78	1.15	0.4	250	0.019	110	110	116.0	2.00	2.82		80.8	150.2	137.7	67.8	149.4	667	81	79	78	0.000	1.001	23.471	1899
23	1.872	1.872	9.041454	0.08	0.08	0.54	0.83	0	80	80	78	1.14	0.4	250	0.019	110	110	115.0	1.00	2.82		82.2	151.6	138.9	67.8	150.8	667	80	79	78	0.000	1.001	23.471	1932
24	1.954	1.953	9.434561	0.08	0.08	0.54	0.83	0	80	81	78	1.13	0.4	251	0.019	110	109	113.0	2.00	2.79		83.7	152.8	140.0	67.8	152.1	669	80	79	78	0.000	1.001	23.221	1945
25	2.035	2.035	9.827668	0.08	0.08	0.53	0.82	0	81	81	78	1.12	0.4	252	0.019	109	110	111.0	2.00	2.82		84.9	154.3	141.3	67.8	153.5	671	81	79	78	0.000	1.001	23.471	1995
26	2.116	2.116	10.22077	0.08	0.08	0.58	0.81	0	81	81	78	1.08	0.4	253	0.019	110	110	109.0	2.00	2.80		86.6	155.8	142.7	67.9	155.1	674	82	79	78	0.000	1.001	23.304	2021
27	2.198	2.197	10.61388	0.08	0.08	0.57	0.81	0	81	81	78	1.07	0.4	254	0.019	110	110	107.0	2.00	2.80		88.0	157.4	144.0	67.9	156.6	676	82	80	78	0.000	1.001	23.304	2053
28	2.279	2.279	11.00699	0.08	0.08	0.56	0.81	0	81	81	78	1.06	0.4	254	0.019	110	110	106.0	1.00	2.79		89.3	158.8	145.2	67.9	158.1	678	83	81	78	0.000	1.001	23.221	2077
29	2.361	2.360	11.40009	0.08	0.08	0.55	0.80	0	81	81	78	1.04	0.4	254	0.019	110	110	104.0	2.00	2.74		90.6	160.4	146.7	67.9	159.6	679	84	81	78	0.000	1.001	22.805	2069
30	2.442	2.442	11.7932	0.08	0.08	0.54	0.80	0	81	81	78	1.03	0.4	255	0.019	110	110	102.0	2.00	2.52		92.4	161.8	149.1	68.0	161.2	679	84	81	78	0.000	1.001	20.973	1939
31	2.523	2.523	12.18631	0.08	0.08	0.55	0.80	0	81	81	78	0.99	0.4	255	0.019	110	110	101.0	1.00	2.52		93.9	163.4	150.5	68.0	162.7								

Elapsed Time	Particulate Sampling Data																Fuel Weight, lb		Flow, gpm		Temperature Data, oF									Stack		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		Specific Heat of Inlet Water (BTU/lb-°F)	Mass Flow Rate of Inlet Water (lb/min)
57	4.640	4.639	22.40708	0.08	0.08	0.56	0.86	0	83	83	78	0.94	-4.4	92	0.019	96	96	72.0	0.10	2.21		115.3	184.1	170.3	68.5	183.8	355	78	79	78	0.000	1.001	18.392	2122
58	4.721	4.720	22.80019	0.08	0.08	0.56	0.84	0	83	83	78	0.95	-4.1	91	0.019	96	96	71.9	0.10	2.13		114.6	183.3	169.8	68.4	183.0	348	77	78	78	0.000	1.001	17.726	2035
59	4.803	4.802	23.1933	0.08	0.08	0.58	0.84	0	83	83	78	0.96	-4.1	90	0.019	96	96	71.9	0.00	2.23		114.2	182.7	169.0	68.5	182.5	342	77	78	78	0.000	1.001	18.558	2121
60	4.884	4.883	23.5864	0.08	0.08	0.58	0.85	0	83	83	78	0.96	-4	90	0.019	96	96	71.7	0.20	2.22		113.1	182.0	168.2	68.5	181.7	336	76	77	78	0.000	1.001	18.475	2092
61	4.966	4.965	23.97951	0.08	0.08	0.59	0.86	0	83	83	77	0.97	-4	89	0.019	96	96	71.7	0.00	2.22		112.4	181.4	167.7	68.5	181.0	329	76	77	77	0.000	1.001	18.475	2079
62	5.047	5.046	24.37262	0.08	0.08	0.59	0.88	0	83	83	77	0.98	-3.9	88	0.019	96	96	71.7	0.00	2.22		111.8	180.6	167.0	68.5	180.2	323	76	76	77	0.000	1.001	18.475	2067
63	5.128	5.127	24.76572	0.08	0.08	0.6	0.89	0	83	83	78	0.98	-3.9	88	0.019	96	96	71.6	0.10	2.22		110.9	179.9	166.3	68.4	179.5	317	75	76	78	0.000	1.001	18.475	2052
64	5.210	5.209	25.15883	0.08	0.08	0.6	0.90	0	83	83	78	0.98	-3.9	87	0.019	96	96	71.6	0.00	2.23		110.5	179.1	165.8	68.4	178.8	311	75	76	78	0.000	1.001	18.558	2053
65	5.291	5.290	25.55194	0.08	0.08	0.6	0.91	0	83	83	77	0.99	-3.8	87	0.019	96	96	71.6	0.00	2.24		109.9	178.4	165.2	68.4	178.2	306	75	76	77	0.000	1.001	18.642	2050
66	5.373	5.372	25.94504	0.08	0.08	0.6	0.92	0	83	83	78	0.99	-3.8	87	0.019	96	96	71.5	0.10	2.23		109.2	177.7	164.6	68.4	177.4	300	75	75	78	0.000	1.001	18.558	2028
67	5.454	5.453	26.33815	0.08	0.08	0.53	0.87	0	83	83	77	1.08	-3.2	86	0.019	96	96	71.5	0.00	2.22		108.4	177.0	164.0	68.4	176.7	295	74	75	77	0.000	1.001	18.475	2005
68	5.535	5.534	26.73126	0.08	0.08	0.51	0.84	0	83	83	77	1.06	-3.1	86	0.019	96	96	71.5	0.00	2.24		107.9	176.2	163.2	68.4	175.9	290	74	75	77	0.000	1.001	18.642	2013
69	5.617	5.616	27.12436	0.08	0.08	0.53	0.86	0	83	83	78	1.06	-3.1	86	0.019	96	96	71.5	0.00	2.25		107.1	175.6	162.5	68.4	175.3	285	74	75	78	0.000	1.001	18.725	2008
70	5.698	5.697	27.51747	0.08	0.08	0.54	0.85	0	83	83	77	1.07	-2.8	85	0.019	95	95	71.5	0.00	2.26		106.1	174.8	161.8	68.5	174.5	281	74	74	77	0.000	1.001	18.808	1998
71	5.780	5.778	27.91058	0.08	0.08	0.53	0.77	0	83	83	77	1.07	-2.5	85	0.019	95	95	71.4	0.10	2.28		105.5	174.1	161.2	68.5	173.7	276	74	74	77	0.000	1.001	18.974	2003
72	5.861	5.860	28.30368	0.08	0.08	0.55	0.81	0	83	83	78	1.07	-2.4	85	0.019	95	95	71.5	-0.10	2.28		104.9	173.4	160.4	68.5	173.0	271	73	74	78	0.000	1.001	18.974	1992
73	5.942	5.941	28.69679	0.08	0.08	0.54	0.83	0	83	83	78	1.08	-2.3	85	0.019	95	95	71.4	0.10	2.46		104.0	172.6	159.0	68.5	172.2	267	73	74	78	0.000	1.001	20.472	2133
74	6.024	6.023	29.0899	0.08	0.08	0.55	0.79	0	83	83	78	1.08	-1.9	84	0.019	95	95	71.5	-0.10	2.47		103.0	171.8	158.1	68.5	171.3	262	73	74	78	0.000	1.001	20.556	2120
75	6.105	6.104	29.483	0.08	0.08	0.55	0.80	0	83	83	78	1.09	-1.9	84	0.019	95	95	71.4	0.10	2.50		102.5	171.0	157.3	68.5	170.6	258	73	73	78	0.000	1.001	20.805	2136
76	6.187	6.185	29.87611	0.08	0.08	0.55	0.82	0	83	83	78	1.1	-1.8	84	0.019	95	95	71.5	-0.10	2.48		101.3	170.2	156.7	68.5	169.8	254	73	73	78	0.000	1.001	20.639	2094
77	6.268	6.267	30.26922	0.08	0.08	0.56	0.85	0	83	83	77	1.10	-1.70	84	0.019	95	95	71.5	0.00	2.45		100.6	169.4	156.1	68.5	169.0	250	73	73	77	0.000	1.001	20.389	2054
78	6.349	6.348	30.66232	0.08	0.08	0.54	0.80	0	83	83	77	1.12	-1.40	83	0.019	95	95	71.4	0.10	2.46		99.8	168.7	155.6	68.4	168.3	246	72	73	77	0.000	1.001	20.473	2046
79	6.431	6.430	31.05543	0.08	0.08	0.54	0.83	0	83	83	77	1.13	-1.30	83	0.019	95	95	71.4	0.00	2.44		99.2	168.0	154.9	68.5	167.6	242	72	73	77	0.000	1.001	20.306	2016
80	6.512	6.511	31.44854	0.08	0.08	0.54	0.86	0	83	83	77	1.13	-1.20	83	0.019	95	95	71.5	-0.10	2.40		98.8	167.2	154.5	68.4	166.8	239	72	73	77	0.000	1.001	19.973	1976
81	6.594	6.592	31.84164	0.08	0.08	0.54	0.88	0	83	83	77	1.14	-1.10	83	0.019	95	95	71.5	0.00	2.44		97.7	166.6	153.8	68.4	166.1	235	72	73	77	0.000	1.001	20.306	1986
82	6.675	6.674	32.23475	0.08	0.08	0.55	0.91	0	83	83	77	1.14	-1.00	83	0.019	95	95	71.4	0.10	2.50		97.0	165.7	152.8	68.4	165.3	231	72	73	77	0.000	1.001	20.805	2021
83	6.756	6.755	32.62786	0.08	0.08	0.56	0.94	0	83	83	77	1.15	-1.00	83	0.019	95	95	71.5	-0.10	2.52		96.3	165.0	152.3	68.4	164.6	228	72	73	77	0.000	1.001	20.972	2022
84	6.838	6.837	33.02096	0.08	0.08	0.55	0.97	0	83	83	77	1.15	-0.90	82	0.019	95	95	71.5	0.00	2.50		95.6	164.2	151.6	68.4	163.8	224	72	73	77	0.000	1.001	20.805	1992
85	6.919	6.																																

Elapsed Time	Particulate Sampling Data																Fuel Weight, lb		Flow, gpm		Temperature Data, oF										Stack		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	Specific Heat of Inlet Water (BTU/lb-°F)		Mass Flow Rate of Inlet Water (lb/min)
125	10.175	10.173	49.13834	0.08	0.08	0.54	0.80	0	83	83	76	1.22	0.40	94	0.019	96	96	70.5	0.40	3.42		67.6	136.5	124.6	68.1	135.6	162	72	73	76	0.000	1.001	28.463	1927
126	10.257	10.255	49.53145	0.08	0.08	0.54	0.80	0	83	83	77	1.22	0.40	95	0.019	96	96	70.1	0.40	3.40		66.6	135.7	123.9	68.1	134.7	167	72	74	77	0.000	1.001	28.297	1887
127	10.338	10.336	49.92455	0.08	0.08	0.53	0.81	0	83	83	77	1.22	0.40	97	0.019	96	97	69.6	0.50	3.43		66.2	135.0	123.3	68.1	134.0	176	72	74	77	0.000	1.001	28.546	1893
128	10.420	10.418	50.31766	0.08	0.08	0.54	0.81	0	83	83	77	1.22	0.40	100	0.019	97	97	69.0	0.60	3.41		65.4	134.4	122.7	68.1	133.3	194	72	74	77	0.000	1.001	28.380	1858
129	10.501	10.499	50.71077	0.08	0.08	0.53	0.80	0	83	83	77	1.21	0.40	105	0.019	97	97	68.4	0.60	3.38		64.8	133.8	122.4	68.0	132.8	225	73	74	77	0.000	1.001	28.131	1826
130	10.582	10.580	51.10387	0.08	0.08	0.52	0.80	0	83	83	77	1.21	0.40	111	0.019	98	98	67.7	0.70	3.40		64.4	133.5	122.0	68.0	132.4	260	73	75	77	0.000	1.001	28.297	1825
131	10.664	10.662	51.49698	0.08	0.08	0.53	0.80	0	83	83	76	1.21	0.40	118	0.019	98	98	67.0	0.70	3.40		64.0	133.2	121.8	68.0	132.1	303	73	75	76	0.000	1.001	28.297	1814
132	10.745	10.743	51.89009	0.08	0.08	0.57	0.81	0	83	83	77	1.19	0.40	126	0.019	99	99	66.3	0.70	3.41		64.0	133.2	121.8	67.9	132.1	349	74	76	77	0.000	1.001	28.381	1818
133	10.827	10.824	52.28319	0.08	0.08	0.55	0.82	0	83	83	77	1.19	0.40	134	0.019	100	100	65.3	1.00	3.20		64.1	133.3	122.5	68.0	132.3	390	74	76	77	0.000	1.001	26.633	1709
134	10.908	10.906	52.6763	0.08	0.08	0.57	0.81	0	83	83	77	1.18	0.40	141	0.019	100	100	64.5	0.80	2.61		64.7	133.7	124.8	68.0	133.1	423	75	77	77	0.000	1.001	21.722	1406
135	10.989	10.987	53.06941	0.08	0.08	0.55	0.82	0	83	83	77	1.18	0.40	147	0.019	101	101	63.4	1.10	2.57		65.1	133.7	124.9	68.0	133.1	452	75	78	77	0.000	1.001	21.389	1394
136	11.071	11.069	53.46251	0.08	0.08	0.56	0.82	0	83	83	77	1.18	0.40	152	0.019	101	101	62.5	0.90	2.45		65.3	134.4	125.8	68.1	133.8	478	75	78	77	0.000	1.001	20.390	1333
137	11.152	11.150	53.85562	0.08	0.08	0.55	0.82	0	83	83	77	1.17	0.40	156	0.019	101	101	61.4	1.10	2.43		66.2	135.1	126.6	68.1	134.6	495	76	79	77	0.000	1.001	20.224	1340
138	11.234	11.231	54.24873	0.08	0.08	0.55	0.82	0	83	83	77	1.17	0.40	159	0.019	102	102	60.3	1.10	2.44		66.9	136.2	127.6	68.1	135.6	509	75	79	77	0.000	1.001	20.307	1360
139	11.315	11.313	54.64183	0.08	0.08	0.55	0.82	0	83	83	77	1.17	0.40	162	0.019	102	102	59.1	1.20	2.42		67.9	137.1	128.4	68.2	136.5	518	74	78	77	0.000	1.001	20.140	1370
140	11.396	11.394	55.03494	0.08	0.08	0.54	0.83	0	83	83	77	1.17	0.40	164	0.019	102	102	58.1	1.00	2.42		69.0	138.3	129.4	68.2	137.6	525	74	77	77	0.000	1.001	20.140	1391
141	11.478	11.476	55.42805	0.08	0.08	0.55	0.82	0	83	83	77	1.17	0.40	165	0.019	102	102	57.0	1.10	2.41		70.3	139.5	130.4	68.2	138.8	530	74	77	77	0.000	1.001	20.057	1412
142	11.559	11.557	55.82115	0.08	0.08	0.55	0.82	0	83	83	77	1.17	0.40	167	0.019	102	102	55.9	1.10	2.33		71.5	140.5	131.5	68.2	139.8	533	74	77	77	0.000	1.001	19.391	1389
143	11.641	11.638	56.21426	0.08	0.08	0.54	0.82	0	83	83	77	1.16	0.40	167	0.019	102	102	55.0	0.90	2.29		72.6	141.8	132.8	68.2	141.2	536	74	77	77	0.000	1.001	19.058	1385
144	11.722	11.720	56.60737	0.08	0.08	0.55	0.81	0	83	83	77	1.16	0.40	167	0.019	102	102	54.2	0.80	2.31		73.3	143.2	134.0	68.3	142.5	535	74	77	77	0.000	1.001	19.225	1411
145	11.803	11.801	57.00047	0.08	0.08	0.54	0.81	0	83	83	77	1.16	0.40	167	0.019	102	102	53.1	1.10	2.31		74.6	144.2	135.0	68.3	143.6	534	75	77	77	0.000	1.001	19.225	1435
146	11.885	11.883	57.39358	0.08	0.08	0.54	0.82	0	83	83	77	1.16	0.40	168	0.019	102	102	52.1	1.00	2.31		76.1	145.5	136.1	68.3	144.9	535	75	77	77	0.000	1.001	19.225	1464
147	11.966	11.964	57.78669	0.08	0.08	0.54	0.82	0	83	83	77	1.16	0.40	168	0.019	102	102	51.4	0.70	2.31		77.1	146.7	137.2	68.3	146.1	537	75	77	77	0.000	1.001	19.225	1483
148	12.048	12.045	58.17979	0.08	0.08	0.54	0.82	0	83	83	77	1.16	0.40	168	0.019	102	102	50.3	1.10	2.30		78.5	147.9	138.2	68.3	147.3	536	75	77	77	0.000	1.001	19.141	1505
149	12.129	12.127	58.5729	0.08	0.08	0.54	0.82	0	83	83	77	1.16	0.40	168	0.019	102	102	49.5	0.80	2.07		79.6	149.2	140.3	68.4	148.6	536	75	78	77	0.000	1.001	17.227	1372
150	12.210	12.208	58.96601	0.08	0.08	0.54	0.81	0	83	83	77	1.16	0.40	168	0.019	102	102	48.5	1.00	1.68		81.0	150.4	143.0	68.4	149.8	536	76	78	77	0.000	1.001	13.981	1134
151	12.292	12.289	59.35911	0.08	0.08	0.54	0.81	0	83	83	77	1.16	0.40	168	0.019	102	102	47.7	0.80	1.69		82.0	151.7	144.2	68.4	151.1	536	76	78	77	0.000	1.001	14.064	1155
152	12.373	12.371	59.75222	0.08	0.08	0.54	0.81	0	83	83	77	1.16	0.40	168	0.019	102	102	46.7	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			
193	15.711	15.708	75.86959	0.08	0.08	0.53	0.83	0	82	82	77	1.15	0.40	92	0.019	96	96	20.7	0.20	1.86		118.6	187.8	175.8	69.0	187.4	354	76	78	77	0.000	1.001	15.478	1838
194	15.792	15.789	76.2627	0.08	0.08	0.53	0.83	0	82	82	76	1.15	0.40	90	0.019	96	96	20.6	0.10	1.83		118.1	187.3	175.6	69.0	187.0	344	76	77	76	0.000	1.001	15.228	1801
195	15.873	15.870	76.65581	0.08	0.08	0.53	0.83	0	82	82	76	1.15	0.40	89	0.019	96	96	20.5	0.10	1.86		117.7	186.9	175.1	69.0	186.6	336	76	77	76	0.000	1.001	15.478	1824
196	15.955	15.952	77.04891	0.08	0.08	0.53	0.83	0	82	82	76	1.16	0.40	88	0.019	96	96	20.4	0.10	1.86		117.3	186.4	174.6	69.0	186.1	328	75	77	76	0.000	1.001	15.478	1818
197	16.036	16.033	77.44202	0.08	0.08	0.53	0.84	0	82	82	76	1.16	0.40	87	0.019	96	96	20.4	0.00	1.84		116.7	185.9	174.2	69.1	185.6	321	75	76	76	0.000	1.001	15.311	1789
198	16.118	16.115	77.83513	0.08	0.08	0.54	0.83	0	82	82	76	1.16	0.40	87	0.019	96	96	20.3	0.10	1.86		116.0	185.3	173.8	69.0	185.0	314	75	76	76	0.000	1.001	15.478	1797
199	16.199	16.196	78.22823	0.08	0.08	0.53	0.83	0	82	82	76	1.16	0.40	86	0.019	96	96	20.2	0.10	1.84		115.6	184.8	173.3	69.0	184.5	308	75	76	76	0.000	1.001	15.311	1772
200	16.280	16.277	78.62134	0.08	0.08	0.54	0.85	0	82	82	76	1.16	0.40	86	0.019	96	96	20.1	0.10	1.86		115.0	184.4	172.8	69.1	184.1	302	75	75	76	0.000	1.001	15.478	1782
201	16.362	16.359	79.01445	0.08	0.08	0.54	0.84	0	82	82	76	1.16	0.40	85	0.019	96	96	20.1	0.00	1.85		114.5	183.7	172.3	69.1	183.4	296	74	75	76	0.000	1.001	15.395	1765
202	16.443	16.440	79.40755	0.08	0.08	0.53	0.84	0	82	82	76	1.17	0.40	85	0.019	96	96	20.1	0.00	1.83		113.9	183.1	171.7	69.1	182.8	291	74	75	76	0.000	1.001	15.228	1736
203	16.525	16.522	79.80066	0.08	0.08	0.54	0.84	0	82	82	76	1.17	0.40	85	0.019	96	96	20.0	0.10	1.84		113.2	182.6	171.3	69.1	182.3	286	74	75	76	0.000	1.001	15.311	1736
204	16.606	16.603	80.19377	0.08	0.08	0.55	0.84	0	82	82	76	1.17	0.40	84	0.019	96	96	20.0	0.00	1.85		112.8	182.1	170.8	69.1	181.8	281	74	75	76	0.000	1.001	15.395	1739
205	16.687	16.684	80.58688	0.08	0.08	0.54	0.84	0	82	82	76	1.17	0.40	84	0.019	96	96	20.0	0.00	1.84		112.2	181.5	170.2	69.1	181.2	276	74	74	76	0.000	1.001	15.311	1720
206	16.769	16.766	80.97998	0.08	0.08	0.55	0.85	0	82	82	76	1.17	0.40	84	0.019	96	96	20.0	0.00	1.84		111.7	180.9	169.9	69.1	180.7	272	74	74	76	0.000	1.001	15.311	1712
207	16.850	16.847	81.37309	0.08	0.08	0.54	0.85	0	82	82	76	1.17	0.40	84	0.019	96	96	20.0	0.00	1.86		111.1	180.3	169.2	69.1	180.1	267	73	74	76	0.000	1.001	15.478	1722
208	16.932	16.928	81.7662	0.08	0.08	0.54	0.84	0	82	82	76	1.18	0.40	83	0.019	95	95	19.9	0.10	1.86		110.5	179.8	168.8	69.1	179.5	263	73	74	76	0.000	1.001	15.478	1712
209	17.013	17.010	82.1593	0.08	0.08	0.55	0.84	0	82	82	76	1.18	0.40	83	0.019	95	95	19.9	0.00	1.87		110.0	179.2	168.3	69.1	178.9	258	73	74	76	0.000	1.001	15.561	1713
210	17.095	17.091	82.55241	0.08	0.08	0.54	0.86	0	82	82	76	1.18	0.40	83	0.019	95	95	20.0	-0.10	1.86		109.3	178.6	167.7	69.1	178.3	254	73	74	76	0.000	1.001	15.478	1694
211	17.176	17.173	82.94552	0.08	0.08	0.55	0.85	0	82	82	76	1.18	0.40	83	0.019	95	95	19.9	0.10	1.85		108.8	178.1	167.2	69.1	177.8	250	73	73	76	0.000	1.001	15.395	1677
212	17.257	17.254	83.33862	0.08	0.08	0.55	0.84	0	82	82	76	1.18	0.40	83	0.019	95	95	19.9	0.00	1.87		108.2	177.5	166.7	69.1	177.2	246	73	73	76	0.000	1.001	15.561	1686
213	17.339	17.335	83.73173	0.08	0.08	0.56	0.85	0	82	82	76	1.19	0.40	82	0.019	95	95	19.9	0.00	1.85		107.7	177.0	166.2	69.1	176.6	242	73	73	76	0.000	1.001	15.395	1660
214	17.420	17.417	84.12484	0.08	0.08	0.56	0.85	0	82	82	76	1.19	0.40	82	0.019	95	95	19.9	0.00	1.85		107.2	176.4	165.6	69.0	176.0	238	73	73	76	0.000	1.001	15.395	1652
215	17.502	17.498	84.51794	0.08	0.08	0.55	0.85	0	82	82	76	1.19	0.40	82	0.019	95	95	19.8	0.10	1.84		106.6	175.8	165.2	69.1	175.5	235	73	73	76	0.000	1.001	15.311	1634
216	17.583	17.580	84.91105	0.08	0.08	0.56	0.85	0	82	82	75	1.19	0.40	82	0.019	95	95	19.9	-0.10	1.85		106.0	175.2	164.7	69.1	174.9	231	72	73	75	0.000	1.001	15.395	1634
217	17.664	17.661	85.30416	0.08	0.08	0.56	0.86	0	82	82	76	1.20	0.40	82	0.019	95	95	19.9	0.00	1.83		105.6	174.6	164.2	69.1	174.4	228	72	73	76	0.000	1.001	15.228	1611
218	17.746	17.742	85.69726	0.08	0.08	0.56	0.85	0	82	82	76	1.19	0.40	82	0.019	95	95	19.9	0.00	1.83		104.8	174.1	163.6	69.0	173.8	225	72	73	76	0.000	1.001	15.228	1598
219	17.827	17.824	86.09037	0.08	0.08	0.57	0.85	0	82	82	76	1.20	0.40	82	0.019	95	95	19.9	0.00	1.85		104.3	173.5	163.1	69.0	173.2	221	72	73	76	0.000	1.001	15.395	1607
220	17.909	17.905	86.48348	0.08	0.08	0.56	0.86	0	82	82	75	1.20	0.40	81	0.019	95	95	19.9	0.00	1.84		103.9	173.0	162.7	69.0	172.7								

Elapsed Time	Particulate Sampling Data																Fuel Weight, lb		Flow, gpm		Temperature Data, oF										Stack		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	Specific Heat of Inlet Water (BTU/lb-°F)		Mass Flow Rate of Inlet Water (lb/min)
261	21.246	21.242	102.6009	0.08	0.08	0.57	0.88	0	81	81	75	1.21	0.40	78	0.019	95	95	20.2	0.00	2.09		78.6	147.5	138.9	68.6	147.1	142	70	71	75	0.000	1.001	17.393	1369
262	21.327	21.323	102.994	0.08	0.08	0.57	0.88	0	81	81	75	1.21	0.40	78	0.019	95	95	20.2	0.00	2.07		78.1	147.0	138.4	68.6	146.7	141	70	71	75	0.000	1.001	17.227	1347
263	21.409	21.405	103.3871	0.08	0.08	0.57	0.87	0	81	81	75	1.21	0.40	78	0.019	95	95	20.2	0.00	2.08		77.6	146.5	138.0	68.6	146.2	140	70	71	75	0.000	1.001	17.310	1344
264	21.490	21.486	103.7802	0.08	0.08	0.57	0.87	0	81	81	75	1.21	0.4	78	0.019	95	95	20.2	0.00	2.08		77.2	146.0	137.6	68.6	145.7	139	70	71	75	0.000	1.001	17.310	1337
265	21.572	21.568	104.1733	0.08	0.08	0.56	0.87	0	81	81	75	1.21	0.4	78	0.019	95	95	20.2	0.00	2.06		76.6	145.5	137.1	68.6	145.2	138	70	71	75	0.000	1.001	17.143	1315
266	21.653	21.649	104.5664	0.08	0.08	0.57	0.87	0	81	81	75	1.21	0.4	78	0.019	95	95	20.2	0.00	2.08		76.1	145.1	136.7	68.7	144.7	137	70	70	75	0.000	1.001	17.310	1319
267	21.734	21.730	104.9595	0.08	0.08	0.56	0.88	0	81	81	75	1.21	0.4	78	0.019	95	95	20.3	-0.10	2.06		75.5	144.6	136.3	68.7	144.2	136	70	70	75	0.000	1.001	17.143	1297
268	21.816	21.812	105.3526	0.08	0.08	0.57	0.87	0	81	81	75	1.21	0.4	78	0.019	95	95	20.3	0.00	2.09		75.3	144.2	135.8	68.6	143.8	135	70	70	75	0.000	1.001	17.393	1310
269	21.897	21.893	105.7457	0.08	0.08	0.56	0.87	0	81	81	75	1.21	0.4	78	0.019	95	95	20.3	0.00	2.52		74.7	143.7	134.0	68.6	143.2	134	70	70	75	0.000	1.001	20.972	1569
270	21.979	21.974	106.1388	0.08	0.08	0.57	0.87	0	81	81	75	1.21	0.4	78	0.019	95	95	20.3	0.00	2.49		74.0	142.9	133.2	68.6	142.5	133	70	70	75	0.000	1.001	20.722	1535
271	22.060	22.056	106.5319	0.08	0.08	0.56	0.88	0	81	81	75	1.21	0.4	78	0.019	95	95	20.2	0.10	2.49		73.2	142.4	132.7	68.6	141.9	132	70	70	75	0.000	1.001	20.722	1519
272	22.141	22.137	106.925	0.08	0.08	0.56	0.88	0	81	81	74	1.21	0.4	78	0.019	95	95	20.2	0.00	2.47		72.7	141.8	132.3	68.6	141.4	131	70	70	74	0.000	1.001	20.555	1495
273	22.223	22.219	107.3181	0.08	0.08	0.57	0.86	0	81	81	75	1.21	0.4	78	0.019	95	95	20.3	-0.10	2.62		72.2	141.3	131.4	68.5	140.8	131	70	70	75	0.000	1.001	21.804	1576
274	22.304	22.300	107.7112	0.08	0.08	0.56	0.87	0	81	81	75	1.21	0.4	78	0.019	95	95	20.3	0.00	2.84		71.7	140.6	130.0	68.5	139.9	130	70	70	75	0.000	1.001	23.635	1697
275	22.386	22.381	108.1043	0.08	0.08	0.56	0.87	0	81	81	75	1.21	0.4	78	0.019	95	95	20.3	0.00	2.82		71.2	139.9	129.5	68.5	139.2	129	70	70	75	0.000	1.001	23.468	1672
276	22.467	22.463	108.4975	0.08	0.08	0.57	0.88	0	81	81	75	1.21	0.4	78	0.019	95	95	20.3	0.00	2.84		70.2	139.4	129.0	68.4	138.7	128	70	70	75	0.000	1.001	23.635	1662
277	22.548	22.544	108.8906	0.08	0.08	0.57	0.87	0	81	81	75	1.2	0.4	88	0.019	96	96	20.4	-0.10	2.81		70.0	138.7	128.4	68.4	138.0	137	71	71	75	0.000	1.001	23.385	1640
278	22.630	22.626	109.2837	0.08	0.08	0.56	0.87	0	81	81	75	1.21	0.4	97	0.019	97	97	20.1	0.30	2.84		69.3	138.0	127.9	68.4	137.4	162	70	71	75	0.000	1.001	23.635	1639
279	22.711	22.707	109.6768	0.08	0.08	0.57	0.88	0	81	81	74	1.2	0.4	103	0.019	97	97	19.9	0.20	2.82		68.6	137.5	127.4	68.4	136.9	176	70	71	74	0.000	1.001	23.469	1611
280	22.793	22.788	110.0699	0.08	0.08	0.57	0.88	0	81	81	75	1.2	0.4	109	0.019	98	98	19.6	0.30	2.81		68.3	137.1	127.1	68.4	136.4	189	71	71	75	0.000	1.001	23.385	1599
281	22.874	22.870	110.463	0.08	0.08	0.57	0.87	0	81	81	75	1.21	0.4	114	0.019	98	98	19.3	0.30	2.84		67.9	136.6	126.5	68.3	135.9	205	71	71	75	0.000	1.001	23.636	1606
282	22.955	22.951	110.8561	0.08	0.08	0.57	0.87	0	81	81	75	1.2	0.4	121	0.019	99	99	19.0	0.30	2.84		67.4	136.3	126.3	68.3	135.5	228	71	71	75	0.000	1.001	23.636	1596
283	23.037	23.033	111.2492	0.08	0.08	0.57	0.87	0	81	81	75	1.2	0.4	128	0.019	100	100	18.7	0.30	2.54		67.1	136.1	127.1	68.3	135.5	254	71	71	75	0.000	1.001	21.139	1420
284	23.118	23.114	111.6423	0.08	0.08	0.57	0.88	0	81	81	75	1.2	0.4	136	0.019	100	100	18.3	0.40	2.55		67.1	136.1	127.1	68.3	135.5	285	71	72	75	0.000	1.001	21.222	1426
285	23.200	23.195	112.0354	0.08	0.08	0.57	0.88	0	81	81	75	1.2	0.4	144	0.019	101	101	18.1	0.20	2.55		67.1	136.0	127.0	68.3	135.4	313	71	72	75	0.000	1.001	21.222	1427
286	23.281	23.277	112.4285	0.08	0.08	0.57	0.87	0	81	81	74	1.2	0.4	150	0.019	101	101	17.6	0.50	2.54		67.3	136.2	127.3	68.3	135.6	336	72	72	74	0.000	1.001	21.139	1425
287	23.362	23.358	112.8216	0.08	0.08	0.56	0.87	0	81	81	74	1.2	0.4	156	0.019	102	102	17.2	0.40	2.55		67.3	136.3	127.3	68.4	135.7	354	72	72	74	0.000	1.001	21.222	1431
288	23.444	23.439	113.2147	0.08	0.08	0.57	0.88	0	81	81	74	1.2	0.4	161	0.019	102	102	16.9	0.30	2.51		67.4	136.5	127.6	68.3	135.9	373	72						

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					
	26.700	26.695	128.939			0.55	0.84	0.00	82	82	76			136	0.019					2.41	#DIV/0!	89.8	158.9	147.7	68.4	158.3		73.99	75.29		0.00			1752		
																		TOTAL:																		574612

Page 1 of 1

350x WHH new cat iv
4-24 of 4-80

[illegible]

Total Weight of Load (lb): 144.1

Total Moisture of Load (%): 22.6

Equipment Numbers:

Method 28 Hydronic Heater Run Sheets

Client: Heatmor Project Number: 0275WH011E.AD01 Run Number: 2
Model: 350x Tracking Number: 2011 Date: 10/8/14
Test Crew: A. Kravitz, J. Clark
OMNI Equipment ID numbers: : 428A, 428B, 132, 209, 410, 417, 419, 513, 533, 559, 296-T55, 340, 353, 431, 23, 131, 343

WHH Run Notes

Preburn Settings

Target Output (%): 25-49%
Target Output (BTU/hr): 70,000 - 140,000

Preburn Notes

TIME	NOTES
	DAQ time 17:20 = computer time 17:20

Test Settings

Target Output (%): 25-49%
Target Output (BTU/hr): 70,000 - 140,000

Start-Up Timeline

Fuel Loaded by: 1:35
Door Closed at: 1:41
Notes: _____

Test Notes

TIME	NOTES
19:00 35:00	Full filter swaps, Trains A & B Swapped B front for B2A1

Technician Signature: [Signature]
Control No. P-SFDJ-0001, Effective Date: 10/8/2014

Date: 10/8/14

Method 28 Hydronic Heater Run Sheets

Client: Heatmor Project Number: 0275WH011E.AD01 Run Number: 2
 Model: 350x Tracking Number: 2011 Date: 10/8/14
 Test Crew: A. Kravitz, J. Clark
 OMNI Equipment ID numbers: : 428A, 428B, 132, 209, 410, 417, 419, 513, 533, 559, 296-T55, 340, 353, 431, 23, 131, 343

WHH Supplemental Data

Start Time: 17:25Booth #: E3Stop Time: 22:53

Stack Gas Leak Check:

Initial: 0 Final: 0

Sample Train Leak Check:

A: 0.001 @ 2 "HgB: 0.006 @ 4 "Hg

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

Time
O ₂
CO ₂
CO

Pre Test		
Zero	Span	Mid
<u>10:41 14:01</u>	<u>10:13:59</u>	<u>14:02</u>
N/A	N/A	N/A
<u>0.00</u>	<u>16.80</u>	<u>9.91</u>
<u>0.000</u>	<u>4.295</u>	<u>2.519</u>

Post Test		
Zero	Span	Mid
<u>23:18</u>	<u>23:20</u>	<u>23:22</u>
N/A	N/A	N/A
<u>-0.21</u>	<u>16.60</u>	<u>9.88</u>
<u>-0.010</u>	<u>4.248</u>	<u>2.480</u>

Air Velocity (ft/min): Initial: <50Final: <50Scale Audit (lbs): Initial: 10.0Final: 10.0Pitot Tube Leak Test: Initial: 0Final: 0

Stack Diameter (in): _____

Induced Draft: 0% Smoke Capture: 100%

Flue Pipe Cleaned Prior to First Test in Series:

Date: 10/7/14 Initials: A

	Initial	Middle	Ending
P _b (in/Hg)	<u>30.01</u>	<u>30.02</u>	<u>30.04</u>
Ambient (°F)	<u>76</u>	<u>75</u>	<u>73</u>

Tunnel Traverse	
dP (in H ₂ O)	T (°F)
<u>0.016</u>	<u>80</u>
<u>0.020</u>	
<u>0.024</u>	
<u>0.024</u>	
<u>0.016</u>	
<u>0.014</u>	
<u>0.012</u>	
<u>0.022</u>	
<u>0.024</u>	
<u>0.026</u>	
<u>0.022</u>	
<u>0.012</u>	
Static P:	<u>-0.28</u>

Technician Signature: [Signature]
 Control No. P-SFDJ-0001, Effective Date: 10/8/2014

Date: 10/8/14

OMNI-Test Laboratories, Inc.

Manufacturer: Heatmor
Model: 350x
Date: 10/08/14
Run: 2
Control #: 2011
Test Duration: 328
Output Category: III

Technicians: A. Kravitz

Test Results in Accordance with CSA B415.1-09

	HHV Basis	LHV Basis
Overall Efficiency	70.9%	76.4%
Combustion Efficiency	94.5%	94.5%
Heat Transfer Efficiency	75%	80.8%

Output Rate (kJ/h)	142,825	135,485	(Btu/h)
Burn Rate (kg/h)	10.13	22.32	(lb/h)
Input (kJ/h)	201,417	191,066	(Btu/h)

Test Load Weight (dry kg)	55.37	122.03	dry lb
MC wet (%)	18.43		
MC dry (%)	22.59		
Particulate (g)	0		
CO (g)	4,200		
Test Duration (h)	5.47		

Emissions	Particulate	CO
g/MJ Output	0.00	5.38
g/kg Dry Fuel	0.00	75.85
g/h	0.00	768.24
lb/MM Btu Output	0.00	12.50

Air/Fuel Ratio (A/F)	8.12
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VERSION:

2.3

3/23/2010

*Model: 350X
Heatmor
105 Industrial Park Ct. NE, P.O. Box 787
Warroad, MN 56763*

Run 3

Hydronic Heating Appliances - Test Method 28 WHH Results

Manufacturer: Heatmor
 Model: 350X
 Tracking No.: 2011
 Project No.: 0275WB011E.AD01
 Run: 3
 Test Date: October 9, 2014

Burn Rate	3.58 kg/hr dry
Average Tunnel Temperature	94 degrees Fahrenheit
Average Gas Velocity in Dilution Tunnel - vs	8.7 feet/second
Average Gas Flow Rate in Dilution Tunnel - Qsd	23031 dscf/hour
Average Delta p	0.016 inches H2O
Average Delta H	0.54 inches H2O
Total Time of Test	920 minutes

	SAMPLE TRAIN 1	SAMPLE TRAIN 2	AMBIENT SAMPLE TRAIN
Total Sample Volume - Vm	73.30 cubic feet	73.99 cubic feet	361.40 cubic feet
Average Gas Meter Temperature	78 degrees Fahrenheit	78 degrees Fahrenheit	73 degrees Fahrenheit
Total Sample Volume (Standard Conditions) - Vmstd	72.8 dscf	73.9 dscf	355.4 dscf
Total Particulates - mn	19.7 mg	19.2 mg	1.2 mg
Particulate Concentration (dry-standard)	0.00027 grams/dscf	0.00026 grams/dscf	0.000003 grams/dscf
Particulate Emissions	94.40 grams	90.57 grams	
Difference from Average	1.91 grams	1.91 grams	
Results Are Acceptable			

AVERAGE	
Total Sample Volume - Vm	73.64 cubic feet
Average Gas Meter Temperature	78 degrees Fahrenheit
Total Sample Volume (Standard Conditions) - Vmstd	73.3 dscf
Total Particulates - mn	
Particulate Concentration (dry-standard)	0.00026 grams/dscf
Particulate Emission Rate	92.48 grams
7.5% of the average emission rate	6.94 grams

Run: 3

Manufacturer: Heatmor

Model: 350X

Tracking No.: 2011

Project No.: 0275WB011E.AD01

Test Date: October 9, 2014

Technician: A. Kravitz

Beginning Clock Time: 12:57

Recording Interval: 1 min.

Total Sampling Time: 920 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	0.001	0.018	0.022	0.024	0.022	0.010	0.012	0.020	0.020	0.024	0.016	0.008
Initial Temp.	72	72	72	72	72	72	72	72	72	72	72	72
Air Velocity: Initial: <50 Final: <50												
Scale Audit: Pre: 10.0 Post: 10.0												
Pitot Tube Leak Test: Pre: 0 Post: 0												
Induced Draft: 0												
% Smoke Capture: 100												
Flue Pipe Cleaned Prior to First Test in Series: Date: 10/7/2014												

PM Control Module:

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

Meter Box Y Factor: 1.007 1.012 0.989

Barometric Pressure: Begin Middle End 30.04 30.05 30.08

Signature/Date:

Tunnel Velocity: 8.69 ft/sec.

Initial Tunnel Flow: 371.8 scfm

Average Tunnel Flow: 383.8 scfm

Tunnel Area: 0.785 ft2

Post-Test Leak Check (1): 0.001 cfm@"Hg

Post-Test Leak Check (2): 0.006 cfm@"Hg

Fuel Moisture (dry basis %): 21.5

Total Particulate (1): 19.7

Total Particulate (2): 19.2

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	0.00	70	70	69	1.62	1.00	72	0.016			147.2		0.98		58.9	146.2	142.2	68.5	127.4	331	71	71	69	0.000	1.001	8.156				
1	0.080	0.080	0.393	0.08	0.08	0.56	0.84	0.00	70	70	69	1.27	0.50	110	0.016	103	103	146.5	0.70	0.98		59.2	146.6	142.6	68.6	127.8	318	71	71	69	0.000	1.001	8.155	483			
2	0.159	0.161	0.786	0.08	0.08	0.56	0.85	0.00	70	70	69	1.26	0.50	118	0.016	104	104	146.0	0.50	0.96		59.5	147.4	143.5	68.6	128.1	307	72	71	69	0.000	1.001	7.989	476			
3	0.239	0.241	1.178	0.08	0.08	0.56	0.85	0.00	70	70	70	1.25	0.50	139	0.016	106	106	145.0	1.00	0.97		59.7	147.5	143.5	68.6	128.3	317	73	73	70	0.000	1.001	8.072	482			
4	0.319	0.322	1.571	0.08	0.08	0.56	0.85	0.00	70	70	70	1.25	0.50	148	0.016	106	106	144.0	1.00	0.98		60.0	147.8	143.7	68.6	128.6	330	74	73	70	0.000	1.001	8.156	490			
5	0.399	0.402	1.964	0.08	0.08	0.56	0.86	0.00	70	70	69	1.24	0.50	154	0.016	107	107	143.0	1.00	0.98		60.4	148.1	144.1	68.7	129.1	340	75	74	69	0.000	1.001	8.155	493			
6	0.478	0.483	2.357	0.08	0.08	0.55	0.85	0.00	71	70	70	1.23	0.50	166	0.016	108	108	142.0	1.00	0.96		60.7	148.6	144.5	68.7	129.4	373	76	75	70	0.000	1.001	7.989	486			
7	0.558	0.563	2.750	0.08	0.08	0.56	0.84	0.00	71	70	70	1.23	0.50	175	0.016	109	109	140.0	2.00	0.96		61.6	149.0	144.9	68.5	130.1	407	78	77	70	0.000	1.001	7.989	492			
8	0.638	0.643	3.143	0.08	0.08	0.54	0.86	0.00	71	70	70	1.22	0.50	186	0.016	110	110	139.0	1.00	0.98		62.2	149.7	145.5	68.5	130.7	444	79	78	70	0.000	1.001	8.156	508			
9	0.717	0.724	3.535	0.08	0.08	0.54	0.85	0.00	71	70	70	1.21	0.50	194	0.016	110	110	138.0	1.00	0.97		63.1	150.3	146.1	68.5	131.6	468	80	79	70	0.000	1.001	8.072	510			
10	0.797	0.804	3.928	0.08	0.08	0.54	0.85	0.00	71	70	70	1.21	0.50	200	0.016	111	111	137.0	1.00	0.98		63.9	151.1	146.8	68.7	132.6	482	81	80	70	0.000	1.001	8.155	522			
11	0.877	0.885	4.321	0.08	0.08	0.53	0.85	0.00	71	71	70	1.20	0.50	206	0.016	111	111	135.0	2.00	0.97		64.9	152.0	147.8	68.5	133.4	499	81	80	70	0.000	1.001	8.072	524			
12	0.956	0.965	4.714	0.08	0.08	0.52	0.85	0.00	71	71	70	1.19	0.50	212	0.016	112	112	133.0	2.00	0.96		65.9	153.0	148.7	68.7	134.6	522	77	76	70	0.000	1.001	7.989	527			
13	1.036	1.045	5.107	0.08	0.08	0.58	0.84	0.00	71	71	70	1.14	0.50	221	0.016	112	112	132.0	1.00	1.00		66.8	154.1	149.6	68.7	135.5	581	77	75	70	0.000	1.001	8.322	556			
14	1.116	1.126	5.500	0.08	0.08	0.56	0.84	0.00	71	71	70	1.12	0.50	227	0.016	113	113	131.0	1.00	0.90		68.3	155.1	150.9	68.7	137.0	617	75	75	70	0.000	1.001	7.490	512			
15	1.196	1.206	5.892	0.08	0.08	0.54	0.83	0.00	71	71	70	1.10	0.50	232	0.016	113	113	129.0	2.00	0.87		70.1	156.4	152.3	68.6	138.7	628	75	76	70	0.000	1.001	7.240	508			
16	1.275	1.287	6.285	0.08	0.08	0.53	0.82	0.00	71	71	70	1.07	0.40	235	0.016	114	114	128.0	1.00	0.87		71.4	157.9	153.7	68.7	140.1	641	74	77	70	0.000	1.001	7.240	518			
17	1.355	1.367	6.678	0.08	0.08	0.54	0.82	0.00	71	71	70	1.02	0.40	237	0.016	114	114	126.0	2.00	0.86		72.9	159.6	155.3	68.8	141.7	648	74	78	70	0.000	1.001	7.157	522			
18	1.435	1.448	7.071	0.08	0.08	0.53	0.85	0.00	71	71	70	0.96	0.40	240	0.016	114	114	124.0	2.00	0.87		75.2	161.4	157.2	68.7	143.9	655	75	78	70	0.000	1.001	7.240	545			
19	1.514	1.528	7.464	0.08	0.08	0.54	0.84	0.00	72	71	70	0.84	0.40	242	0.016	114	114	123.0	1.00	0.87		76.9	163.1	158.8	68.8	145.7	661	75	78	70	0.000	1.001	7.240	558			
20	1.594	1.608	7.856	0.08	0.08	0.38	0.84	0.00	72	72	70	-0.20	0.40	243	0.016	114	114	121.0	2.00	0.81		78.9	164.8	160.7	68.7	147.6	666	72	79	70	0.000	1.001	6.741	533			
21	1.674	1.689	8.249	0.08	0.08	0.01	0.84	0.00	72	72	70	1.64	0.40	245	0.016	114	114	120.0	1.00	0.77		81.2	166.6	162.3	68.7	149.9	669	3218	79	70	0.000	1.001	6.408	521			
22	1.753	1.769	8.642	0.08	0.08	0.28	0.85	0.00	72	72	70	1.11	0.30	246	0.016	114	114	118.0	2.00	0.70		83.1	168.5	164.6	68.8	151.8	673	3218	80	70	0.000	1.001	5.825	484			
23	1.833	1.850	9.035	0.08	0.08	0.53	0.81	0.00	72	72	70	1.22	0.30	247	0.016	114	114	116.0	2.00	0.75		85.1	170.2	165.9	68.8	153.9	677	72	80	70	0.000	1.001	6.241	532			
24	1.913	1.930	9.428	0.08	0.08	0.53	0.82	0.00	72	72	70	1.21	0.30	249	0.016	115	114	115.0	1.00	0.79		87.5	172.1	167.7	68.9	156.4	679	72	81	70	0.000	1.001	6.574	576			
25	1.993	2.011	9.821	0.08	0.08	0.52	0.26	0.00	72	72	70	1.18	-2.50	249	0.016	115	114	113.0	2.00	0.77		89.2	173.9	169.5	68.9	158.1	682	72	75	70	0.000	1.001	6.408	572			
26	2.072	2.091	10.213	0.08	0.08	0.52	0.05	0.00	72	72	70	1.14	1.00	250	0.016	115	115	111.0	2.00	0.78		91.0	175.7	171.2	69.0	160.0	680	73	77	70	0.000	1.001	6.491	592			
27	2.152	2.171	10.606	0.08	0.08	0.52	0.26	0.00	72	72	70	1.12	0.40	251	0.016	115	115	110.0	1.00	0.79		93.0	177.7	173.2	68.9	161.9	685	73	79	70	0.000	1.001	6.574	612			
28	2.232	2.252	10.999	0.08	0.08	0.51	0.88	0.00	72	72	70	1.09	0.30	252	0.016	115	115	108.0	2.00	0.76		95.0	179.4	174.7	69.0	163.9	688	74	78	70	0.000	1.001	6.324	601			
29	2.311	2.332	11.392	0.08	0.08	0.51	0.87	0.00	72	72	70	1.06	0.30	253	0.016	115	115	106.0	2.00	0.72		97.4	181.5	177.2	68.9	166.3	690	75	77	70	0.000	1.001	5.992	584			
30	2.391	2.413	11.785	0.08	0.08	0.50	0.87	0.00	73	72	70	0.96	0.30	253	0.016	115	115	104.0	2.00	0.59		99.2	183.4	179.8	69.1	168.2	684	76	77	70	0.000	1.001	4.910	487			
31	2.471	2.493	12.178	0.08	0.08	0.46	0.88	0.00	73	72	70	0.56	0.30	181	0.016	109	109	103.0	1.00	0.66		101.3	185.2	181.1	69.1	170.4	600	74	75	70	0.000	1.001	5.492	557			
32	2.550	2.574	12.570	0.08	0.08	0.51	0.87	0.00	73	73	70	0.42	0.30	136	0.016	105	105	102.0	1.00	0.67		102.7	186.9	182.5	69.0	171.7	494	73	74	70	0.000	1.001	5.575	573			
33	2.630	2.654	12.963	0.08	0.08	0.51	0.86	0.00	73	73	70	0.42	0.30	115	0.016	103																					

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					
40	3.188	3.217	15.713	0.08	0.08	0.54	0.87	0.00	73	73	70	0.47	0.30	85	0.016	100	100	100.0	1.00	0.60		104.5	190.3	186.4	69.0	173.6	360	68	69	70	0.000	1.001	4.993	523		
41	3.268	3.297	16.106	0.08	0.08	0.55	0.88	0.00	73	73	70	0.48	0.30	84	0.016	100	100	100.0	0.00	0.60		104.8	190.2	186.2	69.1	173.9	351	68	69	70	0.000	1.001	4.993	524		
42	3.347	3.378	16.499	0.08	0.08	0.55	0.87	0.00	73	73	70	0.50	0.30	83	0.016	100	100	100.0	0.00	0.62		104.9	190.1	186.3	69.0	173.9	343	67	69	70	0.000	1.001	5.159	542		
43	3.427	3.458	16.891	0.08	0.08	0.57	0.87	0.00	73	73	70	0.51	0.30	82	0.016	100	100	100.0	0.00	0.58		104.8	190.0	186.2	69.0	173.9	335	67	68	70	0.000	1.001	4.826	507		
44	3.507	3.539	17.284	0.08	0.08	0.58	0.88	0.00	74	73	70	0.53	0.30	82	0.016	100	100	100.0	0.00	0.62		104.9	189.9	186.1	69.1	174.0	327	67	68	70	0.000	1.001	5.159	542		
45	3.587	3.619	17.677	0.08	0.08	0.55	0.88	0.00	74	73	70	0.60	0.30	81	0.016	100	100	100.0	0.00	0.59		104.9	189.8	185.9	69.1	174.0	320	66	68	70	0.000	1.001	4.910	516		
46	3.666	3.699	18.070	0.08	0.08	0.56	0.88	0.00	74	73	70	0.62	0.30	81	0.016	100	100	100.0	0.00	0.58		105.3	189.6	185.8	69.1	174.4	313	66	68	70	0.000	1.001	4.826	509		
47	3.746	3.780	18.463	0.08	0.08	0.58	0.87	0.00	74	73	71	0.64	0.30	80	0.016	100	100	100.0	0.00	0.61		105.7	189.4	185.7	69.1	174.7	306	66	67	71	0.000	1.001	5.076	537		
48	3.826	3.860	18.856	0.08	0.08	0.58	0.87	0.00	74	74	70	0.72	0.30	80	0.016	100	100	100.0	0.00	0.59		105.7	189.3	185.5	69.0	174.8	300	66	67	70	0.000	1.001	4.910	520		
49	3.905	3.941	19.248	0.08	0.08	0.55	0.86	0.00	74	74	71	0.74	0.40	80	0.016	100	100	100.0	0.00	0.62		105.6	189.1	185.4	69.0	174.6	294	66	67	71	0.000	1.001	5.159	545		
50	3.985	4.021	19.641	0.08	0.08	0.56	0.82	0.00	74	74	71	0.76	0.40	79	0.016	100	99	100.0	0.00	0.62		105.3	189.0	185.3	69.1	174.4	288	66	67	71	0.000	1.001	5.159	544		
51	4.065	4.102	20.034	0.08	0.08	0.57	0.83	0.00	74	74	71	0.77	0.40	79	0.016	100	99	100.0	0.00	0.58		105.2	188.8	185.1	69.2	174.4	282	65	67	71	0.000	1.001	4.826	508		
52	4.144	4.182	20.427	0.08	0.08	0.58	0.83	0.00	74	74	71	0.79	0.40	79	0.016	100	99	100.0	0.00	0.59		105.5	188.6	184.9	69.0	174.6	277	65	67	71	0.000	1.001	4.910	519		
53	4.224	4.262	20.820	0.08	0.08	0.59	0.83	0.00	74	74	71	0.81	0.40	79	0.016	100	99	100.0	0.00	0.68		105.4	188.5	184.3	69.0	174.3	272	65	67	71	0.000	1.001	5.659	597		
54	4.304	4.343	21.213	0.08	0.08	0.56	0.83	0.00	74	74	71	0.86	0.40	78	0.016	99	99	100.0	0.00	0.71		105.1	188.3	183.8	69.1	174.3	267	65	67	71	0.000	1.001	5.908	622		
55	4.384	4.423	21.605	0.08	0.08	0.56	0.83	0.00	74	74	71	0.88	0.40	78	0.016	99	99	100.0	0.00	0.73		105.0	188.0	183.5	69.1	174.1	262	65	67	71	0.000	1.001	6.075	639		
56	4.463	4.504	21.998	0.08	0.08	0.57	0.83	0.00	74	74	71	0.90	0.40	78	0.016	99	99	99.9	0.10	0.71		105.1	187.7	183.3	69.1	174.2	257	65	67	71	0.000	1.001	5.908	622		
57	4.543	4.584	22.391	0.08	0.08	0.58	0.83	0.00	74	74	71	0.91	0.40	78	0.016	99	99	99.9	0.00	0.68		104.8	187.5	183.1	69.2	174.0	253	65	66	71	0.000	1.001	5.658	594		
58	4.623	4.664	22.784	0.08	0.08	0.59	0.83	0.00	74	74	71	0.93	0.40	78	0.016	99	99	99.9	0.00	0.72		104.7	187.3	182.9	69.1	173.8	249	65	66	71	0.000	1.001	5.991	628		
59	4.702	4.745	23.177	0.08	0.08	0.60	0.83	0.00	74	74	71	0.94	0.40	78	0.016	99	99	99.8	0.10	0.71		104.4	187.1	182.7	69.2	173.7	245	65	66	71	0.000	1.001	5.908	618		
60	4.782	4.825	23.569	0.08	0.08	0.60	0.83	0.00	75	74	71	0.97	0.40	78	0.016	99	99	99.8	0.00	0.69		104.3	186.9	182.6	69.1	173.5	240	65	66	71	0.000	1.001	5.742	600		
61	4.862	4.906	23.962	0.08	0.08	0.59	0.83	0.00	75	74	71	0.98	0.40	77	0.016	99	99	99.7	0.10	0.70		104.2	186.6	182.3	69.1	173.3	237	65	66	71	0.000	1.001	5.825	608		
62	4.941	4.986	24.355	0.08	0.08	0.61	0.83	0.00	75	74	71	0.99	0.40	77	0.016	99	99	99.7	0.00	0.70		104.1	186.5	182.1	69.1	173.2	233	65	66	71	0.000	1.001	5.825	607		
63	5.021	5.067	24.748	0.08	0.08	0.59	0.83	0.00	75	74	71	1.03	0.40	77	0.016	99	99	99.7	0.00	0.69		103.8	186.3	181.9	69.1	172.9	230	65	66	71	0.000	1.001	5.742	596		
64	5.101	5.147	25.141	0.08	0.08	0.54	0.83	0.00	75	74	71	1.07	0.40	77	0.016	99	99	99.7	0.00	0.71		103.6	186.0	181.6	69.2	172.8	226	65	66	71	0.000	1.001	5.908	613		
65	5.181	5																																		

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						
88	7.014	7.077	34.569	0.08	0.08	0.53	0.82	0.00	76	75	72	1.22	0.40	75	0.016	99	99	99.1	0.10	0.70		98.4	181.0	177.0	69.3	167.7	172	65	67	72	0.000	1.001	5.825	574			
89	7.093	7.158	34.961	0.08	0.08	0.53	0.81	0.00	76	75	72	1.22	0.40	75	0.016	99	99	99.2	-0.10	0.67		98.2	180.8	176.8	69.2	167.5	171	65	67	72	0.000	1.001	5.575	548			
90	7.173	7.238	35.354	0.08	0.08	0.54	0.81	0.00	76	75	72	1.22	0.40	75	0.016	99	99	99.1	0.10	0.65		98.0	180.5	176.6	69.2	167.2	169	65	67	72	0.000	1.001	5.409	531			
91	7.253	7.318	35.747	0.08	0.08	0.53	0.81	0.00	76	75	72	1.22	0.40	75	0.016	99	99	99.1	0.00	0.70		97.9	180.4	176.4	69.2	167.1	168	65	67	72	0.000	1.001	5.825	571			
92	7.332	7.399	36.140	0.08	0.08	0.54	0.81	0.00	76	75	72	1.22	0.40	75	0.016	99	99	99.2	-0.10	0.66		97.5	180.1	176.2	69.3	166.8	167	65	67	72	0.000	1.001	5.492	536			
93	7.412	7.479	36.533	0.08	0.08	0.54	0.81	0.00	76	75	72	1.23	0.40	75	0.016	99	99	99.0	0.20	0.68		97.6	180.0	176.0	69.2	166.8	166	65	67	72	0.000	1.001	5.658	553			
94	7.492	7.560	36.926	0.08	0.08	0.54	0.81	0.00	76	75	72	1.23	0.40	75	0.016	99	99	99.1	-0.10	0.67		97.3	179.8	175.8	69.1	166.4	164	65	67	72	0.000	1.001	5.575	543			
95	7.572	7.640	37.318	0.08	0.08	0.54	0.82	0.00	76	75	72	1.23	0.40	75	0.016	99	99	99.1	0.00	0.71		96.9	179.5	175.6	69.2	166.1	164	65	67	72	0.000	1.001	5.908	573			
96	7.651	7.721	37.711	0.08	0.08	0.54	0.82	0.00	76	75	72	1.23	0.40	75	0.016	99	99	99.0	0.10	0.62		96.5	179.3	175.5	69.4	166.0	163	65	67	72	0.000	1.001	5.159	499			
97	7.731	7.801	38.104	0.08	0.08	0.55	0.83	0.00	76	76	72	1.23	0.40	75	0.016	99	99	99.1	-0.10	0.67		96.2	179.1	175.2	69.5	165.7	162	66	67	72	0.000	1.001	5.575	537			
98	7.811	7.881	38.497	0.08	0.08	0.54	0.82	0.00	76	76	72	1.23	0.40	75	0.016	99	99	99.0	0.10	0.68		96.0	178.9	175.0	69.4	165.4	160	66	67	72	0.000	1.001	5.658	544			
99	7.890	7.962	38.890	0.08	0.08	0.54	0.82	0.00	76	76	72	1.23	0.40	75	0.016	99	99	99.0	0.00	0.68		95.7	178.7	174.8	69.3	165.1	160	66	67	72	0.000	1.001	5.658	542			
100	7.970	8.042	39.282	0.08	0.08	0.54	0.82	0.00	76	76	72	1.23	0.40	75	0.016	99	99	99.0	0.00	0.65		95.4	178.4	174.6	69.3	164.8	160	66	67	72	0.000	1.001	5.409	517			
101	8.050	8.123	39.675	0.08	0.08	0.54	0.82	0.00	76	76	72	1.23	0.40	75	0.016	99	99	99.0	0.00	0.68		95.2	178.2	174.4	69.3	164.5	160	66	67	72	0.000	1.001	5.658	539			
102	8.129	8.203	40.068	0.08	0.08	0.54	0.82	0.00	76	76	72	1.23	0.40	75	0.016	99	99	99.0	0.00	0.66		94.7	178.0	174.2	69.4	164.1	158	66	67	72	0.000	1.001	5.492	521			
103	8.209	8.283	40.461	0.08	0.08	0.54	0.82	0.00	76	76	72	1.24	0.40	75	0.016	99	99	99.0	0.00	0.67		94.8	177.8	173.9	69.3	164.1	158	66	67	72	0.000	1.001	5.575	529			
104	8.289	8.364	40.854	0.08	0.08	0.54	0.82	0.00	76	76	72	1.23	0.40	75	0.016	99	99	98.9	0.10	0.68		94.5	177.6	173.7	69.2	163.7	158	66	67	72	0.000	1.001	5.658	536			
105	8.369	8.444	41.247	0.08	0.08	0.55	0.82	0.00	76	76	72	1.24	0.40	75	0.016	99	99	98.9	0.00	0.68		94.2	177.4	173.6	69.4	163.6	158	66	67	72	0.000	1.001	5.658	534			
106	8.448	8.525	41.639	0.08	0.08	0.54	0.83	0.00	76	76	72	1.23	0.40	75	0.016	99	99	98.9	0.00	0.69		94.0	177.1	173.3	69.3	163.3	157	66	67	72	0.000	1.001	5.742	540			
107	8.528	8.605	42.032	0.08	0.08	0.54	0.83	0.00	76	76	72	1.23	0.40	75	0.016	99	99	98.9	0.00	0.65		93.7	176.9	173.1	69.4	163.1	156	66	67	72	0.000	1.001	5.409	507			
108	8.608	8.686	42.425	0.08	0.08	0.55	0.84	0.00	76	76	72	1.23	0.40	75	0.016	99	99	98.9	0.00	0.68		93.4	176.7	173.0	69.4	162.7	155	66	67	72	0.000	1.001	5.658	529			
109	8.687	8.766	42.818	0.08	0.08	0.54	0.84	0.00	76	76	73	1.23	0.40	75	0.016	99	99	98.9	0.00	0.68		92.4	176.5	172.8	69.5	161.9	154	66	67	73	0.000	1.001	5.658	524			
110	8.767	8.846	43.211	0.08	0.08	0.54	0.84	0.00	76	76	72	1.23	0.40	75	0.016	99	99	98.9	0.00	0.68		92.3	176.3	172.6	69.3	161.6	154	66	67	72	0.000	1.001	5.658	523			
111	8.847	8.927	43.604	0.08	0.08	0.54	0.84	0.00	77	76	73	1.23	0.40	75	0.016	99	99	98.9	0.00	0.67		92.1	176.1	172.3	69.4	161.5	154	66	67	73	0.000	1.001	5.575	514			
112	8.926	9.007	43.996	0.08	0.08	0.54	0.84	0.00	77	76	73	1.24	0.40	75	0.016	99	99	98.9	0.00	0.70		92.0	175.9	172.1	69.4	161.4	154	66	67	73	0.000	1.001	5.825	536			
113	9.006	9.088	44.389	0.08	0.08	0.55	0.84	0.00	77	76	73	1.24	0.50	7																							

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						
136	10.839	10.937	53.424	0.08	0.08	0.55	0.82	0.00	77	77	73	1.24	0.50	75	0.016	99	99	98.6	0.10	0.77		86.6	170.6	166.4	69.6	156.1	143	67	68	73	0.000	1.001	6.407	555			
137	10.919	11.018	53.817	0.08	0.08	0.54	0.81	0.00	77	77	73	1.24	0.50	75	0.016	99	99	98.7	-0.10	0.76		86.6	170.4	166.3	69.4	155.9	142	67	68	73	0.000	1.001	6.324	548			
138	10.999	11.098	54.210	0.08	0.08	0.54	0.82	0.00	77	77	73	1.24	0.50	75	0.016	99	99	98.6	0.10	0.75		86.1	170.1	166.1	69.6	155.7	144	67	68	73	0.000	1.001	6.241	538			
139	11.078	11.179	54.603	0.08	0.08	0.55	0.81	0.00	78	77	73	1.24	0.50	75	0.016	98	99	98.6	0.00	0.77		86.0	169.9	166.0	69.6	155.6	143	67	68	73	0.000	1.001	6.407	552			
140	11.158	11.259	54.995	0.08	0.08	0.54	0.81	0.00	78	77	73	1.24	0.50	75	0.016	98	99	98.6	0.00	0.73		85.8	169.7	165.8	69.5	155.3	144	67	68	73	0.000	1.001	6.074	522			
141	11.238	11.340	55.388	0.08	0.08	0.54	0.81	0.00	78	77	73	1.24	0.50	75	0.016	98	99	98.7	-0.10	0.74		85.6	169.5	165.4	69.5	155.1	143	67	68	73	0.000	1.001	6.157	528			
142	11.317	11.420	55.781	0.08	0.08	0.55	0.82	0.00	78	77	73	1.24	0.50	75	0.016	98	99	98.6	0.10	0.77		85.3	169.3	165.2	69.5	154.9	143	67	68	73	0.000	1.001	6.407	547			
143	11.397	11.500	56.174	0.08	0.08	0.54	0.82	0.00	78	77	73	1.24	0.50	75	0.016	98	99	98.6	0.00	0.77		85.1	169.0	165.0	69.4	154.6	141	67	68	73	0.000	1.001	6.407	546			
144	11.477	11.581	56.567	0.08	0.08	0.54	0.82	0.00	78	77	73	1.24	0.50	75	0.016	98	99	98.7	-0.10	0.78		84.9	168.8	164.7	69.4	154.3	141	67	68	73	0.000	1.001	6.490	552			
145	11.557	11.661	56.960	0.08	0.08	0.54	0.81	0.00	78	77	73	1.24	0.50	75	0.016	98	99	98.6	0.10	0.75		84.8	168.5	164.6	69.4	154.2	142	67	68	73	0.000	1.001	6.241	530			
146	11.636	11.742	57.352	0.08	0.08	0.54	0.81	0.00	78	77	73	1.24	0.50	75	0.016	98	99	98.6	0.00	0.77		84.5	168.3	164.2	69.4	153.9	142	67	68	73	0.000	1.001	6.407	542			
147	11.716	11.822	57.745	0.08	0.08	0.55	0.81	0.00	78	77	74	1.24	0.50	75	0.016	98	99	98.6	0.00	0.76		84.2	168.1	164.1	69.5	153.7	141	67	68	74	0.000	1.001	6.324	533			
148	11.796	11.902	58.138	0.08	0.08	0.55	0.82	0.00	78	77	74	1.24	0.50	75	0.016	98	99	98.6	0.00	0.75		83.9	167.8	163.9	69.5	153.4	140	67	68	74	0.000	1.001	6.241	524			
149	11.875	11.983	58.531	0.08	0.08	0.55	0.82	0.00	78	77	73	1.24	0.50	75	0.016	98	99	98.6	0.00	0.75		83.9	167.6	163.7	69.4	153.3	140	67	68	73	0.000	1.001	6.241	524			
150	11.955	12.063	58.924	0.08	0.08	0.55	0.82	0.00	78	77	74	1.24	0.50	75	0.016	98	99	98.6	0.00	0.77		83.5	167.4	163.4	69.5	153.0	141	67	68	74	0.000	1.001	6.407	536			
151	12.035	12.144	59.317	0.08	0.08	0.55	0.81	0.00	78	77	74	1.24	0.50	75	0.016	98	99	98.6	0.00	0.76		83.3	167.2	163.2	69.4	152.7	141	67	69	74	0.000	1.001	6.324	528			
152	12.114	12.224	59.709	0.08	0.08	0.55	0.81	0.00	78	77	74	1.24	0.50	75	0.016	98	99	98.6	0.00	0.75		83.1	167.0	163.1	69.5	152.5	141	67	69	74	0.000	1.001	6.241	519			
153	12.194	12.305	60.102	0.08	0.08	0.54	0.81	0.00	78	77	74	1.24	0.50	75	0.016	98	99	98.6	0.00	0.76		82.8	166.7	162.8	69.5	152.2	141	67	69	74	0.000	1.001	6.324	524			
154	12.274	12.385	60.495	0.08	0.08	0.54	0.82	0.00	78	77	74	1.24	0.50	75	0.016	98	99	98.6	0.00	0.79		82.6	166.5	162.6	69.5	152.1	139	67	69	74	0.000	1.001	6.574	544			
155	12.354	12.465	60.888	0.08	0.08	0.54	0.82	0.00	78	77	74	1.24	0.50	75	0.016	98	99	98.6	0.00	0.79		82.5	166.3	162.3	69.4	151.9	137	67	69	74	0.000	1.001	6.574	543			
156	12.433	12.546	61.281	0.08	0.08	0.55	0.82	0.00	78	77	74	1.24	0.50	75	0.016	98	99	98.6	0.00	0.79		82.3	166.0	161.9	69.3	151.6	137	67	69	74	0.000	1.001	6.574	542			
157	12.513	12.626	61.673	0.08	0.08	0.54	0.81	0.00	78	77	74	1.24	0.50	75	0.016	98	99	98.6	0.00	0.79		82.0	165.8	161.7	69.4	151.4	138	67	69	74	0.000	1.001	6.574	539			
158	12.593	12.707	62.066	0.08	0.08	0.55	0.81	0.00	78	77	74	1.24	0.50	75	0.016	98	99	98.6	0.00	0.78		81.9	165.5	161.7	69.3	151.2	138	67	69	74	0.000	1.001	6.490	532			
159	12.672	12.787	62.459	0.08	0.08	0.55	0.81	0.00	78	77	74	1.24	0.50	75	0.016	98	99	98.6	0.00	0.75		81.7	165.4	161.4	69.4	151.0	137	67	69	74	0.000	1.001	6.241	510			
160	12.752	12.868	62.852	0.08	0.08	0.54	0.81	0.00	78	77	74	1.24	0.50	75	0.016	98	99	98.6	0.00	0.82		81.4	165.1	161.1	69.3	150.7	137	67	69	74	0.000	1.001	6.823	556			
161	12.832	12.948	63.245	0.08	0.08	0.55	0.82	0.00	78	78	74	1.24	0.50	75	0.016	98	98	98.5	0.10	0.79		81.3	164.98														

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						
184	14.665	14.798	72.280	0.08	0.08	0.54	0.82	0.00	79	78	74	1.24	0.50	76	0.016	98	98	98.3	0.10	0.77		76.1	159.9	156.1	69.4	145.4	131	68	70	74	0.000	1.001	6.407	488			
185	14.745	14.878	72.673	0.08	0.08	0.55	0.82	0.00	79	78	75	1.24	0.50	76	0.016	98	98	98.4	-0.10	0.81		75.9	159.6	155.9	69.3	145.3	132	68	70	75	0.000	1.001	6.740	512			
186	14.824	14.958	73.065	0.08	0.08	0.55	0.82	0.00	79	78	74	1.24	0.50	76	0.016	98	98	98.4	0.00	0.80		75.6	159.4	155.7	69.3	144.9	131	68	70	74	0.000	1.001	6.657	504			
187	14.904	15.039	73.458	0.08	0.08	0.54	0.81	0.00	79	78	74	1.24	0.50	76	0.016	98	98	98.4	0.00	0.80		75.6	159.2	155.5	69.3	144.9	130	68	70	74	0.000	1.001	6.657	504			
188	14.984	15.119	73.851	0.08	0.08	0.55	0.81	0.00	79	78	75	1.24	0.50	76	0.016	98	98	98.4	0.00	0.81		75.1	159.0	155.3	69.3	144.4	130	68	70	75	0.000	1.001	6.740	507			
189	15.063	15.200	74.244	0.08	0.08	0.55	0.82	0.00	79	78	75	1.24	0.50	76	0.016	98	98	98.3	0.10	0.80		74.6	158.8	155.1	69.6	144.2	131	68	70	75	0.000	1.001	6.657	497			
190	15.143	15.280	74.637	0.08	0.08	0.55	0.82	0.00	79	78	74	1.24	0.50	76	0.016	98	98	98.4	-0.10	0.77		74.6	158.6	154.9	69.5	144.0	130	68	70	74	0.000	1.001	6.407	478			
191	15.223	15.361	75.030	0.08	0.08	0.55	0.82	0.00	79	78	74	1.24	0.50	76	0.016	98	98	98.3	0.10	0.79		74.3	158.4	154.6	69.5	143.8	130	68	70	74	0.000	1.001	6.574	489			
192	15.302	15.441	75.422	0.08	0.08	0.54	0.83	0.00	79	78	74	1.24	0.50	76	0.016	98	98	98.3	0.00	0.79		74.2	158.2	154.5	69.7	143.8	129	68	70	74	0.000	1.001	6.573	488			
193	15.382	15.521	75.815	0.08	0.08	0.55	0.81	0.00	79	78	74	1.24	0.50	76	0.016	98	98	98.3	0.00	0.80		73.8	158.0	154.3	69.6	143.4	128	68	70	74	0.000	1.001	6.657	492			
194	15.462	15.602	76.208	0.08	0.08	0.54	0.81	0.00	79	78	75	1.24	0.50	76	0.016	98	98	98.3	0.00	0.79		73.5	157.7	154.1	69.7	143.3	128	68	70	75	0.000	1.001	6.573	484			
195	15.542	15.682	76.601	0.08	0.08	0.54	0.82	0.00	79	78	75	1.24	0.50	76	0.016	98	98	98.3	0.00	0.79		73.1	157.5	153.9	69.7	142.9	129	68	70	75	0.000	1.001	6.573	481			
196	15.621	15.763	76.994	0.08	0.08	0.55	0.81	0.00	79	78	75	1.24	0.50	76	0.016	98	98	98.3	0.00	0.78		73.2	157.3	153.8	69.7	143.0	128	68	70	75	0.000	1.001	6.490	476			
197	15.701	15.843	77.386	0.08	0.08	0.55	0.82	0.00	79	78	75	1.24	0.50	76	0.016	98	98	98.3	0.00	0.78		73.0	157.1	153.6	69.6	142.6	127	68	70	75	0.000	1.001	6.490	474			
198	15.781	15.924	77.779	0.08	0.08	0.54	0.82	0.00	79	78	75	1.24	0.50	76	0.016	98	98	98.3	0.00	0.79		72.6	157.0	153.4	69.7	142.3	128	68	70	75	0.000	1.001	6.573	478			
199	15.860	16.004	78.172	0.08	0.08	0.55	0.81	0.00	79	78	75	1.24	0.50	76	0.016	98	98	98.3	0.00	0.78		72.5	156.8	153.2	69.7	142.2	127	68	70	75	0.000	1.001	6.490	471			
200	15.940	16.084	78.565	0.08	0.08	0.54	0.81	0.00	79	78	75	1.24	0.50	76	0.016	98	98	98.3	0.00	0.79		72.3	156.6	152.9	69.7	142.0	128	69	70	75	0.000	1.001	6.573	476			
201	16.020	16.165	78.958	0.08	0.08	0.55	0.82	0.00	79	78	75	1.24	0.50	76	0.016	98	98	98.3	0.00	0.77		72.2	156.3	152.8	69.7	141.8	126	69	70	75	0.000	1.001	6.407	463			
202	16.099	16.245	79.351	0.08	0.08	0.55	0.81	0.00	79	78	75	1.24	0.50	76	0.016	98	98	98.3	0.00	0.80		72.0	156.1	152.7	69.7	141.7	126	69	70	75	0.000	1.001	6.657	480			
203	16.179	16.326	79.743	0.08	0.08	0.54	0.82	0.00	79	78	75	1.25	0.50	76	0.016	98	98	98.3	0.00	0.81		71.8	156.0	152.4	69.7	141.4	127	69	70	75	0.000	1.001	6.740	484			
204	16.259	16.406	80.136	0.08	0.08	0.55	0.82	0.00	79	78	75	1.24	0.50	76	0.016	98	98	98.2	0.10	0.78		71.4	155.7	152.2	69.7	141.1	127	69	70	75	0.000	1.001	6.490	464			
205	16.339	16.487	80.529	0.08	0.08	0.54	0.81	0.00	79	78	75	1.25	0.50	76	0.016	98	98	98.2	0.00	0.80		71.3	155.5	152.0	69.7	141.0	128	69	70	75	0.000	1.001	6.657	475			
206	16.418	16.567	80.922	0.08	0.08	0.54	0.82	0.00	79	78	75	1.24	0.50	76	0.016	98	98	98.3	-0.10	0.81		71.1	155.4	151.8	69.7	140.8	126	69	70	75	0.000	1.001	6.740	480			
207	16.498	16.647	81.315	0.08	0.08	0.55	0.82	0.00	79	78	75	1.24	0.50	76	0.016	98	98	98.3	0.00	0.77		71.0	155.1	151.6	69.6	140.6	126	69	70	75	0.000	1.001	6.407	455			
208	16.578	16.728	81.708	0.08	0.08	0.54	0.81	0.00	79	78	75	1.25	0.50	76	0.016	98	98	98.2	0.10	0.81		70.9	154.9	151.3	69.5	140.4	124	69	70	75	0.000	1.001	6.740	478			
209	16.657	16.808	82.100	0.08	0.08	0.55	0.81	0.00	79	78	75	1.24	0.50	76	0.016	98	98	98.2	0.00	0.81		70.5	154.7	151													

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					
232	18.490	18.658	91.135	0.08	0.08	0.54	0.81	0.00	80	79	75	1.24	0.50	76	0.016	98	98	98.2	0.10	0.87		65.9	149.9	146.2	69.5	135.5	120	70	71	75	0.000	1.001	7.239	478		
233	18.570	18.738	91.528	0.08	0.08	0.55	0.81	0.00	80	79	75	1.24	0.50	76	0.016	98	98	98.2	0.00	0.87		65.9	149.6	146.0	69.4	135.3	120	70	71	75	0.000	1.001	7.239	478		
234	18.650	18.819	91.921	0.08	0.08	0.55	0.82	0.00	80	79	75	1.24	0.50	76	0.016	98	98	98.2	0.00	0.86		65.7	149.5	145.9	69.5	135.2	120	70	71	75	0.000	1.001	7.156	471		
235	18.730	18.899	92.314	0.08	0.08	0.54	0.81	0.00	80	79	75	1.24	0.50	76	0.016	98	98	98.2	0.00	0.84		65.2	149.2	145.6	69.6	134.8	119	70	71	75	0.000	1.001	6.989	457		
236	18.809	18.980	92.707	0.08	0.08	0.55	0.82	0.00	80	79	75	1.24	0.50	76	0.016	98	98	98.2	0.00	0.87		65.0	149.0	145.4	69.6	134.6	119	70	71	75	0.000	1.001	7.239	471		
237	18.889	19.060	93.099	0.08	0.08	0.54	0.82	0.00	80	79	75	1.24	0.50	76	0.016	98	98	98.2	0.00	0.85		65.1	148.8	145.3	69.4	134.6	120	70	71	75	0.000	1.001	7.073	461		
238	18.969	19.140	93.492	0.08	0.08	0.54	0.81	0.00	80	79	75	1.24	0.50	76	0.016	98	98	98.2	0.00	0.86		64.6	148.7	145.1	69.6	134.2	118	70	71	75	0.000	1.001	7.156	463		
239	19.048	19.221	93.885	0.08	0.08	0.55	0.81	0.00	80	79	75	1.24	0.50	76	0.016	98	98	98.3	-0.10	0.87		64.7	148.4	144.9	69.4	134.2	119	70	71	75	0.000	1.001	7.239	469		
240	19.128	19.301	94.278	0.08	0.08	0.54	0.82	0.00	80	79	75	1.24	0.50	76	0.016	98	98	98.2	0.10	0.89		64.3	148.2	144.7	69.5	133.8	117	70	71	75	0.000	1.001	7.406	477		
241	19.208	19.382	94.671	0.08	0.08	0.55	0.81	0.00	80	79	75	1.24	0.50	76	0.016	98	98	98.3	-0.10	0.89		64.0	148.0	144.5	69.6	133.6	118	70	71	75	0.000	1.001	7.406	475		
242	19.287	19.462	95.064	0.08	0.08	0.55	0.81	0.00	80	79	75	1.24	0.50	76	0.016	98	98	98.2	0.10	0.85		64.1	147.8	144.2	69.5	133.5	118	70	71	75	0.000	1.001	7.073	454		
243	19.367	19.543	95.456	0.08	0.08	0.55	0.82	0.00	80	79	75	1.24	0.50	76	0.016	98	98	98.2	0.00	0.86		63.8	147.6	144.1	69.5	133.3	119	70	71	75	0.000	1.001	7.156	457		
244	19.447	19.623	95.849	0.08	0.08	0.55	0.81	0.00	80	79	75	1.24	0.50	76	0.016	98	98	98.2	0.00	0.88		63.5	147.4	143.8	69.5	133.0	118	70	71	75	0.000	1.001	7.322	465		
245	19.527	19.703	96.242	0.08	0.08	0.54	0.81	0.00	80	79	75	1.24	0.50	76	0.016	98	98	98.2	0.00	0.86		63.2	147.3	143.7	69.6	132.8	118	70	71	75	0.000	1.001	7.156	453		
246	19.606	19.784	96.635	0.08	0.08	0.54	0.82	0.00	80	79	75	1.24	0.50	76	0.016	98	98	98.2	0.00	0.86		63.0	147.0	143.6	69.6	132.6	117	70	71	75	0.000	1.001	7.156	451		
247	19.686	19.864	97.028	0.08	0.08	0.56	0.81	0.00	80	79	75	1.24	0.50	76	0.016	98	98	98.2	0.00	0.84		62.7	146.8	143.4	69.7	132.3	118	70	71	75	0.000	1.001	6.989	438		
248	19.766	19.945	97.421	0.08	0.08	0.54	0.81	0.00	80	79	75	1.24	0.50	76	0.016	98	98	98.2	0.00	0.87		62.5	146.6	143.2	69.6	132.1	117	70	71	75	0.000	1.001	7.239	453		
249	19.845	20.025	97.813	0.08	0.08	0.55	0.82	0.00	80	80	75	1.24	0.50	76	0.016	98	98	98.2	0.00	0.89		62.3	146.4	143.0	69.6	131.9	117	70	71	75	0.000	1.001	7.405	462		
250	19.925	20.106	98.206	0.08	0.08	0.55	0.81	0.00	80	80	76	1.24	0.50	76	0.016	98	98	98.3	-0.10	0.87		62.1	146.2	142.8	69.7	131.9	116	70	71	76	0.000	1.001	7.239	450		
251	20.005	20.186	98.599	0.08	0.08	0.55	0.82	0.00	80	80	75	1.24	0.50	76	0.016	98	98	98.2	0.10	0.85		62.0	146.1	142.6	69.7	131.7	117	70	71	75	0.000	1.001	7.073	439		
252	20.084	20.266	98.992	0.08	0.08	0.55	0.82	0.00	80	80	76	1.24	0.50	76	0.016	98	98	98.2	0.00	0.85		61.7	145.8	142.5	69.7	131.4	116	70	71	76	0.000	1.001	7.073	437		
253	20.164	20.347	99.385	0.08	0.08	0.54	0.81	0.00	80	80	75	1.24	0.50	77	0.016	98	98	98.2	0.00	0.85		61.6	145.6	142.2	69.7	131.3	116	70	71	75	0.000	1.001	7.073	436		
254	20.244	20.427	99.777	0.08	0.08	0.55	0.81	0.00	80	80	75	1.24	0.50	77	0.016	98	98	98.2	0.00	0.89		61.4	145.5	142.0	69.6	131.0	116	70	71	75	0.000	1.001	7.405	455		
255	20.324	20.508	100.170	0.08	0.08	0.55	0.81	0.00	80	80	75	1.24	0.50	76	0.016	98	98	98.2	0.00	0.92		61.1	145.2	141.6	69.7	130.8	116	70	71	75	0.000	1.001	7.655	468		
256	20.403	20.588	100.563	0.08	0.08	0.55	0.81	0.00	80	80	76	1.24	0.50	77	0.016	98	98	98.2	0.00	0.94		61.0	145.0	141.3	69.6	130.6	115	70	71	76	0.000	1.001	7.822	478		
257	20.483	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				
280	22.316	22.518	109.991	0.08	0.08	0.54	0.81	0.00	81	80	76	1.24	0.50	88	0.016	99	99	97.4	0.30	0.98		55.4	139.6	136.1	69.5	124.9	117	75	75	76	0.000	1.001	8.154	452	
281	22.396	22.599	110.384	0.08	0.08	0.54	0.80	0.00	81	80	76	1.23	0.50	88	0.016	99	99	97.3	0.10	0.96		55.3	139.4	135.8	69.4	124.7	118	75	75	76	0.000	1.001	7.988	442	
282	22.475	22.679	110.777	0.08	0.08	0.54	0.82	0.00	81	80	76	1.23	0.50	88	0.016	99	99	97.1	0.20	0.98		55.2	139.1	135.6	69.3	124.5	122	75	75	76	0.000	1.001	8.155	450	
283	22.555	22.759	111.169	0.08	0.08	0.54	0.81	0.00	81	80	76	1.24	0.50	87	0.016	99	99	96.9	0.20	0.96		54.6	138.9	135.3	69.6	124.2	124	75	75	76	0.000	1.001	7.988	437	
284	22.635	22.840	111.562	0.08	0.08	0.54	0.81	0.00	81	80	76	1.24	0.50	87	0.016	99	99	96.7	0.20	0.98		54.6	138.6	135.2	69.3	123.9	125	75	75	76	0.000	1.001	8.155	446	
285	22.715	22.920	111.955	0.08	0.08	0.55	0.81	0.00	81	80	76	1.24	0.50	87	0.016	99	99	96.6	0.10	0.98		54.2	138.3	134.8	69.4	123.7	128	75	75	76	0.000	1.001	8.155	443	
286	22.794	23.001	112.348	0.08	0.08	0.54	0.82	0.00	81	80	76	1.24	0.50	87	0.016	99	99	96.4	0.20	0.97		54.0	138.1	134.6	69.4	123.4	129	75	75	76	0.000	1.001	8.071	436	
287	22.874	23.081	112.741	0.08	0.08	0.55	0.81	0.00	81	80	76	1.24	0.50	87	0.016	99	99	96.2	0.20	0.97		53.7	137.9	134.5	69.6	123.3	130	75	75	76	0.000	1.001	8.071	434	
288	22.954	23.162	113.133	0.08	0.08	0.54	0.82	0.00	81	80	76	1.24	0.50	87	0.016	99	99	96.0	0.20	0.97		53.8	137.7	134.2	69.3	123.1	129	75	75	76	0.000	1.001	8.072	435	
289	23.033	23.242	113.526	0.08	0.08	0.54	0.81	0.00	81	80	76	1.24	0.50	88	0.016	99	99	95.8	0.20	0.95		53.6	137.5	134.0	69.4	123.0	130	75	75	76	0.000	1.001	7.905	424	
290	23.113	23.322	113.919	0.08	0.08	0.55	0.81	0.00	81	81	76	1.24	0.50	89	0.016	99	99	95.4	0.40	0.98		53.3	137.3	133.9	69.6	122.8	133	75	76	76	0.000	1.001	8.154	435	
291	23.193	23.403	114.312	0.08	0.08	0.54	0.81	0.00	81	81	76	1.23	0.50	92	0.016	99	99	94.8	0.60	0.96		53.2	137.2	133.7	69.6	122.8	132	75	76	76	0.000	1.001	7.988	425	
292	23.272	23.483	114.705	0.08	0.08	0.55	0.81	0.00	81	81	76	1.24	0.50	97	0.016	100	100	94.1	0.70	1.00		53.2	137.1	133.6	69.6	122.8	125	76	76	76	0.000	1.001	8.321	443	
293	23.352	23.564	115.098	0.08	0.08	0.54	0.81	0.00	81	81	76	1.23	0.50	104	0.016	100	100	93.5	0.60	0.96		53.2	137.2	133.8	69.6	122.8	134	76	77	76	0.000	1.001	7.988	426	
294	23.432	23.644	115.490	0.08	0.08	0.54	0.80	0.00	81	81	76	1.23	0.50	114	0.016	101	101	92.4	1.10	0.97		53.6	137.4	133.9	69.5	123.1	238	77	77	76	0.000	1.001	8.071	433	
295	23.512	23.724	115.883	0.08	0.08	0.54	0.81	0.00	81	81	76	1.22	0.50	130	0.016	103	103	91.1	1.30	0.98		54.0	137.5	134.0	69.5	123.5	391	78	79	76	0.000	1.001	8.154	440	
296	23.591	23.805	116.276	0.08	0.08	0.53	0.81	0.00	81	81	76	1.21	0.50	143	0.016	104	104	89.8	1.30	0.96		55.1	137.7	134.2	69.6	124.6	469	79	80	76	0.000	1.001	7.988	440	
297	23.671	23.885	116.669	0.08	0.08	0.54	0.81	0.00	81	81	76	1.20	0.50	151	0.016	105	105	88.4	1.40	0.97		56.1	138.8	135.2	69.4	125.5	496	80	81	76	0.000	1.001	8.071	454	
298	23.751	23.966	117.062	0.08	0.08	0.53	0.81	0.00	81	81	76	1.19	0.50	158	0.016	105	105	87.0	1.40	0.95		57.1	139.6	136.0	69.5	126.6	512	78	78	76	0.000	1.001	7.905	452	
299	23.830	24.046	117.455	0.08	0.08	0.52	0.80	0.00	81	81	76	1.17	0.50	163	0.016	106	106	85.6	1.40	0.98		58.5	140.6	137.0	69.6	128.1	523	76	77	76	0.000	1.001	8.154	477	
300	23.910	24.127	117.847	0.08	0.08	0.52	0.80	0.00	81	81	76	1.13	0.50	167	0.016	106	106	83.9	1.70	0.96		60.0	142.0	138.2	69.6	129.6	532	76	76	76	0.000	1.001	7.988	480	
301	23.990	24.207	118.240	0.08	0.08	0.53	0.80	0.00	81	81	76	1.10	0.50	170	0.016	106	106	82.4	1.50	0.98		61.5	143.5	139.7	69.6	131.1	539	75	76	76	0.000	1.001	8.154	502	
302	24.069	24.287	118.633	0.08	0.08	0.55	0.83	0.00	81	81	76	1.00	0.40	172	0.016	106	106	80.8	1.60	0.96		62.9	144.9	141.1	69.8	132.6	546	76	76	76	0.000	1.001	7.988	503	
303	24.149	24.368	119.026	0.08	0.08	0.52	0.86	0.00	81	81	76	0.92	0.40	175	0.016	107	107	79.1	1.70	0.96		64.9	146.4	142.5	69.6	134.4	551	75	77	76	0.000	1.001	7.988	519	
304	24.229	24.448	119.419	0.08	0.08	0.53	0.86	0.00	81	81	76	0.73	0.40	176	0.016	107	107	77.6	1.50	0.96		66.3	148.2	144.1	69.6	136.1									

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					
328	26.142	26.378	128.846	0.08	0.08	0.55	0.82	0.00	81	81	76	1.23	0.30	122	0.016	102	102	47.5	0.60	0.64		107.7	189.0	184.9	70.1	177.8	464	80	74	76	0.000	1.001	5.325	574		
329	26.221	26.459	129.239	0.08	0.08	0.54	0.82	0.00	81	81	76	1.23	0.30	108	0.016	101	101	46.9	0.60	0.62		108.6	190.3	186.0	70.2	178.8	413	80	73	76	0.000	1.001	5.158	561		
330	26.301	26.539	129.632	0.08	0.08	0.55	0.81	0.00	81	81	75	1.23	0.30	101	0.016	100	100	46.5	0.40	0.63		109.3	190.9	186.7	70.2	179.4	386	80	73	75	0.000	1.001	5.242	573		
331	26.381	26.620	130.025	0.08	0.08	0.55	0.81	0.00	81	81	76	1.24	0.30	96	0.016	100	100	46.2	0.30	0.66		109.6	191.6	187.3	70.1	179.7	369	79	72	76	0.000	1.001	5.491	602		
332	26.460	26.700	130.418	0.08	0.08	0.55	0.82	0.00	81	81	76	1.24	0.30	93	0.016	99	99	45.8	0.40	0.67		109.8	192.0	187.6	70.2	180.1	356	79	72	76	0.000	1.001	5.574	613		
333	26.540	26.781	130.811	0.08	0.08	0.55	0.81	0.00	81	81	76	1.24	0.30	91	0.016	99	99	45.6	0.20	0.66		110.0	192.2	187.8	70.1	180.1	346	79	73	76	0.000	1.001	5.491	605		
334	26.620	26.861	131.203	0.08	0.08	0.54	0.82	0.00	81	81	76	1.24	0.30	90	0.016	99	99	45.4	0.20	0.66		110.0	192.2	187.9	70.1	180.1	338	78	73	76	0.000	1.001	5.491	605		
335	26.700	26.941	131.596	0.08	0.08	0.55	0.81	0.00	81	81	76	1.24	0.30	88	0.016	99	99	45.2	0.20	0.68		109.9	192.1	187.7	70.1	180.0	330	78	73	76	0.000	1.001	5.658	623		
336	26.779	27.022	131.989	0.08	0.08	0.55	0.81	0.00	81	81	76	1.24	0.30	88	0.016	99	99	45.1	0.10	0.67		109.7	192.1	187.8	70.1	179.8	323	77	73	76	0.000	1.001	5.574	612		
337	26.859	27.102	132.382	0.08	0.08	0.54	0.82	0.00	81	81	76	1.24	0.30	87	0.016	99	99	44.9	0.20	0.65		109.9	192.0	187.6	70.1	179.9	316	77	73	76	0.000	1.001	5.408	595		
338	26.939	27.183	132.775	0.08	0.08	0.55	0.81	0.00	81	81	75	1.24	0.30	86	0.016	99	99	44.8	0.10	0.68		109.6	191.9	187.6	70.3	179.8	310	77	73	75	0.000	1.001	5.658	621		
339	27.018	27.263	133.168	0.08	0.08	0.55	0.81	0.00	81	81	75	1.25	0.30	86	0.016	99	99	44.7	0.10	0.70		109.7	191.8	187.5	70.1	179.8	304	77	73	75	0.000	1.001	5.824	640		
340	27.098	27.343	133.560	0.08	0.08	0.55	0.82	0.00	81	81	75	1.25	0.30	85	0.016	99	99	44.5	0.20	0.68		109.4	191.7	187.4	70.2	179.6	298	76	73	75	0.000	1.001	5.658	620		
341	27.178	27.424	133.953	0.08	0.08	0.56	0.82	0.00	81	81	75	1.24	0.30	85	0.016	99	99	44.5	0.00	0.68		109.4	191.6	187.3	70.3	179.6	292	76	73	75	0.000	1.001	5.658	619		
342	27.257	27.504	134.346	0.08	0.08	0.54	0.82	0.00	81	81	75	1.25	0.30	84	0.016	99	99	44.4	0.10	0.71		109.1	191.5	187.1	70.3	179.4	286	76	73	75	0.000	1.001	5.907	645		
343	27.337	27.585	134.739	0.08	0.08	0.55	0.82	0.00	81	81	75	1.25	0.30	84	0.016	99	99	44.3	0.10	0.68		109.2	191.3	187.0	70.2	179.4	281	75	73	75	0.000	1.001	5.658	619		
344	27.417	27.665	135.132	0.08	0.08	0.55	0.82	0.00	81	81	75	1.25	0.30	84	0.016	99	99	44.2	0.10	0.67		109.1	191.1	186.8	70.1	179.2	275	75	73	75	0.000	1.001	5.574	609		
345	27.497	27.746	135.524	0.08	0.08	0.55	0.82	0.00	81	81	75	1.25	0.30	83	0.016	99	99	44.2	0.00	0.68		108.9	191.0	186.7	70.3	179.2	270	75	73	75	0.000	1.001	5.658	617		
346	27.576	27.826	135.917	0.08	0.08	0.56	0.82	0.00	81	81	75	1.25	0.30	83	0.016	99	99	44.0	0.20	0.69		108.7	190.8	186.6	70.3	179.0	265	75	73	75	0.000	1.001	5.741	625		
347	27.656	27.906	136.310	0.08	0.08	0.55	0.82	0.00	81	81	75	1.25	0.30	83	0.016	99	99	44.0	0.00	0.68		108.5	190.7	186.5	70.3	178.7	259	74	72	75	0.000	1.001	5.658	614		
348	27.736	27.987	136.703	0.08	0.08	0.56	0.82	0.00	81	81	75	1.25	0.30	83	0.016	99	99	43.9	0.10	0.68		108.2	190.5	186.3	70.4	178.6	255	74	72	75	0.000	1.001	5.657	613		
349	27.815	28.067	137.096	0.08	0.08	0.55	0.82	0.00	81	81	75	1.25	0.30	82	0.016	98	98	43.9	0.00	0.67		108.2	190.3	186.2	70.3	178.5	251	74	72	75	0.000	1.001	5.574	604		
350	27.895	28.148	137.489	0.08	0.08	0.56	0.82	0.00	81	81	75	1.25	0.30	82	0.016	98	98	43.8	0.10	0.68		108.1	190.2	186.0	70.2	178.3	246	74	72	75	0.000	1.001	5.658	612		
351	27.975	28.228	137.881	0.08	0.08	0.56	0.83	0.00	81	81	75	1.25	0.30	82	0.016	98	98	43.7	0.10	0.67		107.7	190.0	185.8	70.2	177.9	242	74	72	75	0.000	1.001	5.574	601		
352	28.054	28.309	138.274	0.08	0.08	0.55	0.82	0.00	81	81	75	1.25	0.30	82	0.016	98	98	43.6	0.10	0.66		107.7	189.8	185.6	70.3	178.1	239	74	72	75	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				
376	29.967	30.239	147.702	0.08	0.08	0.55	0.85	0.00	81	81	76	1.26	0.40	79	0.016	98	98	43.1	0.00	0.66		104.5	184.8	180.7	70.4	174.9	181	74	72	76	0.000	1.001	5.491	574	
377	30.047	30.319	148.095	0.08	0.08	0.55	0.86	0.00	81	81	76	1.26	0.40	79	0.016	98	98	42.6	0.50	0.65		104.1	184.5	180.5	70.5	174.5	179	74	72	76	0.000	1.001	5.408	563	
378	30.127	30.400	148.488	0.08	0.08	0.55	0.85	0.00	81	81	76	1.26	0.40	79	0.016	98	98	43.1	-0.50	0.68		104.2	184.3	180.3	70.3	174.5	178	74	72	76	0.000	1.001	5.658	590	
379	30.206	30.480	148.881	0.08	0.08	0.55	0.85	0.00	81	81	76	1.26	0.40	79	0.016	98	98	43.2	-0.10	0.67		103.8	184.1	180.0	70.4	174.2	176	74	73	76	0.000	1.001	5.574	579	
380	30.286	30.560	149.273	0.08	0.08	0.56	0.86	0.00	81	81	76	1.26	0.40	79	0.016	98	98	43.1	0.10	0.68		103.6	183.9	179.7	70.4	174.0	174	74	73	76	0.000	1.001	5.657	587	
381	30.366	30.641	149.666	0.08	0.08	0.56	0.86	0.00	81	81	76	1.26	0.40	79	0.016	98	98	43.1	0.00	0.70		103.3	183.6	179.5	70.4	173.7	173	74	73	76	0.000	1.001	5.824	603	
382	30.445	30.721	150.059	0.08	0.08	0.56	0.87	0.00	81	81	76	1.27	0.40	79	0.016	98	98	43.1	0.00	0.67		103.4	183.4	179.4	70.4	173.8	171	74	73	76	0.000	1.001	5.574	577	
383	30.525	30.802	150.452	0.08	0.08	0.55	0.86	0.00	81	81	76	1.26	0.40	79	0.016	98	98	43.1	0.00	0.68		102.9	183.2	179.1	70.4	173.3	170	74	73	76	0.000	1.001	5.657	583	
384	30.605	30.882	150.845	0.08	0.08	0.55	0.87	0.00	81	81	76	1.26	0.40	79	0.016	98	98	43.1	0.00	0.67		102.6	183.0	178.8	70.5	173.2	169	74	73	76	0.000	1.001	5.574	573	
385	30.685	30.962	151.237	0.08	0.08	0.56	0.87	0.00	81	81	76	1.26	0.40	79	0.016	98	98	43.1	0.00	0.68		102.6	182.8	178.7	70.4	173.0	167	75	73	76	0.000	1.001	5.657	581	
386	30.764	31.043	151.630	0.08	0.08	0.56	0.88	0.00	81	81	76	1.27	0.40	79	0.016	98	98	43.0	0.10	0.68		102.4	182.5	178.5	70.4	172.8	166	75	73	76	0.000	1.001	5.657	580	
387	30.844	31.123	152.023	0.08	0.08	0.56	0.87	0.00	81	81	76	1.27	0.40	79	0.016	98	98	43.1	-0.10	0.68		102.2	182.3	178.2	70.3	172.5	165	75	73	76	0.000	1.001	5.658	579	
388	30.924	31.204	152.416	0.08	0.08	0.56	0.88	0.00	81	81	76	1.26	0.40	79	0.016	98	98	43.1	0.00	0.70		101.9	182.1	178.0	70.4	172.3	163	75	73	76	0.000	1.001	5.824	594	
389	31.003	31.284	152.809	0.08	0.08	0.56	0.88	0.00	81	81	76	1.26	0.40	79	0.016	98	98	43.1	0.00	0.68		101.6	181.8	177.8	70.4	172.0	162	75	73	76	0.000	1.001	5.657	575	
390	31.083	31.365	153.202	0.08	0.08	0.56	0.89	0.00	81	81	76	1.26	0.40	79	0.016	98	98	43.1	0.00	0.67		101.3	181.6	177.6	70.5	171.8	161	75	73	76	0.000	1.001	5.574	566	
391	31.163	31.445	153.594	0.08	0.08	0.56	0.89	0.00	81	82	76	1.27	0.40	78	0.016	98	98	43.1	0.00	0.68		101.1	181.4	177.4	70.5	171.6	160	75	73	76	0.000	1.001	5.657	573	
392	31.242	31.525	153.987	0.08	0.08	0.56	0.90	0.00	82	82	76	1.26	0.40	78	0.016	98	98	43.0	0.10	0.68		100.8	181.2	177.2	70.5	171.3	158	75	73	76	0.000	1.001	5.657	571	
393	31.322	31.606	154.380	0.08	0.08	0.55	0.89	0.00	82	82	76	1.27	0.40	78	0.016	98	98	43.0	0.00	0.66		100.9	180.9	177.0	70.4	171.3	158	75	73	76	0.000	1.001	5.491	555	
394	31.402	31.686	154.773	0.08	0.08	0.56	0.89	0.00	82	82	76	1.26	0.40	78	0.016	98	98	43.1	-0.10	0.69		100.6	180.7	176.7	70.4	171.0	156	75	73	76	0.000	1.001	5.741	578	
395	31.482	31.767	155.166	0.08	0.08	0.55	0.89	0.00	82	82	76	1.26	0.40	78	0.016	98	98	43.1	0.00	0.67		100.2	180.5	176.5	70.5	170.7	156	75	73	76	0.000	1.001	5.574	559	
396	31.561	31.847	155.559	0.08	0.08	0.56	0.89	0.00	82	82	76	1.26	0.40	78	0.016	98	98	43.1	0.00	0.74		100.0	180.3	176.3	70.5	170.5	154	75	73	76	0.000	1.001	6.157	617	
397	31.641	31.928	155.951	0.08	0.08	0.55	0.89	0.00	82	82	76	1.26	0.40	78	0.016	98	98	43.1	0.00	0.66		99.9	180.1	176.1	70.5	170.3	153	75	73	76	0.000	1.001	5.491	549	
398	31.721	32.008	156.344	0.08	0.08	0.56	0.90	0.00	82	82	76	1.27	0.40	78	0.016	98	98	43.0	0.10	0.67		99.7	179.8	175.9	70.4	170.1	152	75	73	76	0.000	1.001	5.574	557	
399	31.800	32.088	156.737	0.08	0.08	0.56	0.90	0.00	82	82	76	1.26	0.40	78	0.016	98	98	43.0	0.00	0.68		99.3	179.7	175.7	70.4	169.7	152	75	73	76	0.000	1.001	5.657	563	
400	31.880	32.169	157.130	0.08	0.08	0.55	0.90	0.00	82	82	76	1.26	0.40	78	0.016	98	98	43.0	0.00	0.67		99.0	179.4	175.5	70.5	169.6	150	75							

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				
424	33.793	34.099	166.558	0.08	0.08	0.54	0.83	0.00	82	82	76	1.27	0.50	77	0.016	98	98	43.0	0.00	0.74		93.6	173.6	169.5	70.2	163.7	133	76	74	76	0.000	1.001	6.157	577	
425	33.873	34.179	166.950	0.08	0.08	0.55	0.84	0.00	82	82	76	1.27	0.50	77	0.016	98	98	43.0	0.00	0.74		93.5	173.3	169.3	70.1	163.6	133	76	74	76	0.000	1.001	6.157	576	
426	33.952	34.260	167.343	0.08	0.08	0.54	0.83	0.00	82	82	76	1.27	0.50	77	0.016	98	98	43.0	0.00	0.74		93.2	173.1	169.1	70.0	163.2	132	76	74	76	0.000	1.001	6.157	574	
427	34.032	34.340	167.736	0.08	0.08	0.54	0.83	0.00	82	82	76	1.27	0.50	77	0.016	98	98	42.9	0.10	0.74		93.1	172.9	168.8	70.1	163.1	132	76	74	76	0.000	1.001	6.157	574	
428	34.112	34.421	168.129	0.08	0.08	0.55	0.83	0.00	82	82	76	1.27	0.50	77	0.016	98	98	43.0	-0.10	0.76		92.7	172.6	168.6	70.1	162.8	131	76	74	76	0.000	1.001	6.323	587	
429	34.191	34.501	168.522	0.08	0.08	0.54	0.83	0.00	82	82	76	1.27	0.50	77	0.016	98	98	42.9	0.10	0.76		92.4	172.4	168.3	70.2	162.6	131	76	74	76	0.000	1.001	6.323	585	
430	34.271	34.581	168.915	0.08	0.08	0.54	0.83	0.00	82	82	76	1.27	0.50	77	0.016	98	98	42.9	0.00	0.75		92.1	172.2	168.1	70.2	162.3	131	76	74	76	0.000	1.001	6.240	575	
431	34.351	34.662	169.307	0.08	0.08	0.55	0.83	0.00	82	82	76	1.27	0.50	77	0.016	98	98	42.9	0.00	0.74		92.0	171.9	168.0	70.1	162.1	131	76	74	76	0.000	1.001	6.157	567	
432	34.430	34.742	169.700	0.08	0.08	0.54	0.84	0.00	82	82	76	1.27	0.50	77	0.016	98	98	43.0	-0.10	0.75		91.8	171.7	167.7	70.0	161.9	130	76	74	76	0.000	1.001	6.240	574	
433	34.510	34.823	170.093	0.08	0.08	0.55	0.83	0.00	82	82	76	1.27	0.50	77	0.016	98	98	43.0	0.00	0.75		91.5	171.5	167.5	70.2	161.6	130	76	75	76	0.000	1.001	6.240	571	
434	34.590	34.903	170.486	0.08	0.08	0.54	0.83	0.00	82	82	76	1.27	0.50	77	0.016	98	98	43.0	0.00	0.76		91.3	171.2	167.2	70.1	161.4	129	76	75	76	0.000	1.001	6.323	578	
435	34.670	34.984	170.879	0.08	0.08	0.54	0.83	0.00	82	82	76	1.27	0.50	77	0.016	98	98	42.9	0.10	0.75		91.0	171.0	167.0	70.2	161.2	128	76	75	76	0.000	1.001	6.240	568	
436	34.749	35.064	171.272	0.08	0.08	0.55	0.83	0.00	82	82	76	1.27	0.50	77	0.016	98	98	42.9	0.00	0.73		90.7	170.7	166.8	70.3	160.9	128	76	75	76	0.000	1.001	6.074	551	
437	34.829	35.144	171.664	0.08	0.08	0.54	0.83	0.00	82	82	76	1.27	0.50	77	0.016	98	98	43.0	-0.10	0.75		90.5	170.6	166.6	70.3	160.7	128	76	75	76	0.000	1.001	6.240	565	
438	34.909	35.225	172.057	0.08	0.08	0.54	0.83	0.00	82	82	76	1.27	0.50	77	0.016	98	98	43.0	0.00	0.76		90.4	170.3	166.4	70.2	160.5	127	76	75	76	0.000	1.001	6.323	572	
439	34.988	35.305	172.450	0.08	0.08	0.54	0.83	0.00	82	82	76	1.27	0.50	77	0.016	98	98	42.9	0.10	0.76		90.0	170.0	166.2	70.3	160.3	127	76	75	76	0.000	1.001	6.323	570	
440	35.068	35.386	172.843	0.08	0.08	0.54	0.83	0.00	82	82	76	1.27	0.50	77	0.016	98	98	42.9	0.00	0.74		89.8	169.8	165.9	70.4	160.1	126	76	75	76	0.000	1.001	6.157	553	
441	35.148	35.466	173.236	0.08	0.08	0.54	0.83	0.00	82	82	76	1.27	0.50	77	0.016	98	98	43.0	-0.10	0.76		89.5	169.6	165.7	70.3	159.8	126	76	75	76	0.000	1.001	6.323	566	
442	35.227	35.547	173.628	0.08	0.08	0.54	0.83	0.00	82	82	76	1.27	0.50	77	0.016	98	98	43.0	0.00	0.74		89.2	169.4	165.5	70.2	159.3	125	76	75	76	0.000	1.001	6.157	550	
443	35.307	35.627	174.021	0.08	0.08	0.54	0.84	0.00	82	82	76	1.27	0.50	77	0.016	98	98	42.9	0.10	0.73		89.0	169.1	165.3	70.3	159.3	125	76	75	76	0.000	1.001	6.074	541	
444	35.387	35.707	174.414	0.08	0.08	0.54	0.83	0.00	82	82	76	1.27	0.50	77	0.016	98	98	42.9	0.00	0.76		88.8	168.9	165.1	70.2	159.0	125	76	75	76	0.000	1.001	6.323	562	
445	35.467	35.788	174.807	0.08	0.08	0.54	0.83	0.00	82	82	76	1.27	0.50	77	0.016	98	98	43.0	-0.10	0.76		88.5	168.6	164.8	70.3	158.8	125	76	75	76	0.000	1.001	6.323	560	
446	35.546	35.868	175.200	0.08	0.08	0.54	0.83	0.00	82	82	76	1.27	0.50	77	0.016	98	98	42.9	0.10	0.74		88.6	168.4	164.6	70.2	158.8	124	76	75	76	0.000	1.001	6.157	546	
447	35.626	35.949	175.593	0.08	0.08	0.55	0.83	0.00	82	82	76	1.27	0.50	77	0.016	98	98	42.9	0.00	0.77		88.1	168.2	164.3	70.3	158.4	124	76	75	76	0.000	1.001	6.406	565	
448	35.706	36.029	175.985	0.08	0.08	0.54	0.82	0.00	82	82	76	1.27	0.50	77	0.016	98	98	42.9	0.00	0.73		87.9	168.0	164.2	70.2	158.1	124	76	75	76	0.000				

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					
472	37.618	37.959	185.413	0.08	0.08	0.55	0.83	0.00	82	82	76	1.27	0.50	77	0.016	98	98	43.0	0.00	0.74		83.1	162.7	159.1	70.2	153.3	117	75	75	76	0.000	1.001	6.157	512		
473	37.698	38.040	185.806	0.08	0.08	0.54	0.83	0.00	82	82	76	1.27	0.50	77	0.016	98	98	43.0	0.00	0.73		82.7	162.5	159.0	70.2	152.9	117	76	75	76	0.000	1.001	6.074	503		
474	37.778	38.120	186.199	0.08	0.08	0.55	0.84	0.00	82	82	76	1.27	0.50	76	0.016	98	98	43.0	0.00	0.75		82.5	162.3	158.7	70.2	152.7	117	76	75	76	0.000	1.001	6.240	515		
475	37.858	38.200	186.592	0.08	0.08	0.55	0.83	0.00	82	82	76	1.27	0.50	77	0.016	98	98	43.0	0.00	0.76		82.3	162.1	158.5	70.1	152.4	117	76	75	76	0.000	1.001	6.323	521		
476	37.937	38.281	186.985	0.08	0.08	0.55	0.83	0.00	82	82	76	1.27	0.50	76	0.016	98	98	43.0	0.00	0.74		82.0	161.9	158.3	70.2	152.2	116	76	75	76	0.000	1.001	6.157	505		
477	38.017	38.361	187.377	0.08	0.08	0.54	0.84	0.00	82	82	76	1.27	0.50	76	0.016	98	98	43.0	0.00	0.76		81.9	161.6	158.2	70.1	152.0	115	75	75	76	0.000	1.001	6.323	519		
478	38.097	38.442	187.770	0.08	0.08	0.55	0.83	0.00	82	82	76	1.27	0.50	76	0.016	98	98	43.0	0.00	0.74		81.7	161.4	157.9	70.1	151.7	115	75	75	76	0.000	1.001	6.157	503		
479	38.176	38.522	188.163	0.08	0.08	0.54	0.83	0.00	82	82	76	1.27	0.50	77	0.016	98	98	43.0	0.00	0.74		81.5	161.2	157.7	70.1	151.6	115	75	75	76	0.000	1.001	6.157	502		
480	38.256	38.603	188.556	0.08	0.08	0.54	0.83	0.00	82	82	76	1.27	0.50	76	0.016	98	98	43.0	0.00	0.76		81.2	161.0	157.5	70.1	151.3	115	75	75	76	0.000	1.001	6.323	514		
481	38.336	38.683	188.949	0.08	0.08	0.55	0.83	0.00	82	82	76	1.27	0.50	76	0.016	98	98	43.0	0.00	0.77		80.8	160.8	157.4	70.2	151.1	115	75	75	76	0.000	1.001	6.406	518		
482	38.415	38.763	189.341	0.08	0.08	0.54	0.84	0.00	82	82	76	1.27	0.50	76	0.016	98	98	43.0	0.00	0.76		80.9	160.6	157.2	70.0	150.9	115	75	75	76	0.000	1.001	6.323	512		
483	38.495	38.844	189.734	0.08	0.08	0.55	0.83	0.00	82	82	76	1.27	0.50	76	0.016	98	98	43.0	0.00	0.75		80.6	160.4	156.9	70.1	150.7	115	75	75	76	0.000	1.001	6.240	504		
484	38.575	38.924	190.127	0.08	0.08	0.54	0.83	0.00	82	82	75	1.27	0.50	76	0.016	98	98	43.0	0.00	0.76		80.6	160.2	156.7	70.0	150.5	114	75	75	75	0.000	1.001	6.323	510		
485	38.655	39.005	190.520	0.08	0.08	0.54	0.83	0.00	82	82	75	1.27	0.50	76	0.016	98	98	43.0	0.00	0.76		80.2	160.0	156.4	70.1	150.3	114	75	75	75	0.000	1.001	6.323	508		
486	38.734	39.085	190.913	0.08	0.08	0.55	0.83	0.00	82	82	75	1.27	0.50	76	0.016	98	98	43.0	0.00	0.75		79.9	159.7	156.2	70.2	150.0	114	75	75	75	0.000	1.001	6.240	499		
487	38.814	39.166	191.306	0.08	0.08	0.54	0.83	0.00	82	82	75	1.27	0.50	76	0.016	98	98	43.0	0.00	0.74		79.8	159.6	156.1	70.0	149.8	114	75	75	75	0.000	1.001	6.157	492		
488	38.894	39.246	191.698	0.08	0.08	0.55	0.83	0.00	82	81	75	1.27	0.50	76	0.016	98	98	43.0	0.00	0.73		79.5	159.4	156.0	70.1	149.6	114	75	75	75	0.000	1.001	6.074	484		
489	38.973	39.326	192.091	0.08	0.08	0.55	0.84	0.00	82	81	75	1.27	0.50	76	0.016	98	98	43.0	0.00	0.73		79.5	159.1	155.7	70.0	149.6	113	75	75	75	0.000	1.001	6.074	484		
490	39.053	39.407	192.484	0.08	0.08	0.54	0.83	0.00	82	81	75	1.27	0.50	76	0.016	98	98	43.1	-0.10	0.76		79.2	159.0	155.5	70.0	149.2	113	75	75	75	0.000	1.001	6.323	501		
491	39.133	39.487	192.877	0.08	0.08	0.54	0.83	0.00	82	81	75	1.27	0.50	76	0.016	98	98	43.1	0.00	0.76		78.9	158.7	155.3	70.0	148.9	113	75	75	75	0.000	1.001	6.323	500		
492	39.212	39.568	193.270	0.08	0.08	0.54	0.84	0.00	81	81	75	1.27	0.50	76	0.016	98	98	43.0	0.10	0.74		78.7	158.5	155.1	70.1	148.8	113	75	75	75	0.000	1.001	6.157	485		
493	39.292	39.648	193.663	0.08	0.08	0.54	0.83	0.00	81	81	75	1.27	0.50	76	0.016	98	98	43.0	0.00	0.77		78.6	158.3	155.0	70.1	148.7	112	75	75	75	0.000	1.001	6.407	504		
494	39.372	39.728	194.055	0.08	0.08	0.55	0.84	0.00	81	81	74	1.27	0.50	76	0.016	98	98	43.0	0.00	0.76		78.4	158.2	154.8	70.0	148.4	112	75	75	74	0.000	1.001	6.323	496		
495	39.452	39.809	194.448	0.08	0.08	0.54	0.84	0.00	81	81	74	1.27	0.50	76	0.016	98	98	43.0	0.00	0.76		78.1	157.9	154.6	70.1	148.2	112	75	75	74	0.000	1.001	6.323	494		
496	39.531	39.889	194.841	0.08	0.08	0.55	0.84	0.00	81	81	74	1.27	0.50	76	0.016	98	98	42.7	0.30	0.77		78.0	157.7	154.4	70.1	148.1	113	75	75	74	0.000	1.001	6.407	500		

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				
520	41.444	41.819	204.269	0.08	0.08	0.55	0.84	0.00	80	80	73	1.27	0.50	76	0.016	98	98	43.2	0.00	0.89		72.6	152.1	148.4	69.7	142.4	109	75	74	73	0.000	1.001	7.405	539	
521	41.524	41.900	204.662	0.08	0.08	0.55	0.84	0.00	80	80	73	1.27	0.50	76	0.016	98	98	43.2	0.00	0.91		72.4	151.8	148.1	69.7	142.1	109	75	74	73	0.000	1.001	7.572	549	
522	41.603	41.980	205.054	0.08	0.08	0.56	0.84	0.00	80	80	73	1.27	0.50	76	0.016	98	98	43.2	0.00	0.94		72.4	151.6	147.9	69.6	142.0	109	74	74	73	0.000	1.001	7.822	567	
523	41.683	42.061	205.447	0.08	0.08	0.55	0.84	0.00	80	80	73	1.27	0.50	76	0.016	98	98	43.3	-0.10	0.90		72.0	151.4	147.7	69.7	141.7	108	74	74	73	0.000	1.001	7.489	540	
524	41.763	42.141	205.840	0.08	0.08	0.55	0.83	0.00	80	80	73	1.27	0.50	76	0.016	98	98	43.2	0.10	0.91		71.7	151.1	147.4	69.7	141.4	108	74	74	73	0.000	1.001	7.572	543	
525	41.843	42.222	206.233	0.08	0.08	0.55	0.84	0.00	80	80	73	1.27	0.50	76	0.016	98	98	43.3	-0.10	0.90		71.6	150.9	147.2	69.7	141.2	108	74	74	73	0.000	1.001	7.489	537	
526	41.922	42.302	206.626	0.08	0.08	0.54	0.84	0.00	80	80	73	1.27	0.50	76	0.016	98	98	43.2	0.10	0.89		71.3	150.7	147.0	69.7	141.1	108	74	74	73	0.000	1.001	7.405	529	
527	42.002	42.382	207.019	0.08	0.08	0.55	0.84	0.00	80	79	73	1.27	0.50	76	0.016	98	98	43.3	-0.10	0.88		70.9	150.5	146.8	69.8	140.8	108	74	74	73	0.000	1.001	7.322	520	
528	42.082	42.463	207.411	0.08	0.08	0.55	0.84	0.00	80	79	73	1.27	0.50	76	0.016	98	98	43.3	0.00	0.89		70.8	150.2	146.6	69.8	140.6	108	74	74	73	0.000	1.001	7.405	525	
529	42.161	42.543	207.804	0.08	0.08	0.55	0.84	0.00	80	79	73	1.27	0.50	76	0.016	98	98	43.3	0.00	0.89		70.5	150.0	146.3	69.8	140.3	108	74	74	73	0.000	1.001	7.405	523	
530	42.241	42.624	208.197	0.08	0.08	0.55	0.84	0.00	80	79	73	1.27	0.50	76	0.016	98	98	43.3	0.00	0.89		70.3	149.8	146.0	69.7	140.0	107	74	74	73	0.000	1.001	7.405	521	
531	42.321	42.704	208.590	0.08	0.08	0.55	0.84	0.00	80	79	73	1.27	0.50	76	0.016	98	98	43.3	0.00	0.90		70.3	149.5	145.8	69.8	140.2	108	74	74	73	0.000	1.001	7.488	527	
532	42.400	42.785	208.983	0.08	0.08	0.55	0.83	0.00	79	79	73	1.27	0.50	76	0.016	98	98	43.3	0.00	0.91		70.1	149.3	145.7	69.9	140.0	107	74	74	73	0.000	1.001	7.572	531	
533	42.480	42.865	209.376	0.08	0.08	0.55	0.84	0.00	79	79	73	1.27	0.50	76	0.016	98	98	43.3	0.00	0.91		69.8	149.0	145.5	69.8	139.7	107	74	74	73	0.000	1.001	7.572	529	
534	42.560	42.945	209.768	0.08	0.08	0.54	0.84	0.00	79	79	73	1.27	0.50	76	0.016	98	98	43.3	0.00	0.89		69.7	148.9	145.2	69.7	139.5	107	74	74	73	0.000	1.001	7.405	517	
535	42.640	43.026	210.161	0.08	0.08	0.55	0.85	0.00	79	79	72	1.27	0.50	76	0.016	98	98	43.3	0.00	0.93		69.5	148.6	145.0	69.9	139.3	107	74	74	72	0.000	1.001	7.738	538	
536	42.719	43.106	210.554	0.08	0.08	0.55	0.84	0.00	79	79	73	1.27	0.50	76	0.016	98	98	43.3	0.00	0.91		69.3	148.4	144.8	69.8	139.0	107	74	74	73	0.000	1.001	7.572	525	
537	42.799	43.187	210.947	0.08	0.08	0.55	0.84	0.00	79	79	73	1.27	0.50	76	0.016	98	98	43.4	-0.10	0.88		69.0	148.1	144.6	69.9	138.9	107	74	74	73	0.000	1.001	7.322	506	
538	42.879	43.267	211.340	0.08	0.08	0.55	0.84	0.00	79	79	72	1.27	0.50	76	0.016	98	98	43.3	0.10	0.90		68.8	148.0	144.4	69.9	138.7	107	74	74	72	0.000	1.001	7.488	516	
539	42.958	43.347	211.732	0.08	0.08	0.55	0.84	0.00	79	79	72	1.27	0.50	76	0.016	98	98	43.4	-0.10	0.93		68.4	147.7	144.2	70.0	138.4	106	74	74	72	0.000	1.001	7.738	530	
540	43.038	43.428	212.125	0.08	0.08	0.55	0.84	0.00	79	79	73	1.27	0.50	75	0.016	98	98	43.4	0.00	0.89		68.3	147.5	143.9	69.8	138.1	106	74	74	73	0.000	1.001	7.405	506	
541	43.118	43.508	212.518	0.08	0.08	0.55	0.83	0.00	79	79	73	1.27	0.50	76	0.016	98	98	43.4	0.00	0.89		68.0	147.3	143.7	69.9	137.9	106	74	74	73	0.000	1.001	7.405	504	
542	43.197	43.589	212.911	0.08	0.08	0.55	0.84	0.00	79	79	72	1.27	0.50	75	0.016	98	98	43.4	0.00	0.90		67.8	147.0	143.5	69.8	137.7	106	74	74	72	0.000	1.001	7.488	509	
543	43.277	43.669	213.304	0.08	0.08	0.55	0.85	0.00	79	79	72	1.27	0.50	75	0.016	98	98	43.4	0.00	0.89		67.7	146.8	143.3	69.8	137.6	106	74	74	72	0.000	1.001	7.405	502	
544	43.357	43.750	213.697	0.08	0.08	0.55	0.84	0.00	79	79	73	1.27	0.50	75	0.016	98	98	43.3	0.10	0.91		67.5	146.6	143.1	69.7	137.2	105	74	74	73	0.000				

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				
568	45.270	45.680	223.124	0.08	0.08	0.55	0.84	0.00	78	78	71	1.27	0.50	75	0.016	98	98	43.6	0.00	0.89		62.7	141.5	138.2	69.6	132.3	103	74	73	71	0.000	1.001	7.405	465	
569	45.349	45.760	223.517	0.08	0.08	0.55	0.84	0.00	78	78	71	1.27	0.50	75	0.016	98	98	43.6	0.00	0.90		62.2	141.3	138.0	69.7	131.9	102	74	74	71	0.000	1.001	7.489	466	
570	45.429	45.841	223.910	0.08	0.08	0.55	0.84	0.00	78	78	72	1.27	0.50	75	0.016	98	98	43.6	0.00	0.91		62.1	141.1	137.9	69.7	131.7	102	73	73	72	0.000	1.001	7.572	470	
571	45.509	45.921	224.303	0.08	0.08	0.56	0.84	0.00	78	78	72	1.27	0.50	75	0.016	98	98	43.6	0.00	0.89		62.1	140.9	137.7	69.6	131.7	102	73	73	72	0.000	1.001	7.405	460	
572	45.588	46.001	224.696	0.08	0.08	0.55	0.84	0.00	78	78	72	1.27	0.50	80	0.016	99	99	43.7	-0.10	0.90		61.7	140.7	137.5	69.7	131.5	111	74	73	72	0.000	1.001	7.489	463	
573	45.668	46.082	225.089	0.08	0.08	0.55	0.84	0.00	78	78	72	1.27	0.50	82	0.016	99	99	43.6	0.10	0.90		61.5	140.5	137.2	69.7	131.2	126	74	74	72	0.000	1.001	7.489	461	
574	45.748	46.162	225.481	0.08	0.08	0.55	0.84	0.00	78	78	72	1.27	0.50	84	0.016	99	99	43.6	0.00	0.89		61.3	140.3	137.1	69.7	131.0	132	74	74	72	0.000	1.001	7.405	455	
575	45.828	46.243	225.874	0.08	0.08	0.55	0.84	0.00	78	78	71	1.27	0.50	85	0.016	99	99	43.6	0.00	0.91		61.2	140.1	136.9	69.7	130.9	134	74	74	71	0.000	1.001	7.572	464	
576	45.907	46.323	226.267	0.08	0.08	0.55	0.84	0.00	78	78	71	1.27	0.50	85	0.016	99	99	43.6	0.00	0.89		61.1	139.9	136.7	69.7	130.8	135	74	74	71	0.000	1.001	7.405	453	
577	45.987	46.403	226.660	0.08	0.08	0.55	0.84	0.00	78	78	71	1.27	0.50	85	0.016	99	99	43.6	0.00	0.89		60.7	139.7	136.4	69.7	130.4	135	74	74	71	0.000	1.001	7.405	450	
578	46.067	46.484	227.053	0.08	0.08	0.55	0.83	0.00	78	78	71	1.27	0.50	86	0.016	99	99	43.6	0.00	0.91		60.5	139.4	136.2	69.7	130.2	135	74	74	71	0.000	1.001	7.572	459	
579	46.146	46.564	227.445	0.08	0.08	0.55	0.84	0.00	78	78	72	1.27	0.50	86	0.016	99	99	43.6	0.00	0.90		60.4	139.3	136.1	69.7	130.0	135	74	74	72	0.000	1.001	7.489	453	
580	46.226	46.645	227.838	0.08	0.08	0.55	0.84	0.00	78	78	72	1.27	0.50	86	0.016	99	99	43.6	0.00	0.90		60.3	139.0	135.9	69.7	129.9	135	74	74	72	0.000	1.001	7.489	452	
581	46.306	46.725	228.231	0.08	0.08	0.55	0.85	0.00	78	78	71	1.27	0.50	86	0.016	99	99	43.6	0.00	0.92		60.1	138.8	135.7	69.7	129.8	135	74	74	71	0.000	1.001	7.655	460	
582	46.385	46.806	228.624	0.08	0.08	0.55	0.84	0.00	78	78	72	1.27	0.50	86	0.016	99	99	43.7	-0.10	0.91		59.9	138.6	135.5	69.6	129.5	135	74	74	72	0.000	1.001	7.572	454	
583	46.465	46.886	229.017	0.08	0.08	0.55	0.83	0.00	78	78	72	1.27	0.50	86	0.016	99	99	43.7	0.00	0.91		59.6	138.5	135.3	69.7	129.3	135	74	74	72	0.000	1.001	7.572	452	
584	46.545	46.966	229.410	0.08	0.08	0.56	0.84	0.00	78	78	72	1.27	0.50	86	0.016	99	99	43.6	0.10	0.92		59.6	138.2	135.0	69.5	129.1	135	74	74	72	0.000	1.001	7.655	457	
585	46.625	47.047	229.802	0.08	0.08	0.55	0.84	0.00	78	78	71	1.27	0.50	86	0.016	99	99	43.7	-0.10	0.90		59.4	138.0	134.9	69.7	129.1	135	74	74	71	0.000	1.001	7.489	446	
586	46.704	47.127	230.195	0.08	0.08	0.55	0.85	0.00	78	78	71	1.27	0.50	86	0.016	99	99	43.7	0.00	0.91		59.0	137.8	134.7	69.6	128.7	135	74	74	71	0.000	1.001	7.572	448	
587	46.784	47.208	230.588	0.08	0.08	0.55	0.84	0.00	78	78	72	1.27	0.50	86	0.016	99	99	43.7	0.00	0.91		58.9	137.7	134.5	69.7	128.6	135	74	74	72	0.000	1.001	7.572	447	
588	46.864	47.288	230.981	0.08	0.08	0.55	0.84	0.00	78	78	71	1.27	0.50	86	0.016	99	99	43.7	0.00	0.91		58.6	137.4	134.3	69.7	128.3	135	74	74	71	0.000	1.001	7.572	444	
589	46.943	47.369	231.374	0.08	0.08	0.55	0.84	0.00	78	78	71	1.27	0.50	86	0.016	99	99	43.6	0.10	0.92		58.6	137.2	134.1	69.5	128.1	135	74	74	71	0.000	1.001	7.655	449	
590	47.023	47.449	231.767	0.08	0.08	0.56	0.84	0.00	78	78	71	1.27	0.50	86	0.016	99	99	43.6	0.00	0.92		58.1	137.0	133.9	69.7	127.9	135	74	74	71	0.000	1.001	7.655	445	
591	47.103	47.529	232.159	0.08	0.08	0.55	0.84	0.00	78	78	71	1.27	0.50	86	0.016	99	99	43.6	0.00	0.92		58.3	136.9	133.7	69.7	128.0	136	74	74	71	0.000	1.001	7.655	447	
592	47.182	47.610	232.552	0.08	0.08	0.56	0.84	0.00	78	78	72	1.27	0.50	87	0.016	99	99	43.5	0.10	0.85		58.1	136.7	133.7	69.7	127.8	137	74	74	72	0.000				

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				
616	49.095	49.540	241.980	0.08	0.08	0.55	0.84	0.00	77	77	71	1.25	0.50	148	0.016	105	105	33.9	0.40	0.64		73.6	150.5	147.9	70.1	143.6	468	77	78	71	0.000	1.001	5.325	392	
617	49.175	49.620	242.373	0.08	0.08	0.55	0.83	0.00	77	77	71	1.26	0.50	148	0.016	105	105	33.3	0.60	0.61		74.6	151.6	149.0	70.1	144.7	469	78	78	71	0.000	1.001	5.075	379	
618	49.255	49.701	242.766	0.08	0.08	0.55	0.84	0.00	77	77	71	1.25	0.50	149	0.016	105	105	32.7	0.60	0.66		76.0	152.8	150.1	70.0	146.0	471	78	78	71	0.000	1.001	5.491	418	
619	49.334	49.781	243.158	0.08	0.08	0.55	0.84	0.00	77	77	71	1.25	0.50	149	0.016	105	105	32.2	0.50	0.62		77.1	154.0	151.3	70.1	147.2	472	78	78	71	0.000	1.001	5.159	398	
620	49.414	49.862	243.551	0.08	0.08	0.55	0.84	0.00	77	77	71	1.25	0.50	149	0.016	105	105	31.7	0.50	0.64		78.5	155.2	152.4	70.1	148.5	471	76	76	71	0.000	1.001	5.325	418	
621	49.494	49.942	243.944	0.08	0.08	0.55	0.84	0.00	77	77	71	1.26	0.50	150	0.016	105	105	31.0	0.70	0.63		79.6	156.5	153.7	70.1	149.6	470	75	74	71	0.000	1.001	5.242	417	
622	49.573	50.022	244.337	0.08	0.08	0.55	0.84	0.00	77	77	71	1.26	0.50	150	0.016	105	105	30.5	0.50	0.61		80.7	157.6	154.7	70.2	150.8	470	74	73	71	0.000	1.001	5.075	410	
623	49.653	50.103	244.730	0.08	0.08	0.55	0.85	0.00	77	77	71	1.26	0.50	150	0.016	105	105	29.9	0.60	0.63		81.8	158.8	155.9	70.0	151.9	472	73	72	71	0.000	1.001	5.242	430	
624	49.733	50.183	245.123	0.08	0.08	0.55	0.84	0.00	77	77	71	1.26	0.50	151	0.016	105	105	29.3	0.60	0.62		83.2	159.9	157.0	70.1	153.3	475	73	71	71	0.000	1.001	5.159	430	
625	49.813	50.264	245.515	0.08	0.08	0.55	0.83	0.00	77	77	71	1.26	0.50	152	0.016	105	105	28.7	0.60	0.63		84.2	161.0	158.1	70.1	154.3	476	73	71	71	0.000	1.001	5.242	442	
626	49.892	50.344	245.908	0.08	0.08	0.55	0.85	0.00	77	77	71	1.25	0.50	152	0.016	105	105	27.9	0.80	0.64		85.5	162.3	159.4	70.2	155.7	476	73	71	71	0.000	1.001	5.325	456	
627	49.972	50.425	246.301	0.08	0.08	0.55	0.84	0.00	77	77	71	1.25	0.50	152	0.016	105	105	27.4	0.50	0.65		86.3	163.3	160.4	70.2	156.5	479	73	71	71	0.000	1.001	5.408	467	
628	50.052	50.505	246.694	0.08	0.08	0.55	0.83	0.00	77	77	71	1.25	0.50	153	0.016	106	105	26.8	0.60	0.65		87.6	164.5	161.4	70.1	157.8	482	73	71	71	0.000	1.001	5.408	474	
629	50.131	50.585	247.087	0.08	0.08	0.55	0.83	0.00	77	77	71	1.25	0.50	153	0.016	106	105	26.1	0.70	0.63		88.5	165.7	162.6	70.3	158.9	484	73	71	71	0.000	1.001	5.242	465	
630	50.211	50.666	247.480	0.08	0.08	0.55	0.84	0.00	77	77	71	1.25	0.50	153	0.016	106	105	25.5	0.60	0.63		90.0	166.9	163.8	70.1	160.1	484	73	71	71	0.000	1.001	5.242	472	
631	50.291	50.746	247.872	0.08	0.08	0.55	0.84	0.00	77	77	71	1.25	0.50	154	0.016	106	106	24.9	0.60	0.62		91.0	168.0	164.8	70.3	161.3	483	73	71	71	0.000	1.001	5.158	470	
632	50.370	50.827	248.265	0.08	0.08	0.55	0.84	0.00	77	77	71	1.25	0.50	153	0.016	106	105	24.2	0.70	0.63		91.9	169.3	166.1	70.2	162.1	481	73	71	71	0.000	1.001	5.242	482	
633	50.450	50.907	248.658	0.08	0.08	0.55	0.83	0.00	77	77	71	1.25	0.50	176	0.016	107	107	23.7	0.50	0.63		93.3	170.4	167.1	70.2	163.4	498	73	72	71	0.000	1.001	5.242	489	
634	50.530	50.988	249.051	0.08	0.08	0.55	0.84	0.00	77	77	71	1.25	0.50	190	0.016	109	109	22.9	0.80	0.57		94.1	171.6	168.3	70.3	164.4	518	74	72	71	0.000	1.001	4.742	447	
635	50.610	51.068	249.444	0.08	0.08	0.54	0.83	0.00	77	77	71	1.25	0.50	198	0.016	109	109	22.2	0.70	0.61		95.5	172.7	169.4	70.2	165.7	531	74	72	71	0.000	1.001	5.075	485	
636	50.689	51.148	249.836	0.08	0.08	0.55	0.84	0.00	77	77	71	1.25	0.50	203	0.016	110	110	21.5	0.70	0.64		97.1	174.1	170.6	70.3	167.4	542	75	73	71	0.000	1.001	5.325	518	
637	50.769	51.229	250.229	0.08	0.08	0.54	0.84	0.00	77	77	71	1.25	0.50	207	0.016	110	110	20.8	0.70	0.61		98.9	175.7	172.3	70.2	169.1	551	75	73	71	0.000	1.001	5.075	503	
638	50.849	51.309	250.622	0.08	0.08	0.54	0.83	0.00	77	77	71	1.24	0.50	209	0.016	110	110	20.0	0.80	0.64		100.1	177.3	173.7	70.3	170.4	553	75	73	71	0.000	1.001	5.325	534	
639	50.928	51.390	251.015	0.08	0.08	0.55	0.83	0.00	77	77	71	1.24	0.50	210	0.016	110	110	19.4	0.60	0.64		101.8	178.8	175.2	70.2	172.0	553	76	74	71	0.000	1.001	5.325	542	
640	51.008	51.470	251.408	0.08	0.08	0.55	0.83	0.00	77	77	71	1.24	0.50	211	0.016	110	110	18.7	0.70	0.61		103.4	180.4	176.8											

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				
664	52.921	53.400	260.836	0.08	0.08	0.55	0.84	0.00	77	77	72	1.27	0.50	80	0.016	99	99	14.4	0.00	0.79		111.7	190.2	185.1	69.9	181.6	283	70	68	72	0.000	1.001	6.573	735	
665	53.001	53.481	261.228	0.08	0.08	0.55	0.83	0.00	77	77	72	1.26	0.50	79	0.016	99	99	14.4	0.00	0.80		111.5	189.9	185.0	69.9	181.5	278	70	68	72	0.000	1.001	6.656	743	
666	53.080	53.561	261.621	0.08	0.08	0.54	0.85	0.00	77	77	72	1.27	0.50	79	0.016	99	99	14.4	0.00	0.79		111.4	189.8	184.7	69.8	181.3	273	70	68	72	0.000	1.001	6.573	733	
667	53.160	53.641	262.014	0.08	0.08	0.55	0.83	0.00	77	77	73	1.27	0.50	79	0.016	99	99	14.3	0.10	0.78		111.1	189.6	184.4	69.8	181.0	268	70	68	73	0.000	1.001	6.490	722	
668	53.240	53.722	262.407	0.08	0.08	0.54	0.83	0.00	77	77	73	1.27	0.50	79	0.016	99	99	14.4	-0.10	0.81		111.0	189.4	184.2	69.7	180.8	264	70	68	73	0.000	1.001	6.740	749	
669	53.319	53.802	262.800	0.08	0.08	0.55	0.84	0.00	77	77	73	1.27	0.50	78	0.016	99	99	14.3	0.10	0.79		110.8	189.1	184.1	69.8	180.6	259	70	68	73	0.000	1.001	6.573	729	
670	53.399	53.883	263.192	0.08	0.08	0.55	0.84	0.00	77	77	73	1.27	0.50	78	0.016	99	99	14.3	0.00	0.81		110.5	189.0	183.8	69.7	180.2	255	70	68	73	0.000	1.001	6.740	746	
671	53.479	53.963	263.585	0.08	0.08	0.54	0.84	0.00	77	77	73	1.27	0.50	78	0.016	99	99	14.3	0.00	0.78		110.3	188.8	183.6	69.8	180.0	251	70	68	73	0.000	1.001	6.490	716	
672	53.558	54.044	263.978	0.08	0.08	0.55	0.84	0.00	77	77	73	1.27	0.50	78	0.016	99	99	14.4	-0.10	0.77		110.1	188.5	183.4	69.7	179.9	247	70	68	73	0.000	1.001	6.407	706	
673	53.638	54.124	264.371	0.08	0.08	0.56	0.83	0.00	77	77	73	1.27	0.50	78	0.016	99	99	14.4	0.00	0.82		110.0	188.3	183.2	69.7	179.6	243	70	68	73	0.000	1.001	6.823	751	
674	53.718	54.204	264.764	0.08	0.08	0.54	0.84	0.00	77	77	73	1.27	0.50	78	0.016	99	99	14.4	0.00	0.79		109.7	188.0	183.0	69.8	179.5	239	70	68	73	0.000	1.001	6.573	722	
675	53.798	54.285	265.157	0.08	0.08	0.56	0.83	0.00	77	77	73	1.27	0.50	78	0.016	99	99	14.3	0.10	0.82		109.3	187.8	182.7	69.7	179.1	235	70	68	73	0.000	1.001	6.823	747	
676	53.877	54.365	265.549	0.08	0.08	0.55	0.82	0.00	77	78	73	1.27	0.50	78	0.016	99	99	14.3	0.00	0.80		109.3	187.6	182.5	69.7	179.0	232	70	68	73	0.000	1.001	6.657	728	
677	53.957	54.446	265.942	0.08	0.08	0.55	0.84	0.00	77	78	73	1.27	0.50	77	0.016	99	99	14.4	-0.10	0.81		109.2	187.3	182.3	69.5	178.7	228	70	68	73	0.000	1.001	6.740	737	
678	54.037	54.526	266.335	0.08	0.08	0.55	0.84	0.00	77	78	73	1.27	0.50	77	0.016	99	99	14.4	0.00	0.79		108.8	187.1	182.0	69.7	178.5	225	70	68	73	0.000	1.001	6.573	716	
679	54.116	54.607	266.728	0.08	0.08	0.55	0.83	0.00	77	78	73	1.27	0.50	77	0.016	99	99	14.3	0.10	0.80		108.5	186.8	181.7	69.7	178.1	222	70	68	73	0.000	1.001	6.657	723	
680	54.196	54.687	267.121	0.08	0.08	0.56	0.84	0.00	77	78	73	1.27	0.50	77	0.016	99	99	14.3	0.00	0.81		108.3	186.6	181.5	69.7	177.9	218	70	68	73	0.000	1.001	6.740	731	
681	54.276	54.767	267.514	0.08	0.08	0.55	0.84	0.00	77	78	73	1.27	0.50	77	0.016	99	99	14.3	0.00	0.79		108.1	186.4	181.3	69.6	177.7	215	70	68	73	0.000	1.001	6.573	711	
682	54.355	54.848	267.906	0.08	0.08	0.55	0.84	0.00	78	78	73	1.27	0.50	77	0.016	99	99	14.4	-0.10	0.81		107.7	186.1	181.2	69.7	177.3	212	70	69	73	0.000	1.001	6.740	726	
683	54.435	54.928	268.299	0.08	0.08	0.55	0.84	0.00	78	78	73	1.27	0.50	77	0.016	99	99	14.4	0.00	0.80		107.5	185.9	180.9	69.7	177.2	210	70	69	73	0.000	1.001	6.657	717	
684	54.515	55.009	268.692	0.08	0.08	0.56	0.84	0.00	78	78	73	1.27	0.50	77	0.016	99	99	14.4	0.00	0.80		107.3	185.7	180.6	69.6	177.0	207	70	69	73	0.000	1.001	6.657	715	
685	54.595	55.089	269.085	0.08	0.08	0.55	0.83	0.00	78	78	73	1.27	0.50	77	0.016	99	99	14.4	0.00	0.83		107.0	185.4	180.4	69.7	176.7	204	70	69	73	0.000	1.001	6.906	740	
686	54.674	55.169	269.478	0.08	0.08	0.55	0.83	0.00	78	78	73	1.27	0.50	76	0.016	98	98	14.3	0.10	0.82		106.8	185.1	180.2	69.7	176.5	202	70	69	73	0.000	1.001	6.823	729	
687	54.754	55.250	269.871	0.08	0.08	0.55	0.85	0.00	78	78	73	1.27	0.50	76	0.016	98	98	14.3	0.00	0.80		106.5	185.0	179.9	69.7	176.3	199	70	69	73	0.000	1.001	6.657	710	
688	54.834	55.330	270.263	0.08	0.08	0.55	0.84	0.00	78	78	73	1.27	0.50	76	0.016	98	98	14.4	-0.10	0.80		106.6	184.6	179.8	69.5	176.1	197	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					
712	56.746	57.260	279.691	0.08	0.08	0.55	0.83	0.00	78	78	73	1.27	0.50	75	0.016	98	98	14.4	0.00	0.75		101.1	179.1	174.8	69.6	170.7	156	70	69	73	0.000	1.001	6.241	632		
713	56.826	57.341	280.084	0.08	0.08	0.56	0.85	0.00	78	78	73	1.27	0.50	75	0.016	98	98	14.4	0.00	0.73		100.8	178.8	174.6	69.6	170.3	155	70	69	73	0.000	1.001	6.074	613		
714	56.906	57.421	280.477	0.08	0.08	0.54	0.84	0.00	78	78	73	1.27	0.50	75	0.016	98	98	14.4	0.00	0.73		100.4	178.6	174.4	69.6	170.0	154	70	69	73	0.000	1.001	6.074	611		
715	56.986	57.502	280.870	0.08	0.08	0.55	0.83	0.00	78	78	73	1.27	0.50	75	0.016	98	98	14.5	-0.10	0.75		100.2	178.4	174.1	69.6	169.8	153	70	69	73	0.000	1.001	6.241	626		
716	57.065	57.582	281.262	0.08	0.08	0.55	0.84	0.00	78	78	73	1.27	0.50	75	0.016	98	98	14.4	0.10	0.76		99.9	178.2	173.9	69.7	169.6	152	70	69	73	0.000	1.001	6.324	632		
717	57.145	57.663	281.655	0.08	0.08	0.55	0.84	0.00	78	78	73	1.27	0.50	75	0.016	98	98	14.4	0.00	0.73		100.1	178.0	173.7	69.5	169.5	150	70	69	73	0.000	1.001	6.074	608		
718	57.225	57.743	282.048	0.08	0.08	0.55	0.85	0.00	78	78	73	1.27	0.50	75	0.016	98	98	14.5	-0.10	0.74		99.7	177.7	173.5	69.6	169.3	149	70	69	73	0.000	1.001	6.157	615		
719	57.304	57.823	282.441	0.08	0.08	0.55	0.84	0.00	78	79	73	1.27	0.50	75	0.016	98	98	14.4	0.10	0.78		99.4	177.5	173.1	69.6	169.0	148	70	69	73	0.000	1.001	6.490	646		
720	57.384	57.904	282.834	0.08	0.08	0.55	0.84	0.00	78	79	73	1.27	0.50	75	0.016	98	98	14.4	0.00	0.77		99.2	177.3	173.1	69.5	168.7	147	70	69	73	0.000	1.001	6.407	636		
721	57.464	57.984	283.227	0.08	0.08	0.56	0.84	0.00	78	78	73	1.27	0.50	75	0.016	98	98	14.4	0.00	0.76		99.0	177.0	172.9	69.5	168.5	146	70	69	73	0.000	1.001	6.324	627		
722	57.543	58.065	283.619	0.08	0.08	0.54	0.84	0.00	78	79	73	1.27	0.50	75	0.016	98	98	14.4	0.00	0.72		98.7	176.7	172.5	69.5	168.2	145	70	69	73	0.000	1.001	5.991	592		
723	57.623	58.145	284.012	0.08	0.08	0.55	0.84	0.00	78	79	73	1.27	0.50	75	0.016	98	98	14.4	0.00	0.75		98.5	176.5	172.2	69.5	168.0	144	70	69	73	0.000	1.001	6.241	616		
724	57.703	58.226	284.405	0.08	0.08	0.55	0.84	0.00	78	78	73	1.27	0.50	75	0.016	98	98	14.4	0.00	0.78		98.3	176.4	172.2	69.5	167.7	143	70	69	73	0.000	1.001	6.490	638		
725	57.783	58.306	284.798	0.08	0.08	0.55	0.84	0.00	78	79	73	1.27	0.50	74	0.016	98	98	14.4	0.00	0.77		98.0	176.1	171.9	69.5	167.6	143	70	69	73	0.000	1.001	6.407	629		
726	57.862	58.386	285.191	0.08	0.08	0.55	0.84	0.00	78	79	73	1.27	0.50	74	0.016	98	98	14.4	0.00	0.72		97.7	175.9	171.7	69.6	167.4	142	70	69	73	0.000	1.001	5.991	586		
727	57.942	58.467	285.583	0.08	0.08	0.55	0.84	0.00	78	79	73	1.27	0.50	74	0.016	98	98	14.4	0.00	0.71		97.6	175.7	171.5	69.6	167.1	141	70	69	73	0.000	1.001	5.908	577		
728	58.022	58.547	285.976	0.08	0.08	0.55	0.84	0.00	78	79	73	1.27	0.50	74	0.016	98	98	14.4	0.00	0.74		97.4	175.4	171.4	69.6	167.0	141	70	69	73	0.000	1.001	6.157	600		
729	58.101	58.628	286.369	0.08	0.08	0.56	0.84	0.00	78	79	73	1.27	0.50	74	0.016	98	98	14.4	0.00	0.77		97.0	175.2	171.1	69.5	166.5	140	70	69	73	0.000	1.001	6.407	622		
730	58.181	58.708	286.762	0.08	0.08	0.55	0.83	0.00	78	79	73	1.27	0.50	74	0.016	98	98	14.4	0.00	0.74		97.0	175.0	170.8	69.5	166.6	139	70	69	73	0.000	1.001	6.157	598		
731	58.261	58.788	287.155	0.08	0.08	0.55	0.85	0.00	78	79	73	1.27	0.50	74	0.016	98	98	14.4	0.00	0.74		96.7	174.8	170.7	69.6	166.3	138	70	69	73	0.000	1.001	6.157	596		
732	58.340	58.869	287.548	0.08	0.08	0.56	0.84	0.00	78	79	73	1.27	0.50	74	0.016	98	98	14.4	0.00	0.74		96.3	174.5	170.3	69.7	166.0	138	70	69	73	0.000	1.001	6.157	594		
733	58.420	58.949	287.940	0.08	0.08	0.55	0.84	0.00	78	79	73	1.27	0.50	74	0.016	98	98	14.4	0.00	0.74		96.1	174.3	170.1	69.6	165.7	137	70	69	73	0.000	1.001	6.157	593		
734	58.500	59.030	288.333	0.08	0.08	0.56	0.84	0.00	78	79	73	1.27	0.50	74	0.016	98	98	14.4	0.00	0.79		95.9	174.1	170.0	69.6	165.5	136	70	69	73	0.000	1.001	6.573	631		
735	58.580	59.110	288.726	0.08	0.08	0.54	0.84	0.00	78	79	73	1.27	0.50	74	0.016	98	98	14.4	0.00	0.75		95.7	173.9	169.8	69.6	165.2	136	69	69	73	0.000	1.001	6.241	598		
736	58.659	59.191	289.119	0.08	0.08	0.55	0.85	0.00	78	79	73	1.27	0.50	74	0.016	98	98	14.4	0.00	0.73		95.5	173.6	169.5	69.6	165.1	135	69	69	73	0.000	1.001	6.074			

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						
760	60.572	61.121	298.547	0.08	0.08	0.55	0.84	0.00	78	79	72	1.27	0.50	74	0.016	98	98	14.4	0.00	0.76		90.3	168.3	164.3	69.4	159.7	123	69	69	72	0.000	1.001	6.324	572			
761	60.652	61.201	298.940	0.08	0.08	0.56	0.84	0.00	78	79	73	1.26	0.50	74	0.016	98	98	14.5	-0.10	0.74		90.1	168.1	164.3	69.5	159.5	123	69	69	73	0.000	1.001	6.157	555			
762	60.731	61.282	299.332	0.08	0.08	0.55	0.84	0.00	78	79	73	1.27	0.50	74	0.016	98	98	14.4	0.10	0.77		89.9	167.8	163.9	69.3	159.3	123	69	69	73	0.000	1.001	6.407	577			
763	60.811	61.362	299.725	0.08	0.08	0.55	0.84	0.00	78	79	73	1.27	0.50	74	0.016	98	98	14.5	-0.10	0.75		89.4	167.6	163.9	69.5	159.0	122	69	69	73	0.000	1.001	6.241	559			
764	60.891	61.442	300.118	0.08	0.08	0.55	0.85	0.00	78	79	73	1.27	0.50	74	0.016	98	98	14.4	0.10	0.76		89.5	167.3	163.6	69.5	159.0	122	69	69	73	0.000	1.001	6.324	567			
765	60.971	61.523	300.511	0.08	0.08	0.56	0.83	0.00	78	79	73	1.27	0.50	74	0.016	98	98	14.5	-0.10	0.74		89.1	167.2	163.4	69.4	158.5	122	69	69	73	0.000	1.001	6.158	549			
766	61.050	61.603	300.904	0.08	0.08	0.55	0.84	0.00	78	79	73	1.27	0.50	74	0.016	98	98	14.5	0.00	0.74		89.1	166.9	163.1	69.4	158.5	121	69	69	73	0.000	1.001	6.158	549			
767	61.130	61.684	301.296	0.08	0.08	0.55	0.84	0.00	78	79	72	1.27	0.50	74	0.016	98	98	14.4	0.10	0.76		88.7	166.7	162.9	69.4	158.1	121	69	69	72	0.000	1.001	6.324	562			
768	61.210	61.764	301.689	0.08	0.08	0.55	0.84	0.00	78	78	73	1.27	0.50	74	0.016	98	98	14.5	-0.10	0.76		88.8	166.5	162.7	69.3	158.1	120	69	69	73	0.000	1.001	6.324	562			
769	61.289	61.845	302.082	0.08	0.08	0.55	0.83	0.00	78	78	72	1.27	0.50	73	0.016	98	98	14.5	0.00	0.74		88.5	166.3	162.5	69.4	157.9	120	69	69	72	0.000	1.001	6.158	546			
770	61.369	61.925	302.475	0.08	0.08	0.55	0.84	0.00	78	78	72	1.27	0.50	74	0.016	98	98	14.5	0.00	0.91		88.3	166.1	161.5	69.3	157.6	120	69	69	72	0.000	1.001	7.572	669			
771	61.449	62.005	302.868	0.08	0.08	0.55	0.84	0.00	78	79	73	1.27	0.50	73	0.016	98	98	14.5	0.00	0.90		88.0	165.7	161.3	69.3	157.4	119	69	69	73	0.000	1.001	7.489	660			
772	61.528	62.086	303.261	0.08	0.08	0.55	0.85	0.00	78	78	72	1.27	0.50	73	0.016	98	98	14.5	0.00	0.89		87.7	165.5	161.0	69.3	157.0	119	69	69	72	0.000	1.001	7.406	650			
773	61.608	62.166	303.653	0.08	0.08	0.55	0.84	0.00	78	78	72	1.27	0.50	73	0.016	98	98	14.5	0.00	0.89		87.4	165.2	160.7	69.2	156.7	118	69	69	72	0.000	1.001	7.406	648			
774	61.688	62.247	304.046	0.08	0.08	0.56	0.84	0.00	78	78	73	1.27	0.50	73	0.016	98	98	14.5	0.00	0.91		87.2	165.0	160.5	69.2	156.4	118	69	69	73	0.000	1.001	7.572	661			
775	61.768	62.327	304.439	0.08	0.08	0.55	0.84	0.00	78	79	72	1.27	0.50	73	0.016	98	98	14.5	0.00	0.89		86.9	164.7	160.3	69.4	156.2	118	69	69	72	0.000	1.001	7.406	644			
776	61.847	62.407	304.832	0.08	0.08	0.56	0.84	0.00	78	78	72	1.27	0.50	73	0.016	98	98	14.5	0.00	0.89		86.7	164.4	160.0	69.3	156.0	117	69	69	72	0.000	1.001	7.406	643			
777	61.927	62.488	305.225	0.08	0.08	0.55	0.83	0.00	78	78	73	1.27	0.50	73	0.016	98	98	14.5	0.00	0.88		86.4	164.2	159.7	69.3	155.8	117	69	69	73	0.000	1.001	7.323	634			
778	62.007	62.568	305.618	0.08	0.08	0.55	0.84	0.00	78	78	72	1.27	0.50	73	0.016	98	98	14.5	0.00	0.90		86.2	163.9	159.5	69.3	155.5	117	69	69	72	0.000	1.001	7.489	646			
779	62.086	62.649	306.010	0.08	0.08	0.56	0.85	0.00	78	79	73	1.27	0.50	73	0.016	98	98	14.5	0.00	0.90		86.0	163.6	159.2	69.2	155.2	117	69	69	73	0.000	1.001	7.489	645			
780	62.166	62.729	306.403	0.08	0.08	0.55	0.84	0.00	78	78	72	1.27	0.50	73	0.016	98	98	14.5	0.00	0.91		85.8	163.3	158.9	69.1	154.9	117	69	69	72	0.000	1.001	7.572	650			
781	62.246	62.810	306.796	0.08	0.08	0.55	0.84	0.00	78	78	73	1.27	0.50	73	0.016	98	98	14.6	-0.10	0.91		85.4	163.1	158.8	69.3	154.6	117	69	69	73	0.000	1.001	7.572	647			
782	62.325	62.890	307.189	0.08	0.08	0.55	0.85	0.00	78	79	72	1.27	0.50	73	0.016	98	98	14.5	0.10	0.89		85.1	162.8	158.4	69.3	154.4	117	69	69	72	0.000	1.001	7.406	631			
783	62.405	62.970	307.582	0.08	0.08	0.55	0.84	0.00	78	78	72	1.27	0.50	73	0.016	98	98	14.5	0.00	0.88		84.9	162.5	158.3	69.3	154.2	116	69	68	72	0.000	1.001	7.323	622			
784	62.485	63.051	307.974	0.08	0.08	0.55	0.84	0.00	78	78	72	1.27	0.50	73	0.016	98	98	14.5	0.00	0.89		84.9	162.3	157.9	69.0	154.0	117	69	68	72	0.000	1.001	7.406	630			
785	62.565	63.131	308.367	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				
808	64.398	64.981	317.402	0.08	0.08	0.55	0.84	0.00	78	78	72	1.27	0.50	73	0.016	98	98	14.5	0.10	0.94		78.6	156.2	152.0	69.0	147.6	110	69	68	72	0.000	1.001	7.822	615	
809	64.477	65.061	317.795	0.08	0.08	0.55	0.84	0.00	78	78	72	1.27	0.50	73	0.016	98	98	14.6	-0.10	0.90		78.4	156.0	151.8	69.1	147.5	110	69	68	72	0.000	1.001	7.489	588	
810	64.557	65.142	318.188	0.08	0.08	0.55	0.83	0.00	78	78	72	1.27	0.50	73	0.016	98	98	14.6	0.00	0.95		78.0	155.7	151.7	69.1	147.2	110	69	68	72	0.000	1.001	7.905	618	
811	64.637	65.222	318.581	0.08	0.08	0.55	0.84	0.00	78	78	72	1.27	0.50	73	0.016	98	98	14.6	0.00	0.91		77.9	155.4	151.3	69.1	147.1	110	69	68	72	0.000	1.001	7.572	591	
812	64.716	65.303	318.974	0.08	0.08	0.55	0.83	0.00	78	78	72	1.27	0.50	73	0.016	98	98	14.6	0.00	0.91		77.5	155.1	151.0	69.2	146.7	110	69	68	72	0.000	1.001	7.572	587	
813	64.796	65.383	319.366	0.08	0.08	0.55	0.85	0.00	78	78	72	1.27	0.50	73	0.016	98	98	14.6	0.00	0.91		77.3	154.9	150.7	69.0	146.3	110	69	68	72	0.000	1.001	7.573	586	
814	64.876	65.464	319.759	0.08	0.08	0.55	0.84	0.00	78	78	72	1.27	0.50	73	0.016	98	98	14.6	0.00	0.92		77.1	154.7	150.6	69.1	146.2	109	69	68	72	0.000	1.001	7.656	591	
815	64.956	65.544	320.152	0.08	0.08	0.55	0.84	0.00	78	78	72	1.27	0.50	73	0.016	98	98	14.5	0.10	0.92		77.0	154.4	150.5	69.0	146.0	109	69	68	72	0.000	1.001	7.656	590	
816	65.035	65.624	320.545	0.08	0.08	0.55	0.84	0.00	78	78	72	1.27	0.50	73	0.016	98	98	14.6	-0.10	0.94		76.8	154.2	150.1	69.0	145.7	109	69	68	72	0.000	1.001	7.822	601	
817	65.115	65.705	320.938	0.08	0.08	0.55	0.84	0.00	78	78	72	1.27	0.50	73	0.016	98	98	14.6	0.00	0.94		76.5	154.0	149.9	69.1	145.6	108	69	68	72	0.000	1.001	7.822	599	
818	65.195	65.785	321.331	0.08	0.08	0.55	0.85	0.00	78	78	72	1.27	0.50	73	0.016	98	98	14.6	0.00	0.91		76.3	153.7	149.7	69.0	145.3	109	69	68	72	0.000	1.001	7.573	578	
819	65.274	65.866	321.723	0.08	0.08	0.55	0.84	0.00	78	78	72	1.27	0.50	73	0.016	98	98	14.6	0.00	0.93		76.1	153.5	149.4	69.0	145.1	110	69	68	72	0.000	1.001	7.739	589	
820	65.354	65.946	322.116	0.08	0.08	0.55	0.84	0.00	78	78	72	1.27	0.50	73	0.016	98	98	14.6	0.00	0.91		75.7	153.2	149.1	69.0	144.7	109	69	68	72	0.000	1.001	7.573	574	
821	65.434	66.026	322.509	0.08	0.08	0.55	0.84	0.00	78	78	72	1.27	0.50	73	0.016	98	98	14.6	0.00	0.92		75.4	153.0	149.0	69.0	144.5	108	69	68	72	0.000	1.001	7.656	578	
822	65.513	66.107	322.902	0.08	0.08	0.55	0.84	0.00	78	78	72	1.27	0.50	73	0.016	98	98	14.6	0.00	0.94		75.2	152.7	148.6	69.0	144.2	108	69	68	72	0.000	1.001	7.822	589	
823	65.593	66.187	323.295	0.08	0.08	0.55	0.84	0.00	78	78	72	1.27	0.50	73	0.016	98	98	14.6	0.00	0.94		75.0	152.5	148.5	69.0	144.0	108	69	68	72	0.000	1.001	7.822	587	
824	65.673	66.268	323.687	0.08	0.08	0.56	0.84	0.00	78	78	72	1.27	0.50	73	0.016	98	98	14.6	0.00	0.92		74.8	152.3	148.2	69.0	143.8	109	69	68	72	0.000	1.001	7.656	573	
825	65.753	66.348	324.080	0.08	0.08	0.55	0.84	0.00	78	78	72	1.27	0.50	73	0.016	98	98	14.6	0.00	0.92		74.5	152.0	148.0	69.0	143.5	108	69	68	72	0.000	1.001	7.656	571	
826	65.832	66.429	324.473	0.08	0.08	0.56	0.84	0.00	78	78	72	1.27	0.50	73	0.016	98	98	14.6	0.00	0.91		74.3	151.8	147.8	69.0	143.3	107	69	68	72	0.000	1.001	7.573	564	
827	65.912	66.509	324.866	0.08	0.08	0.55	0.84	0.00	78	78	72	1.27	0.50	73	0.016	98	98	14.6	0.00	0.94		73.9	151.6	147.6	69.1	143.0	108	69	68	72	0.000	1.001	7.822	579	
828	65.992	66.589	325.259	0.08	0.08	0.55	0.84	0.00	78	78	72	1.27	0.50	73	0.016	98	98	14.6	0.00	0.93		73.8	151.3	147.3	69.0	142.9	107	69	68	72	0.000	1.001	7.739	572	
829	66.071	66.670	325.652	0.08	0.08	0.56	0.84	0.00	78	78	72	1.27	0.50	73	0.016	98	98	14.6	0.00	0.94		73.5	151.0	147.0	69.0	142.5	107	69	68	72	0.000	1.001	7.822	576	
830	66.151	66.750	326.044	0.08	0.08	0.55	0.84	0.00	78	78	72	1.27	0.50	73	0.016	98	98	14.6	0.00	0.92		73.3	150.8	146.8	69.0	142.3	107	69	68	72	0.000	1.001	7.656	562	
831	66.231	66.831	326.437	0.08	0.08	0.55	0.84	0.00	78	78	72	1.27	0.50	73	0.016	98	98	14.6	0.00	0.93		73.1	150.6	146.6	69.0	142.1	106	69	68	72	0.000	1.001	7.739	567	
832	66.310	66.911	326.830	0.08	0.08	0.55	0.84	0.00	78	78	72	1.27	0.50	73	0.016	98	98	14.6	0.00	0.91		73.0	150.3	146.4	69.0	141.9	106	69	68	72	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				
856	68.223	68.841	336.258	0.08	0.08	0.55	0.85	0.00	78	78	72	1.27	0.50	72	0.016	98	98	14.7	0.00	1.01		67.1	144.5	140.6	68.9	136.0	103	68	68	72	0.000	1.001	8.405	565	
857	68.303	68.922	336.651	0.08	0.08	0.56	0.84	0.00	78	78	72	1.27	0.50	72	0.016	98	98	14.7	0.00	0.98		67.1	144.2	140.3	68.7	135.8	104	68	68	72	0.000	1.001	8.155	547	
858	68.383	69.002	337.044	0.08	0.08	0.55	0.83	0.00	78	78	72	1.27	0.50	72	0.016	98	98	14.7	0.00	0.96		66.8	144.0	140.1	68.8	135.6	103	68	68	72	0.000	1.001	7.989	534	
859	68.462	69.082	337.436	0.08	0.08	0.55	0.85	0.00	78	78	72	1.27	0.50	72	0.016	98	98	14.6	0.10	0.97		66.6	143.7	139.9	68.8	135.4	103	68	68	72	0.000	1.001	8.072	538	
860	68.542	69.163	337.829	0.08	0.08	0.56	0.84	0.00	78	78	72	1.27	0.50	72	0.016	98	98	14.7	-0.10	0.99		66.4	143.6	139.7	68.7	135.1	103	68	68	72	0.000	1.001	8.239	548	
861	68.622	69.243	338.222	0.08	0.08	0.55	0.84	0.00	78	78	72	1.27	0.50	72	0.016	98	98	14.7	0.00	0.98		66.0	143.3	139.5	68.9	134.9	102	68	68	72	0.000	1.001	8.155	539	
862	68.701	69.324	338.615	0.08	0.08	0.55	0.84	0.00	78	78	72	1.27	0.50	72	0.016	98	98	14.7	0.00	0.99		65.8	143.0	139.2	68.9	134.6	102	68	68	72	0.000	1.001	8.238	543	
863	68.781	69.404	339.008	0.08	0.08	0.55	0.84	0.00	78	78	72	1.27	0.50	72	0.016	98	98	14.7	0.00	1.00		65.7	142.8	139.0	68.7	134.4	102	68	68	72	0.000	1.001	8.322	547	
864	68.861	69.485	339.400	0.08	0.08	0.55	0.84	0.00	78	78	72	1.27	0.50	72	0.016	98	98	14.7	0.00	1.00		65.4	142.6	138.7	68.7	134.1	101	68	68	72	0.000	1.001	8.322	545	
865	68.941	69.565	339.793	0.08	0.08	0.55	0.84	0.00	78	78	72	1.27	0.50	72	0.016	98	98	14.7	0.00	1.00		65.1	142.3	138.6	68.8	133.9	101	68	68	72	0.000	1.001	8.322	543	
866	69.020	69.645	340.186	0.08	0.08	0.56	0.85	0.00	78	78	72	1.27	0.50	72	0.016	98	98	14.7	0.00	1.02		65.0	142.1	138.4	68.8	133.8	102	68	68	72	0.000	1.001	8.488	552	
867	69.100	69.726	340.579	0.08	0.08	0.55	0.84	0.00	78	78	72	1.27	0.50	72	0.016	98	98	14.7	0.00	0.98		64.6	141.9	138.2	68.8	133.4	102	68	68	72	0.000	1.001	8.155	527	
868	69.180	69.806	340.972	0.08	0.08	0.55	0.84	0.00	78	78	72	1.27	0.50	72	0.016	98	98	14.7	0.00	0.98		64.6	141.6	137.9	68.7	133.3	102	68	68	72	0.000	1.001	8.155	528	
869	69.259	69.887	341.365	0.08	0.08	0.55	0.85	0.00	78	78	72	1.27	0.50	72	0.016	98	98	14.7	0.00	0.99		64.3	141.4	137.7	68.8	133.1	101	68	68	72	0.000	1.001	8.239	531	
870	69.339	69.967	341.757	0.08	0.08	0.55	0.84	0.00	78	78	72	1.27	0.50	72	0.016	98	98	14.7	0.00	1.01		64.0	141.3	137.5	68.8	132.8	101	68	68	72	0.000	1.001	8.405	539	
871	69.419	70.048	342.150	0.08	0.08	0.55	0.84	0.00	78	78	72	1.27	0.50	72	0.016	98	98	14.8	-0.10	0.99		63.7	141.1	137.2	68.8	132.5	102	68	68	72	0.000	1.001	8.239	526	
872	69.498	70.128	342.543	0.08	0.08	0.55	0.85	0.00	78	78	72	1.27	0.50	72	0.016	98	98	14.7	0.10	1.00		63.5	140.8	137.0	68.8	132.3	102	68	68	72	0.000	1.001	8.322	529	
873	69.578	70.208	342.936	0.08	0.08	0.55	0.84	0.00	78	78	72	1.27	0.50	81	0.016	99	99	14.8	-0.10	1.01		63.3	140.6	136.8	68.8	132.1	126	68	68	72	0.000	1.001	8.405	533	
874	69.658	70.289	343.329	0.08	0.08	0.55	0.85	0.00	78	78	72	1.27	0.50	87	0.016	99	99	14.7	0.10	1.00		63.3	140.3	136.6	68.8	132.0	139	68	68	72	0.000	1.001	8.322	527	
875	69.738	70.369	343.722	0.08	0.08	0.55	0.84	0.00	78	78	72	1.27	0.50	91	0.016	100	100	14.6	0.10	0.98		63.1	140.1	136.5	68.8	131.9	145	68	68	72	0.000	1.001	8.155	515	
876	69.817	70.450	344.114	0.08	0.08	0.55	0.84	0.00	78	78	72	1.27	0.50	95	0.016	100	100	14.4	0.20	1.01		63.0	140.0	136.2	68.7	131.7	154	69	68	72	0.000	1.001	8.405	530	
877	69.897	70.530	344.507	0.08	0.08	0.55	0.85	0.00	78	78	72	1.27	0.50	99	0.016	101	101	14.2	0.20	0.98		63.0	139.8	136.2	68.8	131.8	166	69	68	72	0.000	1.001	8.155	515	
878	69.977	70.611	344.900	0.08	0.08	0.55	0.84	0.00	78	78	72	1.27	0.50	103	0.016	101	101	13.9	0.30	0.97		62.9	139.7	136.1	68.7	131.6	180	69	68	72	0.000	1.001	8.072	508	
879	70.056	70.691	345.293	0.08	0.08	0.56	0.84	0.00	78	78	71	1.27	0.50	108	0.016	101	101	13.7	0.20	1.01		62.9	139.7	136.2	68.7	131.6	196	69	69	71	0.000	1.001	8.405	529	
880	70.136	70.771	345.686	0.08	0.08	0.55	0.84	0.00	78	78	71	1.26	0.50	113	0.016	102	102	13.5	0.20	0.96		63.0	139.7	136.3	68.8	131.8	212	69	69						

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					
904	72.049	72.701	355.113	0.08	0.08	0.55	0.84	0.00	77	77	71	1.25	0.50	179	0.016	108	108	5.7	0.30	0.88		76.7	152.6	148.6	68.7	145.4	444	74	73	71	0.000	1.001	7.323	562		
905	72.129	72.782	355.506	0.08	0.08	0.55	0.84	0.00	77	77	71	1.25	0.50	181	0.016	108	108	5.2	0.50	0.90		77.6	153.5	149.5	68.8	146.4	448	74	73	71	0.000	1.001	7.490	582		
906	72.208	72.862	355.899	0.08	0.08	0.55	0.85	0.00	77	77	71	1.25	0.50	181	0.016	108	108	4.9	0.30	0.91		78.6	154.6	150.5	68.7	147.3	454	74	73	71	0.000	1.001	7.573	596		
907	72.288	72.943	356.292	0.08	0.08	0.55	0.83	0.00	77	77	71	1.25	0.50	182	0.016	108	108	4.5	0.40	0.93		79.6	155.5	151.4	68.7	148.3	456	74	73	71	0.000	1.001	7.739	617		
908	72.368	73.023	356.685	0.08	0.08	0.55	0.84	0.00	77	77	71	1.25	0.50	183	0.016	108	108	4.2	0.30	0.89		80.5	156.4	152.2	68.8	149.3	459	75	73	71	0.000	1.001	7.406	597		
909	72.447	73.104	357.078	0.08	0.08	0.55	0.83	0.00	77	77	71	1.26	0.50	184	0.016	108	108	3.9	0.30	0.89		81.5	157.4	153.2	68.8	150.3	460	75	73	71	0.000	1.001	7.406	605		
910	72.527	73.184	357.470	0.08	0.08	0.55	0.84	0.00	77	77	71	1.26	0.50	184	0.016	108	108	3.4	0.50	0.89		82.7	158.2	154.0	68.7	151.4	461	75	73	71	0.000	1.001	7.406	613		
911	72.607	73.264	357.863	0.08	0.08	0.56	0.83	0.00	77	77	71	1.25	0.50	185	0.016	108	108	3.1	0.30	0.77		83.5	159.4	155.8	68.8	152.3	464	75	74	71	0.000	1.001	6.408	536		
912	72.686	73.345	358.256	0.08	0.08	0.56	0.84	0.00	77	77	71	1.25	0.50	185	0.016	108	108	2.8	0.30	0.82		84.7	160.3	156.7	68.8	153.5	465	75	74	71	0.000	1.001	6.824	579		
913	72.766	73.425	358.649	0.08	0.08	0.55	0.83	0.00	77	77	71	1.25	0.50	186	0.016	108	108	2.5	0.30	0.78		85.6	161.5	157.6	68.8	154.4	467	75	74	71	0.000	1.001	6.491	556		
914	72.846	73.506	359.042	0.08	0.08	0.55	0.83	0.00	77	77	71	1.25	0.50	186	0.016	108	108	2.0	0.50	0.78		86.9	162.3	158.5	68.8	155.6	466	75	74	71	0.000	1.001	6.491	564		
915	72.926	73.586	359.435	0.08	0.08	0.55	0.83	0.00	77	77	71	1.25	0.50	186	0.016	108	108	1.7	0.30	0.76		87.9	163.6	159.7	68.7	156.6	466	75	74	71	0.000	1.001	6.325	557		
916	73.005	73.667	359.827	0.08	0.08	0.54	0.84	0.00	77	77	71	1.25	0.50	186	0.016	108	108	1.4	0.30	0.80		89.0	164.5	160.7	68.8	157.8	465	76	74	71	0.000	1.001	6.657	593		
917	73.085	73.747	360.220	0.08	0.08	0.56	0.85	0.00	77	77	71	1.25	0.50	186	0.016	108	108	1.0	0.40	0.78		89.6	165.7	161.7	68.8	158.3	465	76	74	71	0.000	1.001	6.491	582		
918	73.165	73.827	360.613	0.08	0.08	0.55	0.84	0.00	77	77	71	1.25	0.50	186	0.016	108	108	0.7	0.30	0.76		90.5	166.5	162.6	68.9	159.4	465	76	74	71	0.000	1.001	6.324	573		
919	73.240	73.908	361.006	0.08	0.08	0.55	0.84	0.00	77	77	71	1.25	0.50	186	0.016	102	108	0.4	0.30	0.79		91.7	167.6	163.5	68.8	160.5	465	76	74	71	0.000	1.001	6.574	604		
920	73.300	73.988	361.399	0.06	0.08	0.55	0.83	0.00	77	77	71	1.25	0.50	186	0.016	82	108	0.0	0.40	0.80		91.7	168.7	164.6	68.8	160.5	464	76	74	71	0.000	1.001	6.657	611		
	73.300	73.988	361.399			0.54	0.83	0.00	78	78	73			94	0.016					0.80	#DIV/0!	83.6	164.1	160.2	69.6	153.2		81.26	74.84		0.00			547		
TOTAL:																																			503173	

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350x WHH new cat iv
4-50 of 4-80

[illegible]

Total Weight of Load (lb): 141.6

Total Moisture of Load (%): 21.5

Equipment Numbers:

Method 28 Hydronic Heater Run Sheets

Client: Heatmor Project Number: 0275WH011E.AD01 Run Number: 3
 Model: 350x Tracking Number: 2011 Date: 10/9/14
 Test Crew: A. Kravitz, J. Clark
 OMNI Equipment ID numbers: ; 428A, 428B, 132, 209, 410, 417, 419, 513, 533, 559, 296-T55, 340, 353, 431, 23, 131, 343

WHH Run Notes

Preburn Settings

Target Output (%): <15%
 Target Output (BTU/hr): <42,000

Preburn Notes

TIME	NOTES
1:42 ET	Test setting (~ 39,000 BTU/hr) 12:36 DAQ = 12:35 computer

Test Settings

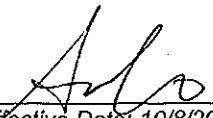
Target Output (%): <15%
 Target Output (BTU/hr): <42,000

Start-Up Timeline

Fuel Loaded by: 1:25
 Door Closed at: 1:35
 Notes: _____

Test Notes

TIME	NOTES
0:21:00	Train A front filter swapped for B305
0:25:00	Train B front swapped for B306
3:33:00	Ambient train started
5:06:00	Train A front swapped for B307
5:16:00	Train B front swapped for B308
5:20:00	Train A front → B309

Technician Signature: 
 Control No. P-SFDJ-0001, Effective Date: 10/8/2014

Date: 10/9/14

Method 28 Hydronic Heater Run Sheets

Client: HeatmorProject Number: 0275WH011E.AD01Run Number: 3Model: 350xTracking Number: 2011Date: 10/9/14Test Crew: A. Kravitz, J. Clark

OMNI Equipment ID numbers: : 428A, 428B, 132, 209, 410, 417, 419, 513, 533, 559, 296-T55, 340, 353, 431, 23, 131, 343

WHH Supplemental Data

Start Time: 12:57Booth #: E3Stop Time: 04:17

Stack Gas Leak Check:

Initial: 0 Final: 0

Sample Train Leak Check:

A: 0.001 @ -1.1 "HgB: 0.006 @ -1.5 "Hg

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

Time	Pre Test		
	Zero	Span	Mid
O ₂	<u>11:01</u>	<u>11:04</u>	<u>11:08</u>
CO ₂	<u>N/A</u>	<u>N/A</u>	<u>N/A</u>
CO	<u>0.00</u>	<u>16.80</u>	<u>10.26</u>
	<u>0.000</u>	<u>4.295</u>	<u>2.536</u>

Post Test		
Zero	Span	Mid
<u>04:19</u>	<u>04:21</u>	<u>04:23</u>
<u>N/A</u>	<u>N/A</u>	<u>N/A</u>
<u>0.23</u>	<u>17.12</u>	<u>10.29</u>
<u>0.030</u>	<u>4.298</u>	<u>2.544</u>

Air Velocity (ft/min): Initial: 50 Final: 50Scale Audit (lbs): Initial: 10.0 Final: 10.0Pitot Tube Leak Test: Initial: 0 Final: 0Stack Diameter (in): 8Induced Draft: 0% Smoke Capture: 100%

Flue Pipe Cleaned Prior to First Test in Series:

Date: 10/7/14 Initials: A

	Initial	Middle	Ending
P _b (in/Hg)	<u>30.04</u>	<u>30.05</u>	<u>30.08</u>
Ambient (°F)	<u>69</u>	<u>75</u>	<u>71</u>

Tunnel Traverse	
dP (in H ₂ O)	T (°F)
<u>0.014</u>	<u>72</u>
<u>0.018</u>	
<u>0.022</u>	
<u>0.024</u>	
<u>0.022</u>	
<u>0.010</u>	
<u>0.013</u>	
<u>0.020</u>	
<u>0.020</u>	
<u>0.024</u>	
<u>0.016</u>	
<u>0.008</u>	
Static P:	<u>-0.27</u>

Technician Signature: A
 Control No. P-SFDJ-0001, Effective Date: 10/8/2014

Date: 10/9/14

OMNI-Test Laboratories, Inc.

Manufacturer: Heatmor
Model: 350x
Date: 10/09/14
Run: 3
Control #: 2011
Test Duration: 920
Output Category: I

Technicians: A. Kravitz

Test Results in Accordance with CSA B415.1-09

	HHV Basis	LHV Basis
Overall Efficiency	70.6%	76.0%
Combustion Efficiency	92.7%	92.7%
Heat Transfer Efficiency	76%	82.0%

Output Rate (kJ/h)	50,330	47,743	(Btu/h)
Burn Rate (kg/h)	3.58	7.90	(lb/h)
Input (kJ/h)	71,290	67,626	(Btu/h)

Test Load Weight (dry kg)	54.97	121.15	dry lb
MC wet (%)	17.7		
MC dry (%)	21.51		
Particulate (g)	0		
CO (g)	5,645		
Test Duration (h)	15.33		

Emissions	Particulate	CO
g/MJ Output	0.00	7.31
g/kg Dry Fuel	0.00	102.70
g/h	0.00	368.15
lb/MM Btu Output	0.00	17.00

Air/Fuel Ratio (A/F)	9.57
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VERSION:

2.3

3/23/2010

*Model: 350X
Heatmor
105 Industrial Park Ct. NE, P.O. Box 787
Warroad, MN 56763*

Run 4

Hydronic Heating Appliances - Test Method 28 WHH Results

Manufacturer: Heatmor
 Model: 350X
 Tracking No.: 2011
 Project No.: 0275WB011E.AD01
 Run: 4
 Test Date: October 10, 2014

Burn Rate	5.05 kg/hr dry
Average Tunnel Temperature	102 degrees Fahrenheit
Average Gas Velocity in Dilution Tunnel - vs	9.5 feet/second
Average Gas Flow Rate in Dilution Tunnel - Qsd	24879 dscf/hour
Average Delta p	0.019 inches H2O
Average Delta H	0.55 inches H2O
Total Time of Test	645 minutes

	SAMPLE TRAIN 1	SAMPLE TRAIN 2	AMBIENT SAMPLE TRAIN
Total Sample Volume - Vm	52.50 cubic feet	52.75 cubic feet	225.35 cubic feet
Average Gas Meter Temperature	78 degrees Fahrenheit	78 degrees Fahrenheit	73 degrees Fahrenheit
Total Sample Volume (Standard Conditions) - Vmstd	52.3 dscf	52.9 dscf	222.4 dscf
Total Particulates - mn	18.4 mg	17.6 mg	2.1 mg
Particulate Concentration (dry-standard)	0.00035 grams/dscf	0.00033 grams/dscf	0.000009 grams/dscf
Particulate Emission Rate	91.56 grams	86.53 grams	
Difference from Average	2.51 grams	2.51 grams	
Results Are Acceptable			

AVERAGE	
Total Sample Volume - Vm	52.62 cubic feet
Average Gas Meter Temperature	78 degrees Fahrenheit
Total Sample Volume (Standard Conditions) - Vmstd	52.6 dscf
Total Particulates - mn	
Particulate Concentration (dry-standard)	0.00033 grams/dscf
Particulate Emission Rate	89.04 grams
7.5% of the average emission rate	6.68 grams

Hydronic Heating Appliances - Test Method 28 WHH
Test Data

Run: 4
Manufacturer: Heatmor
Model: 350X
Tracking No.: 2011
Project No.: 0275WB011E.AD01
Test Date: October 10, 2014
Technician: A. Kravitz
Beginning Clock Time: 11:45
Recording Interval: 1 min.
Total Sampling Time: 645 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	0.029	0.024	0.024	0.022	0.008	0.014	0.020	0.024	0.022	0.022	0.008
Initial Temp.	71	71	71	71	71	71	71	71	71	71	71	71
Air Velocity: Initial: <50 Final: <50												
Scale Audit: Pre: 10.0 Post: 10.0												
Induced Draft: 0												
Pitot Tube Leak Test: Pre: 0 Post: 0 % Smoke Capture: 100												
Flue Pipe Cleaned Prior to First Test in Series: Date: 10/7/2014												

PM Control Module:
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

Meter Box Y Factor: 1.007 1.012 0.989
Barometric Pressure: Begin Middle End
30.15 30.15 30.14

Signature/Date:
Tunnel Velocity: 9.49 ft/sec.
Initial Tunnel Flow: 422.5 scfm
Average Tunnel Flow: 414.6 scfm
Tunnel Area: 0.785 ft2
Post-Test Leak Check (1): 0 cfm@"Hg
Post-Test Leak Check (2): 0.002 cfm@"Hg
Fuel Moisture (dry basis %): 22.6
Total Particulate (1): 18.4
Total Particulate (2): 17.6

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
0	0.000	0.000	0.00001			0.01	0.03	0.00	71	70	70	1.62	1	71	0.019			146.8		1.67		74.69	141.55	134.94	67.19	141.87	305	62	62	70	0.000	1.001	13.900	
1	0.081	0.082	0.34938	0.08	0.08	0.56	0.85	0.00	71	70	70	1.28	0.5	101	0.019	101	101	146.2	0.60	1.69		75.37	142.56	135.67	66.99	142.36	295	64	64	70	0.000	1.001	14.067	1061
2	0.163	0.164	0.69876	0.08	0.08	0.56	0.85	0.00	71	70	70	1.28	0.5	98	0.019	101	101	145.6	0.60	1.65		75.31	142.68	136.12	67.09	142.40	279	64	64	70	0.000	1.001	13.734	1035
3	0.244	0.245	1.04814	0.08	0.08	0.56	0.84	0.00	71	70	70	1.27	0.5	109	0.019	102	102	145.0	0.60	1.69		75.34	142.62	136.06	66.99	142.33	281	66	66	70	0.000	1.001	14.067	1061
4	0.326	0.327	1.397519	0.08	0.08	0.57	0.86	0.00	71	71	70	1.27	0.5	135	0.019	104	104	144.0	1.00	1.69		75.47	142.68	136.01	66.93	142.40	341	67	67	70	0.000	1.001	14.067	1063
5	0.407	0.409	1.746899	0.08	0.08	0.56	0.84	0.00	71	71	70	1.26	0.5	154	0.019	106	106	143.0	1.00	1.71		75.70	142.90	136.29	67.06	142.76	401	69	69	70	0.000	1.001	14.234	1079
6	0.488	0.491	2.096279	0.08	0.08	0.56	0.85	0.00	71	71	70	1.26	0.5	168	0.019	107	107	142.0	1.00	1.67		75.93	143.01	136.29	66.93	142.86	440	70	70	70	0.000	1.001	13.901	1057
7	0.570	0.572	2.445659	0.08	0.08	0.56	0.85	0.00	71	71	70	1.25	0.5	178	0.019	108	108	141.0	1.00	1.65		76.03	143.29	136.34	67.03	143.05	460	71	72	70	0.000	1.001	13.734	1045
8	0.651	0.654	2.795039	0.08	0.08	0.55	0.84	0.00	71	71	70	1.25	0.5	187	0.019	109	109	140.0	1.00	1.67		77.01	143.57	136.57	66.90	143.91	506	73	73	70	0.000	1.001	13.901	1072
9	0.733	0.736	3.144419	0.08	0.08	0.56	0.85	0.00	71	71	70	1.24	0.5	202	0.019	110	110	139.0	1.00	1.65		77.31	144.24	137.13	66.96	144.27	584	75	75	70	0.000	1.001	13.734	1063
10	0.814	0.818	3.493798	0.08	0.08	0.55	0.85	0.00	72	71	70	1.23	0.5	214	0.019	111	111	137.0	2.00	1.65		78.45	145.31	138.31	66.96	145.42	619	77	77	70	0.000	1.001	13.734	1079
11	0.895	0.900	3.843178	0.08	0.08	0.54	0.84	0.00	72	71	70	1.22	0.5	221	0.019	111	112	135.0	2.00	1.61		79.01	145.76	138.75	66.99	146.01	636	78	79	70	0.000	1.001	13.401	1060
12	0.977	0.981	4.192558	0.08	0.08	0.54	0.84	0.00	72	71	70	1.21	0.5	227	0.019	112	112	134.0	1.00	1.65		79.97	146.93	139.82	67.09	147.06	653	80	80	70	0.000	1.001	13.734	1100
13	1.058	1.063	4.541938	0.08	0.08	0.55	0.84	0.00	72	71	70	1.2	0.5	231	0.019	112	112	132.0	2.00	1.67		81.50	148.33	140.88	66.90	148.40	651	82	82	70	0.000	1.001	13.901	1134
14	1.140	1.145	4.891318	0.08	0.08	0.55	0.83	0.00	72	72	70	1.19	0.5	234	0.019	112	112	130.0	2.00	1.90		83.38	149.74	141.89	66.93	150.31	654	83	84	70	0.000	1.001	15.815	1320
15	1.221	1.227	5.240698	0.08	0.08	0.57	0.83	0.00	72	72	70	1.17	0.5	236	0.019	113	113	128.0	2.00	1.41		85.02	151.25	144.69	66.90	151.92	661	84	85	70	0.000	1.001	11.737	999
16	1.302	1.308	5.590078	0.08	0.08	0.56	0.80	0.00	72	72	70	1.16	0.4	238	0.019	113	113	126.0	2.00	1.47		86.73	152.99	146.26	66.99	153.72	664	86	86	70	0.000	1.001	12.236	1062
17	1.384	1.390	5.939457	0.08	0.08	0.43	0.80	0.00	72	72	71	0.75	0.4	240	0.019	113	113	125.0	1.00	1.37		88.30	154.83	148.11	67.03	155.33	668	87	85	71	0.000	1.001	11.404	1008
18	1.465	1.472	6.288837	0.08	0.08	0.54	0.79	0.00	72	72	70	0.45	0.4	242	0.019	113	113	123.0	2.00	1.45		90.34	156.80	149.46	67.06	157.40	673	88	84	70	0.000	1.001	12.069	1092
19	1.547	1.554	6.638217	0.08	0.08	0.00	0.77	0.00	72	72	71	1.63	0.4	243	0.019	113	113	121.0	2.00	1.45		91.60	158.42	151.02	67.09	158.69	672	88	83	71	0.000	1.001	12.069	1107
20	1.628	1.636	6.987597	0.08	0.08	0.01	0.80	0.00	72	72	70	1.64	0.4	244	0.019	113	113	119.0	2.00	1.47		93.96	160.16	152.76	66.99	160.95	675	88	83	70	0.000	1.001	12.236	1151
21	1.709	1.717	7.336977	0.08	0.08	0.54	0.82	0.00	72	72	71	1.22	0.3	245	0.019	113	113	117.0	2.00	1.47		95.51	162.12	154.55	67.15	162.66	676	81	82	71	0.000	1.001	12.236	1170
22	1.791	1.799	7.686357	0.08	0.08	0.54	0.03	0.00	73	72	70	1.21	1	246	0.019	113	113	115.0	2.00	1.45		97.47	163.91	156.18	67.06	164.53	680	78	75	70	0.000	1.001	12.069	1178
23	1.872	1.881	8.035736	0.08	0.08	0.54	0.83	0.00	73	72	71	1.2	0.4	248	0.019	113	114	113.0	2.00	1.45		99.19	165.70	158.14	67.19	166.37	683	78	79	71	0.000	1.001	12.069	1198
24	1.953	1.963	8.385116	0.08	0.08	0.55	0.85	0.00	73	73	71	1.19	0.4	248	0.019	113	113	112.0	1.00	1.43		101.15	167.83	160.05	67.15	168.31	685	78	79	71	0.000	1.001	11.903	1205
25	2.035	2.044	8.734496	0.08	0.08	0.54	0.84	0.00	73	73	71	1.18	0.4	249	0.019	113	113	110.0	2.00	1.30		103.19	169.23	162.17	67.12	170.31	688	79	80	71	0.000	1.001	10.821	1118
26	2.116	2.126	9.083876	0.08	0.08	0.53	0.82	0.00	73	73	70	1.17	0.4	249	0.019	113	113	108.0	2.00	1.16		104.80	171.36	164.81	67.19	171.98	691	79	80	70	0.000	1.001	9.655	1013
27	2.198	2.208	9.433256	0.08	0.08	0.56	0.83	0.00	73	73	70	1.14	0.4	250	0.019	114	114	106.0	2.00	1.18		106.80	173.04	166.10	67.25	174.05	695	79	81	70	0.000	1.001	9.822	1050
28	2.279	2.290	9.782636	0.08	0.08	0.51	0.82	0.00	73	73	71	1.02	0.4	250	0.019	114	114	105.0	1.00	1.14		108.54	175.01	167.89	67.15	175.69	697	79	82	71	0.000	1.001	9.489	1031
29	2.360	2.372	10.13202	0.08	0.08	0.01	0.82	0.00	73	73	71	1.64	0.3	251	0.019	114	114	103.0	2.00	1.16		110.52	177.02	169.96	67.12	177.64	699	74	82	71	0.000	1.001	9.656	1068
30	2.442	2.453	10.4814	0.08	0.08	0.56	0.87	0.00	73	73	71	1.22	0.3	251	0.019	114	114	101.0	2.00	1.16		112.27	179.10	171.98	67.31	179.58	699	77	83	71	0.000	1.001	9.655	1085
31	2.523	2.535	10.83078	0.08	0.08	0.55	0.84	0.00	73	74	71	1.2	0.3	251	0.019	114	113	99.6	1.40	1.22		114.30	181.06	173.66	67.38	181.68	700	81	83	71	0.000	1.001	10.155	1162
32	2.605	2.617	11.18016	0.08	0.08	0.54	0.83	0.00	74	74	71	1.19	0.3	252	0.019	113	113	98.1	1.50	1.12		116.46	182.85	175.85	67.19	183.65	702	80	84	71	0.000	1.001	9.322	1087
33	2.686	2.699	11.52953	0.08	0.08	0.54	0.83	0.00	74	74	71	1.18	0.3	252	0.019	113	113	96.3	1.80	1.10		118.04	184.92	177.75	67.31	185.36	702	79	84	71	0.000	1.001	9.156	1082
34																																		

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
57	4.640	4.661	19.91465	0.08	0.08	0.56	0.86	0.00	75	75	71	1.22	0.3	78	0.019	98	98	91.5	0.00	1.06		116.72	184.19	177.58	67.09	183.81	269	67	69	71	0.000	1.001	8.823	1031
58	4.721	4.743	20.26403	0.08	0.08	0.56	0.86	0.00	75	76	71	1.22	0.3	78	0.019	98	98	91.4	0.10	1.02		116.52	183.86	177.19	66.90	183.42	264	67	69	71	0.000	1.001	8.490	990
59	4.802	4.825	20.61341	0.08	0.08	0.56	0.84	0.00	75	76	71	1.23	0.3	78	0.019	98	98	91.4	0.00	1.04		115.94	183.52	177.19	67.12	183.06	260	67	69	71	0.000	1.001	8.657	1005
60	4.884	4.907	20.96279	0.08	0.08	0.50	0.83	0.00	75	76	71	1.25	0.4	78	0.019	98	98	91.3	0.10	1.09		115.64	183.19	176.52	67.15	182.79	256	67	69	71	0.000	1.001	9.073	1050
61	4.965	4.988	21.31217	0.08	0.08	0.51	0.82	0.00	75	76	71	1.25	0.4	77	0.019	98	98	91.3	0.00	1.10		115.19	182.79	176.46	67.22	182.40	252	67	69	71	0.000	1.001	9.156	1056
62	5.046	5.070	21.66155	0.08	0.08	0.51	0.83	0.00	75	76	71	1.25	0.4	77	0.019	98	98	91.3	0.00	1.00		114.92	182.46	176.29	67.25	182.17	248	67	69	71	0.000	1.001	8.324	958
63	5.128	5.152	22.01093	0.08	0.08	0.52	0.83	0.00	75	76	71	1.26	0.4	77	0.019	98	98	91.3	0.00	1.04		114.75	182.18	175.40	67.06	181.81	243	67	69	71	0.000	1.001	8.657	995
64	5.209	5.234	22.36031	0.08	0.08	0.52	0.82	0.00	75	76	71	1.25	0.4	77	0.019	98	98	91.2	0.10	1.08		114.13	181.79	175.17	67.15	181.29	240	67	69	71	0.000	1.001	8.990	1027
65	5.291	5.316	22.70969	0.08	0.08	0.52	0.84	0.00	75	76	71	1.25	0.4	77	0.019	98	98	91.2	0.00	1.04		114.09	181.45	175.12	67.03	181.12	236	67	69	71	0.000	1.001	8.657	989
66	5.372	5.397	23.05907	0.08	0.08	0.52	0.83	0.00	76	76	71	1.25	0.4	77	0.019	98	98	91.2	0.00	1.04		113.54	181.17	174.67	67.19	180.73	233	67	69	71	0.000	1.001	8.657	984
67	5.453	5.479	23.40845	0.08	0.08	0.52	0.84	0.00	76	76	71	1.25	0.4	76	0.019	98	98	91.2	0.00	1.12		113.18	180.72	174.28	67.22	180.40	230	68	69	71	0.000	1.001	9.322	1056
68	5.535	5.561	23.75783	0.08	0.08	0.55	0.84	0.00	76	76	71	1.24	0.4	76	0.019	98	98	91.2	0.00	1.00		112.72	180.50	174.11	67.22	179.94	226	68	69	71	0.000	1.001	8.324	939
69	5.616	5.643	24.10721	0.08	0.08	0.55	0.84	0.00	76	76	71	1.24	0.4	76	0.019	98	98	91.1	0.10	1.02		112.59	180.10	173.49	67.06	179.64	223	68	69	71	0.000	1.001	8.490	957
70	5.698	5.724	24.45659	0.08	0.08	0.56	0.85	0.00	76	76	71	1.24	0.4	76	0.019	98	98	91.1	0.00	1.08		112.13	179.66	172.99	67.15	179.28	220	68	69	71	0.000	1.001	8.990	1009
71	5.779	5.806	24.80597	0.08	0.08	0.56	0.83	0.00	76	76	71	1.24	0.4	76	0.019	98	98	91.1	0.00	1.08		111.80	179.38	172.88	67.15	178.95	217	68	69	71	0.000	1.001	8.990	1006
72	5.860	5.888	25.15535	0.08	0.08	0.57	0.83	0.00	76	76	71	1.24	0.4	76	0.019	98	98	91.1	0.00	1.10		111.21	178.98	172.32	67.12	178.33	214	68	69	71	0.000	1.001	9.156	1019
73	5.942	5.970	25.50473	0.08	0.08	0.55	0.85	0.00	76	76	71	1.25	0.4	76	0.019	98	98	91.0	0.10	1.12		111.08	178.59	171.92	67.09	178.17	211	68	68	71	0.000	1.001	9.323	1037
74	6.023	6.051	25.85411	0.08	0.08	0.56	0.84	0.00	76	76	71	1.25	0.4	76	0.019	98	98	91.0	0.00	1.10		110.59	178.31	171.76	67.12	177.71	208	68	68	71	0.000	1.001	9.156	1014
75	6.105	6.133	26.20349	0.08	0.08	0.55	0.85	0.00	76	76	71	1.25	0.4	76	0.019	98	98	91.0	0.00	1.10		110.23	177.92	171.20	67.15	177.38	205	68	68	71	0.000	1.001	9.156	1010
76	6.186	6.215	26.55287	0.08	0.08	0.56	0.86	0.00	76	76	71	1.25	0.4	76	0.019	98	98	91.0	0.00	1.06		109.93	177.53	171.03	67.12	177.05	203	68	68	71	0.000	1.001	8.823	971
77	6.267	6.297	26.90225	0.08	0.08	0.57	0.85	0.00	76	76	71	1.25	0.4	75	0.019	98	98	91.0	0.00	1.10		109.53	177.19	170.69	67.03	176.56	200	68	68	71	0.000	1.001	9.156	1004
78	6.349	6.379	27.25163	0.08	0.08	0.55	0.87	0.00	76	76	71	1.25	0.4	75	0.019	98	98	91.0	0.00	1.10		109.34	176.85	170.35	67.03	176.36	198	68	68	71	0.000	1.001	9.156	1002
79	6.430	6.460	27.60101	0.08	0.08	0.56	0.86	0.00	76	76	71	1.25	0.4	75	0.019	98	98	91.0	0.00	1.08		109.00	176.46	170.07	67.12	176.12	195	68	68	71	0.000	1.001	8.990	981
80	6.512	6.542	27.95039	0.08	0.08	0.56	0.87	0.00	76	76	72	1.25	0.4	75	0.019	98	98	90.9	0.10	1.10		108.67	176.13	169.57	67.06	175.73	193	68	68	72	0.000	1.001	9.156	996
81	6.593	6.624	28.29977	0.08	0.08	0.57	0.85	0.00	76	76	71	1.25	0.4	75	0.019	98	98	90.9	0.00	1.08		108.44	175.73	169.23	66.99	175.43	191	68	68	71	0.000	1.001	8.990	976
82	6.674	6.706	28.64915	0.08	0.08	0.57	0.85	0.00	76	76	71	1.25	0.4	75	0.019	98	98	90.9	0.00	1.08		108.08	175.40	168.95	67.09	175.17	189	68	68	71	0.000	1.001	8.990	973
83	6.756	6.787	28.99853	0.08	0.08	0.55	0.87	0.00	76	76	72	1.25	0.4	75	0.019	98	98	90.9	0.00	1.06		107.72	175.06	168.62	67.09	174.81	186	68	68	72	0.000	1.001	8.823	952
84	6.837	6.869	29.34791	0.08	0.08	0.56	0.86	0.00	76	76	71	1.25	0.4	75	0.019	98	98	90.9																

Elapsed Time	Particulate Sampling Data																Fuel Weight, lb		Flow, gpm		Temperature Data, oF								Stack		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	Specific Heat of Inlet Water (BTU/lb-°F)	Mass Flow Rate of Inlet Water (lb/min)
125	10.174	10.222	43.67248	0.08	0.08	0.56	0.84	0.00	77	78	72	1.26	0.5	74	0.019	98	98	90.6	0.00	1.26		92.81	160.33	153.94	67.06	159.87	138	71	69	72	0.000	1.001	10.488	975
126	10.256	10.304	44.02186	0.08	0.08	0.57	0.84	0.00	77	78	72	1.26	0.4	74	0.019	98	98	90.6	0.00	1.30		92.20	159.88	153.38	67.25	159.44	138	71	69	72	0.000	1.001	10.821	999
127	10.337	10.386	44.37124	0.08	0.08	0.57	0.85	0.00	77	78	72	1.26	0.4	74	0.019	98	98	90.6	0.00	1.35		92.00	159.60	153.21	67.15	159.15	137	71	69	72	0.000	1.001	11.237	1035
128	10.419	10.467	44.72062	0.08	0.08	0.55	0.84	0.00	77	78	72	1.26	0.4	74	0.019	98	98	90.6	0.00	1.30		91.54	159.32	152.87	67.25	158.79	137	71	69	72	0.000	1.001	10.821	992
129	10.500	10.549	45.07	0.08	0.08	0.57	0.85	0.00	77	78	72	1.26	0.4	74	0.019	98	98	90.6	0.00	1.32		91.05	158.87	152.42	67.38	158.43	137	71	69	72	0.000	1.001	10.987	1002
130	10.581	10.631	45.41938	0.08	0.08	0.56	0.85	0.00	77	78	72	1.26	0.4	74	0.019	98	98	90.6	0.00	1.30		90.65	158.53	152.03	67.41	158.05	134	71	69	72	0.000	1.001	10.820	982
131	10.663	10.713	45.76876	0.08	0.08	0.57	0.84	0.00	77	78	72	1.26	0.4	74	0.019	98	98	90.5	0.10	1.32		90.45	158.14	151.81	67.44	157.89	136	71	69	72	0.000	1.001	10.987	995
132	10.744	10.795	46.11814	0.08	0.08	0.56	0.84	0.00	77	78	72	1.26	0.4	74	0.019	98	98	90.5	0.00	1.32		90.02	157.80	151.47	67.47	157.50	135	71	69	72	0.000	1.001	10.987	990
133	10.826	10.876	46.46752	0.08	0.08	0.56	0.84	0.00	77	78	72	1.25	0.4	74	0.019	98	98	90.5	0.00	1.32		89.73	157.41	151.19	67.38	157.10	133	71	69	72	0.000	1.001	10.987	987
134	10.907	10.958	46.8169	0.08	0.08	0.57	0.82	0.00	77	78	72	1.26	0.4	74	0.019	98	98	90.5	0.00	1.32		89.33	157.08	150.86	67.44	156.77	133	71	69	72	0.000	1.001	10.987	983
135	10.988	11.040	47.16628	0.08	0.08	0.56	0.85	0.00	77	78	72	1.26	0.4	74	0.019	98	98	90.5	0.00	1.30		88.97	156.80	150.63	67.38	156.35	134	71	69	72	0.000	1.001	10.820	964
136	11.070	11.122	47.51566	0.08	0.08	0.57	0.84	0.00	77	78	72	1.26	0.4	74	0.019	98	98	90.5	0.00	1.32		88.65	156.35	150.13	67.47	156.12	133	71	69	72	0.000	1.001	10.987	975
137	11.151	11.203	47.86504	0.08	0.08	0.59	0.85	0.00	77	78	72	1.26	0.4	74	0.019	98	98	90.6	-0.10	1.32		88.32	156.07	149.85	67.38	155.69	133	72	69	72	0.000	1.001	10.987	971
138	11.233	11.285	48.21442	0.08	0.08	0.56	0.84	0.00	77	78	72	1.26	0.4	74	0.019	98	98	90.6	0.00	1.32		87.86	155.73	149.51	67.41	155.26	133	72	69	72	0.000	1.001	10.987	966
139	11.314	11.367	48.5638	0.08	0.08	0.56	0.85	0.00	77	78	72	1.26	0.4	74	0.019	98	98	90.5	0.10	1.28		87.66	155.34	149.12	67.34	155.00	132	72	69	72	0.000	1.001	10.654	935
140	11.395	11.449	48.91318	0.08	0.08	0.56	0.85	0.00	77	78	72	1.26	0.4	74	0.019	98	98	90.5	0.00	1.31		87.14	155.00	148.84	67.50	154.64	132	72	69	72	0.000	1.001	10.903	951
141	11.477	11.531	49.26256	0.08	0.08	0.57	0.84	0.00	78	78	72	1.26	0.4	74	0.019	98	98	90.5	0.00	1.30		87.00	154.67	148.56	67.31	154.31	132	72	70	72	0.000	1.001	10.821	942
142	11.558	11.612	49.61194	0.08	0.08	0.56	0.82	0.00	78	78	72	1.26	0.4	74	0.019	98	98	90.5	0.00	1.30		86.58	154.27	148.33	67.41	153.98	130	72	70	72	0.000	1.001	10.820	938
143	11.639	11.694	49.96132	0.08	0.08	0.56	0.84	0.00	78	78	72	1.26	0.4	74	0.019	98	98	90.5	0.00	1.28		86.28	153.99	148.11	67.41	153.69	130	72	70	72	0.000	1.001	10.654	920
144	11.721	11.776	50.3107	0.08	0.08	0.56	0.82	0.00	78	78	72	1.26	0.4	74	0.019	98	98	90.5	0.00	1.30		85.99	153.66	147.66	67.41	153.39	129	72	70	72	0.000	1.001	10.820	931
145	11.802	11.858	50.66008	0.08	0.08	0.56	0.85	0.00	78	78	72	1.26	0.4	74	0.019	98	98	90.5	0.00	1.30		85.53	153.38	147.44	67.44	152.97	128	72	70	72	0.000	1.001	10.820	926
146	11.884	11.939	51.00946	0.08	0.08	0.56	0.84	0.00	78	78	72	1.26	0.4	74	0.019	98	98	90.5	0.00	1.28		85.23	153.04	147.10	67.53	152.77	129	72	70	72	0.000	1.001	10.654	909
147	11.965	12.021	51.35884	0.08	0.08	0.57	0.85	0.00	78	78	72	1.26	0.4	74	0.019	98	98	90.5	0.00	1.30		84.75	152.65	146.77	67.63	152.37	128	72	70	72	0.000	1.001	10.820	918
148	12.046	12.103	51.70822	0.08	0.08	0.57	0.83	0.00	78	78	72	1.26	0.5	74	0.019	98	98	90.5	0.00	1.32		84.35	152.31	146.54	67.57	151.92	127	72	70	72	0.000	1.001	10.987	928
149	12.128	12.185	52.0576	0.08	0.08	0.56	0.84	0.00	78	78	72	1.26	0.4	74	0.019	98	98	90.5	0.00	1.26		83.96	152.03	146.21	67.66	151.62	126	72	70	72	0.000	1.001	10.487	882
150	12.209	12.267	52.40698	0.08	0.08	0.56	0.85	0.00	78	78	72	1.26	0.4	74	0.019	98	98	90.5	0.00	1.26		83.44	151.70	145.93	67.79	151.23	127	72	70	72	0.000	1.001	10.487	876
151	12.291	12.348	52.75636	0.08	0.08	0.56	0.84	0.00	78	78	72	1.26	0.4	74	0.019	98	98	90.5	0.00	1.30		83.17	151.36	145.65	67.73	150.90	126	72	70	72	0.000	1.001	10.820	901
152	12.372	12.430	53.10574	0.08	0.08	0.56	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				
193	15.709	15.783	67.43031	0.08	0.08	0.56	0.84	0.00	78	79	73	1.24	0.4	101	0.019	100	100	87.1	0.80	1.49		69.44	137.52	131.81	67.69	137.13	241	75	74	73	0.000	1.001	12.401	862	
194	15.791	15.865	67.77969	0.08	0.08	0.58	0.83	0.00	78	79	73	1.24	0.4	113	0.019	101	101	86.2	0.90	1.49		69.96	137.63	132.14	67.63	137.59	345	76	75	73	0.000	1.001	12.401	869	
195	15.872	15.947	68.12907	0.08	0.08	0.55	0.83	0.00	78	79	73	1.23	0.4	127	0.019	102	102	85.1	1.10	1.53		70.22	137.91	132.37	67.44	137.66	430	77	76	73	0.000	1.001	12.735	895	
196	15.953	16.028	68.47845	0.08	0.08	0.56	0.83	0.00	78	79	73	1.22	0.4	139	0.019	103	103	83.9	1.20	1.49		70.29	137.80	132.20	67.60	137.89	481	77	77	73	0.000	1.001	12.402	873	
197	16.035	16.110	68.82783	0.08	0.08	0.55	0.83	0.00	78	79	73	1.22	0.4	148	0.019	104	104	82.7	1.20	1.53		70.95	138.53	132.87	67.66	138.61	513	78	78	73	0.000	1.001	12.734	905	
198	16.116	16.192	69.17721	0.08	0.08	0.55	0.82	0.00	78	79	73	1.21	0.4	155	0.019	105	104	81.5	1.20	1.51		72.12	139.20	133.37	67.50	139.63	531	79	78	73	0.000	1.001	12.568	908	
199	16.198	16.274	69.52659	0.08	0.08	0.54	0.81	0.00	78	79	73	1.2	0.4	160	0.019	105	105	80.1	1.40	1.51		72.23	140.10	134.33	67.76	139.99	542	80	79	73	0.000	1.001	12.568	909	
200	16.279	16.355	69.87597	0.08	0.08	0.54	0.80	0.00	78	79	73	1.19	0.4	164	0.019	105	105	78.7	1.40	1.51		73.42	141.22	135.28	67.60	141.02	549	81	80	73	0.000	1.001	12.568	924	
201	16.360	16.437	70.22535	0.08	0.08	0.54	0.80	0.00	78	79	73	1.18	0.4	167	0.019	106	105	77.2	1.50	1.49		74.61	142.17	136.18	67.73	142.33	556	82	81	73	0.000	1.001	12.401	926	
202	16.442	16.519	70.57473	0.08	0.08	0.53	0.80	0.00	78	79	73	1.17	0.4	170	0.019	106	106	75.9	1.30	1.49		76.08	143.52	137.30	67.76	143.84	563	83	82	73	0.000	1.001	12.401	945	
203	16.523	16.601	70.92411	0.08	0.08	0.52	0.84	0.00	78	79	73	1.15	0.4	172	0.019	106	106	74.2	1.70	1.49		77.47	145.31	138.92	67.85	145.32	567	84	82	73	0.000	1.001	12.401	962	
204	16.605	16.683	71.27349	0.08	0.08	0.51	0.83	0.00	78	79	73	1.13	0.4	173	0.019	106	106	73.0	1.20	1.51		78.91	146.49	140.04	67.76	146.66	570	84	83	73	0.000	1.001	12.568	993	
205	16.686	16.764	71.62287	0.08	0.08	0.51	0.84	0.00	78	79	73	1.12	0.4	175	0.019	106	106	71.4	1.60	1.53		80.55	148.00	141.44	67.88	148.44	574	84	82	73	0.000	1.001	12.734	1027	
206	16.767	16.846	71.97225	0.08	0.08	0.54	0.83	0.00	78	79	73	1.03	0.4	176	0.019	106	106	70.0	1.40	1.47		81.93	149.23	142.51	67.79	149.72	576	82	80	73	0.000	1.001	12.235	1004	
207	16.849	16.928	72.32163	0.08	0.08	0.54	0.84	0.00	78	79	73	0.95	0.4	177	0.019	107	106	68.6	1.40	1.45		83.44	150.91	144.13	67.85	151.29	578	80	78	73	0.000	1.001	12.068	1008	
208	16.930	17.010	72.67101	0.08	0.08	0.48	0.83	0.00	79	79	73	0.71	0.4	178	0.019	106	106	67.2	1.40	1.51		85.31	152.37	145.59	67.73	153.03	582	80	78	73	0.000	1.001	12.568	1073	
209	17.012	17.091	73.02039	0.08	0.08	0.01	0.81	0.00	78	79	73	1.63	0.3	179	0.019	107	106	65.8	1.40	1.39		86.59	153.66	147.05	67.79	154.38	583	77	78	73	0.000	1.001	11.569	1003	
210	17.093	17.173	73.36977	0.08	0.08	0.29	0.78	0.00	78	79	73	1.37	0.3	179	0.019	107	106	64.5	1.30	1.49		87.77	155.56	148.50	67.85	155.62	586	74	77	73	0.000	1.001	12.401	1090	
211	17.174	17.255	73.71915	0.08	0.08	0.55	0.81	0.00	78	79	73	1.22	0.3	179	0.019	107	106	63.0	1.50	1.49		89.32	157.08	149.74	67.85	157.17	587	79	77	73	0.000	1.001	12.401	1109	
212	17.256	17.337	74.06853	0.08	0.08	0.54	0.82	0.00	79	79	74	1.22	0.3	180	0.019	107	107	61.8	1.20	1.51		90.99	158.53	151.19	68.10	159.08	588	78	78	74	0.000	1.001	12.567	1145	
213	17.337	17.419	74.41791	0.08	0.08	0.54	0.80	0.00	79	79	74	1.21	0.3	180	0.019	107	107	60.5	1.30	1.45		92.10	160.10	152.76	68.00	160.10	590	78	78	74	0.000	1.001	12.068	1113	
214	17.419	17.500	74.76729	0.08	0.08	0.54	0.81	0.00	79	79	73	1.21	0.3	181	0.019	107	107	59.3	1.20	1.47		94.06	161.33	153.66	67.88	161.94	592	78	78	73	0.000	1.001	12.235	1152	
215	17.500	17.582	75.11667	0.08	0.08	0.53	0.68	0.00	79	79	74	1.2	0.1	181	0.019	107	107	58.0	1.30	1.59		95.50	162.90	155.00	67.88	163.38	593	78	78	74	0.000	1.001	13.233	1265	
216	17.581	17.664	75.46605	0.08	0.08	0.53	0.81	0.00	79	79	74	1.2	-0.6	181	0.019	107	107	56.8	1.20	1.41		96.54	164.25	156.91	68.13	164.66	593	78	78	74	0.000	1.001	11.735	1134	
217	17.663	17.746	75.81543	0.08	0.08	0.53	0.82	0.00	79	79	73	1.19	-1.1	181	0.019	107	107	55.6	1.20	1.34		98.14	166.04	158.98	68.06	166.21	594	78	78	73	0.000	1.001	11.152	1096	
218	17.744	17.827	76.16481	0.08	0.08	0.53	0.77	0.00	79	79	74	1.19	-1.6	181	0.019	107	107	54.4	1.20	1.28		99.82	167.33	160.38	68.10	167.91	595	78	78	74	0.000	1.001	10.653	1065	
219	17.826	17.909	76.51419	0.08	0.08	0.52	0.03	0.00	79	79	73	1.18	1	181	0.019	107	107	53.0	1.40	1.24		101.17	168.84	161.84	68.16	169.32	596	78	3218	73	0.000	1.001	10.320	1045	

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			
261	21.244	21.344	91.18814	0.08	0.08	0.56	0.84	0.00	80	80	74	1.21	0.3	79	0.019	98	98	37.5	0.00	1.00		115.38	184.59	178.37	68.79	184.17	227	69	68	74	0.000	1.001	8.322	961
262	21.325	21.426	91.53752	0.08	0.08	0.56	0.86	0.00	80	80	74	1.22	0.3	79	0.019	98	98	37.5	0.00	1.00		115.12	184.36	178.09	68.76	183.88	224	68	68	74	0.000	1.001	8.322	959
263	21.407	21.507	91.8869	0.08	0.08	0.56	0.87	0.00	80	80	74	1.22	0.3	79	0.019	98	98	37.4	0.10	0.98		114.66	184.08	177.81	68.83	183.48	221	68	68	74	0.000	1.001	8.155	936
264	21.488	21.589	92.23628	0.08	0.08	0.56	0.86	0.00	80	80	74	1.22	0.3	79	0.019	98	98	37.5	-0.10	1.02		114.46	183.63	177.53	68.70	183.16	218	68	68	74	0.000	1.001	8.488	973
265	21.570	21.671	92.58566	0.08	0.08	0.56	0.86	0.00	80	80	74	1.22	0.3	79	0.019	98	98	37.4	0.10	1.00		113.91	183.24	177.08	68.89	182.79	215	68	68	74	0.000	1.001	8.322	949
266	21.651	21.753	92.93504	0.08	0.08	0.57	0.87	0.00	80	80	74	1.22	0.3	78	0.019	98	98	37.4	0.00	1.00		113.45	183.02	176.85	69.02	182.47	212	68	68	74	0.000	1.001	8.321	945
267	21.732	21.834	93.28442	0.08	0.08	0.56	0.86	0.00	80	80	74	1.22	0.3	78	0.019	98	98	37.4	0.00	0.96		113.18	182.74	176.63	68.92	182.11	210	68	68	74	0.000	1.001	7.989	905
268	21.814	21.916	93.6338	0.08	0.08	0.56	0.87	0.00	80	80	74	1.22	0.3	78	0.019	98	98	37.4	0.00	0.75		112.82	182.40	177.53	68.92	181.74	207	68	68	74	0.000	1.001	6.241	705
269	21.895	21.998	93.98318	0.08	0.08	0.58	0.86	0.00	80	80	74	1.22	0.3	78	0.019	98	98	37.4	0.00	1.00		112.60	182.01	175.90	68.99	181.58	204	68	68	74	0.000	1.001	8.322	938
270	21.977	22.080	94.33256	0.08	0.08	0.56	0.87	0.00	80	80	74	1.22	0.3	78	0.019	98	98	37.4	0.00	0.98		112.23	181.67	175.73	68.95	181.19	202	68	68	74	0.000	1.001	8.155	916
271	22.058	22.162	94.68194	0.08	0.08	0.56	0.89	0.00	80	80	74	1.22	0.3	78	0.019	98	98	37.4	0.00	0.96		111.97	181.39	175.34	69.02	180.99	199	68	68	74	0.000	1.001	7.989	896
272	22.139	22.243	95.03132	0.08	0.08	0.56	0.81	0.00	80	80	74	1.22	0.3	78	0.019	98	98	37.4	0.00	0.99		111.51	181.06	175.23	68.99	180.50	197	68	68	74	0.000	1.001	8.238	920
273	22.221	22.325	95.3807	0.08	0.08	0.58	0.81	0.00	80	80	74	1.22	0.3	78	0.019	98	98	37.4	0.00	1.00		111.25	180.83	174.73	69.05	180.30	195	68	68	74	0.000	1.001	8.321	927
274	22.302	22.407	95.73008	0.08	0.08	0.56	0.81	0.00	80	80	74	1.22	0.3	78	0.019	98	98	37.4	0.00	0.98		110.83	180.44	174.39	69.05	179.87	193	68	68	74	0.000	1.001	8.155	905
275	22.384	22.489	96.07946	0.08	0.08	0.57	0.81	0.00	80	80	74	1.22	0.3	78	0.019	98	98	37.3	0.10	0.96		110.60	180.22	174.22	69.05	179.64	191	68	68	74	0.000	1.001	7.989	885
276	22.465	22.570	96.42884	0.08	0.08	0.58	0.82	0.00	80	80	74	1.22	0.3	78	0.019	98	98	37.4	-0.10	0.98		110.04	179.77	173.88	69.11	179.15	189	68	68	74	0.000	1.001	8.155	898
277	22.546	22.652	96.77822	0.08	0.08	0.57	0.81	0.00	80	80	74	1.22	0.3	78	0.019	98	98	37.3	0.10	0.91		109.87	179.43	173.88	69.02	178.89	187	68	68	74	0.000	1.001	7.573	833
278	22.628	22.734	97.1276	0.08	0.08	0.56	0.80	0.00	80	80	74	1.22	0.3	78	0.019	98	98	37.4	-0.10	0.98		109.49	179.15	173.38	69.21	178.69	185	68	68	74	0.000	1.001	8.155	894
279	22.709	22.816	97.47698	0.08	0.08	0.57	0.82	0.00	80	80	74	1.22	0.3	78	0.019	98	98	37.3	0.10	0.94		109.09	178.82	173.21	69.11	178.20	183	67	68	74	0.000	1.001	7.822	854
280	22.791	22.898	97.82636	0.08	0.08	0.56	0.87	0.00	80	80	74	1.22	0.3	77	0.019	97	97	37.3	0.00	0.98		108.92	178.48	172.82	69.08	178.00	181	67	68	74	0.000	1.001	8.155	889
281	22.872	22.979	98.17574	0.08	0.08	0.56	0.88	0.00	80	80	74	1.22	0.3	77	0.019	97	97	37.3	0.00	0.95		108.72	178.26	172.54	69.02	177.74	180	67	68	74	0.000	1.001	7.905	861
282	22.953	23.061	98.52512	0.08	0.08	0.57	0.88	0.00	80	80	74	1.23	0.3	77	0.019	97	97	37.3	0.00	0.96		108.46	177.92	172.15	68.95	177.41	178	67	68	74	0.000	1.001	7.989	867
283	23.035	23.143	98.8745	0.08	0.08	0.57	0.89	0.00	80	80	74	1.22	0.3	77	0.019	97	97	37.3	0.00	0.96		108.13	177.53	171.87	68.99	177.12	176	67	68	74	0.000	1.001	7.989	865
284	23.116	23.225	99.22388	0.08	0.08	0.57	0.88	0.00	80	80	74	1.23	0.3	77	0.019	97	97	37.3	0.00	0.96		107.58	177.19	171.36	69.05	176.62	174	67	68	74	0.000	1.001	7.989	860
285	23.198	23.306	99.57326	0.08	0.08	0.59	0.84	0.00	80	80	74	1.23	0.3	77	0.019	97	97	37.3	0.00	0.92		107.47	176.97	171.36	68.92	176.39	173	67	68	74	0.000	1.001	7.656	824
286	23.279	23.388	99.92264	0.08	0.08	0.56	0.84	0.00	80	80	74	1.23	0.3	77	0.019	97	97	37.3	0.00	0.96		107.18	176.63	170.92	68.86	176.03	171	67	68	74	0.000	1.001	7.989	857
287	23.360	23.470	100.272	0.08	0.08	0.57	0.84	0.00	80	80	74	1.23	0.3	77	0.019	97	97	37.3	0.00	0.96		107.03	176.29	170.58	68.86	175.89	170	67	68	74	0.000	1.001	7.989	856
288	23.442	23.552	100.6214	0.08	0.08	0.57	0.84	0.00	80	80																								

Elapsed Time	Particulate Sampling Data																Fuel Weight, lb		Flow, gpm		Temperature Data, oF								Stack		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	Specific Heat of Inlet Water (BTU/lb-°F)	Mass Flow Rate of Inlet Water (lb/min)
329	26.779	26.905	114.946	0.08	0.08	0.56	0.87	0.00	80	80	74	1.25	0.4	76	0.019	97	97	37.3	0.00	1.28		91.56	160.41	154.19	67.85	159.41	128	68	69	74	0.000	1.001	10.653	977
330	26.860	26.986	115.2953	0.08	0.08	0.56	0.86	0.00	80	80	75	1.25	0.4	76	0.019	97	97	37.3	0.00	1.23		91.43	160.02	153.77	67.79	159.21	126	68	69	75	0.000	1.001	10.237	937
331	26.942	27.068	115.6447	0.08	0.08	0.55	0.87	0.00	80	80	74	1.25	0.4	76	0.019	97	97	37.3	0.00	1.26		90.93	159.60	153.49	67.79	158.72	126	68	69	74	0.000	1.001	10.487	955
332	27.023	27.150	115.9941	0.08	0.08	0.56	0.87	0.00	80	80	75	1.24	0.4	76	0.019	97	97	37.3	0.00	1.25		90.57	159.32	153.15	67.79	158.36	125	68	69	75	0.000	1.001	10.404	943
333	27.105	27.232	116.3435	0.08	0.08	0.55	0.87	0.00	80	80	75	1.24	0.4	76	0.019	97	97	37.3	0.00	1.25		90.31	158.95	152.82	67.69	158.00	125	68	69	75	0.000	1.001	10.404	941
334	27.186	27.314	116.6929	0.08	0.08	0.56	0.87	0.00	80	80	74	1.25	0.4	76	0.019	97	97	37.3	0.00	1.26		90.03	158.59	152.40	67.76	157.79	124	68	69	74	0.000	1.001	10.487	945
335	27.267	27.395	117.0422	0.08	0.08	0.56	0.85	0.00	80	80	75	1.24	0.4	76	0.019	97	97	37.3	0.00	1.26		89.67	158.20	152.17	67.79	157.46	124	69	69	75	0.000	1.001	10.487	941
336	27.349	27.477	117.3916	0.08	0.08	0.55	0.87	0.00	80	80	74	1.25	0.4	76	0.019	97	97	37.3	0.00	1.24		89.44	157.86	151.72	67.73	157.17	124	69	69	74	0.000	1.001	10.321	924
337	27.430	27.559	117.741	0.08	0.08	0.56	0.87	0.00	80	80	74	1.25	0.4	76	0.019	97	97	37.3	0.00	1.23		89.21	157.47	151.53	67.60	156.81	124	69	69	74	0.000	1.001	10.237	914
338	27.512	27.641	118.0904	0.08	0.08	0.56	0.87	0.00	80	80	74	1.25	0.4	76	0.019	97	97	37.3	0.00	1.27		88.91	157.16	151.25	67.60	156.51	123	69	69	74	0.000	1.001	10.570	941
339	27.593	27.722	118.4398	0.08	0.08	0.56	0.87	0.00	80	80	74	1.24	0.4	76	0.019	97	97	37.3	0.00	1.25		88.42	156.77	150.80	67.60	156.02	123	69	69	74	0.000	1.001	10.404	921
340	27.674	27.804	118.7891	0.08	0.08	0.57	0.87	0.00	80	80	74	1.24	0.4	76	0.019	97	97	37.3	0.00	1.25		88.07	156.43	150.46	67.79	155.85	122	69	69	74	0.000	1.001	10.404	917
341	27.756	27.886	119.1385	0.08	0.08	0.56	0.87	0.00	80	80	74	1.25	0.4	76	0.019	97	97	37.4	-0.10	1.24		87.90	156.09	150.21	67.76	155.66	122	69	69	74	0.000	1.001	10.320	908
342	27.837	27.968	119.4879	0.08	0.08	0.57	0.88	0.00	80	80	75	1.25	0.4	76	0.019	97	97	37.3	0.10	1.25		87.21	155.73	149.85	67.76	154.97	122	69	69	75	0.000	1.001	10.404	908
343	27.918	28.050	119.8373	0.08	0.08	0.56	0.87	0.00	80	80	74	1.25	0.4	76	0.019	97	97	37.3	0.00	1.27		86.91	155.37	149.46	67.66	154.57	122	69	69	74	0.000	1.001	10.570	920
344	28.000	28.131	120.1867	0.08	0.08	0.56	0.87	0.00	80	80	74	1.24	0.4	76	0.019	97	97	37.3	0.00	1.27		86.75	155.06	149.18	67.73	154.48	121	69	69	74	0.000	1.001	10.570	918
345	28.081	28.213	120.536	0.08	0.08	0.56	0.87	0.00	80	80	74	1.25	0.4	76	0.019	97	97	37.3	0.00	1.29		86.42	154.72	148.84	67.63	154.05	120	69	69	74	0.000	1.001	10.737	929
346	28.163	28.295	120.8854	0.08	0.08	0.56	0.88	0.00	80	80	75	1.25	0.4	76	0.019	97	97	37.3	0.00	1.26		86.06	154.36	148.59	67.66	153.72	120	69	69	75	0.000	1.001	10.487	904
347	28.244	28.377	121.2348	0.08	0.08	0.57	0.87	0.00	80	80	75	1.24	0.4	76	0.019	97	97	37.3	0.00	1.22		85.67	154.02	148.19	67.69	153.36	119	69	69	75	0.000	1.001	10.154	871
348	28.325	28.458	121.5842	0.08	0.08	0.55	0.86	0.00	80	80	75	1.25	0.4	76	0.019	97	97	37.3	0.00	1.25		85.31	153.63	147.94	67.76	153.06	119	69	69	75	0.000	1.001	10.404	889
349	28.407	28.540	121.9336	0.08	0.08	0.56	0.87	0.00	80	80	74	1.25	0.4	76	0.019	97	97	37.4	-0.10	1.26		84.95	153.35	147.61	67.76	152.70	119	69	69	74	0.000	1.001	10.487	892
350	28.488	28.622	122.2829	0.08	0.08	0.56	0.87	0.00	80	80	74	1.24	0.4	76	0.019	97	97	37.3	0.10	1.25		84.58	153.01	147.27	67.66	152.24	119	69	69	74	0.000	1.001	10.404	881
351	28.570	28.704	122.6323	0.08	0.08	0.56	0.87	0.00	80	80	74	1.25	0.4	76	0.019	97	97	37.3	0.00	1.24		84.58	152.65	146.99	67.53	152.11	119	69	69	74	0.000	1.001	10.321	874
352	28.651	28.786	122.9817	0.08	0.08	0.56	0.87	0.00	80	80	75	1.25	0.4	76	0.019	97	97	37.4	-0.10	1.29		84.02	152.31	146.63	67.66	151.69	118	69	69	75	0.000	1.001	10.737	903
353	28.732	28.867	123.3311	0.08	0.08	0.56	0.88	0.00	80	80	75	1.24	0.4	76	0.019	97	97	37.4	0.00	1.26		83.63	151.92	146.29	67.63	151.26	118	69	69	75	0.000	1.001	10.487	878
354	28.814	28.949	123.6805	0.08	0.08	0.57	0.86	0.00	80	80	74	1.25	0.4	76	0.019	97	97	37.4	0.00	1.28		83.21	151.70	146.09	67.73	150.93	117	69	69	74	0.000	1.001	10.653	887
355	28.895	29.031	124.0298	0.08	0.08	0.56	0.87	0.00	80	80	74	1.25	0.4	76	0.019	97	97	37.3	0.10	1.25		83.10	151.33	145.70	67.50	150.60	117	69	69	74	0.000	1.001	10.404	866
356	28.977	29.113	124.3792	0.08	0.08	0.56																												

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				
397	32.314	32.465	138.7038	0.08	0.08	0.57	0.88	0.00	80	80	74	1.24	0.4	107	0.019	100	100	36.0	0.20	1.42		70.81	138.42	132.95	67.57	138.38	270	71	71	74	0.000	1.001	11.819	838	
398	32.395	32.547	139.0532	0.08	0.08	0.56	0.88	0.00	80	80	74	1.24	0.4	111	0.019	100	100	35.7	0.30	1.42		71.14	138.56	133.18	67.44	138.58	296	71	71	74	0.000	1.001	11.819	842	
399	32.477	32.629	139.4026	0.08	0.08	0.56	0.88	0.00	80	80	74	1.24	0.4	115	0.019	101	101	35.4	0.30	1.42		71.27	138.81	133.32	67.34	138.61	320	71	72	74	0.000	1.001	11.819	843	
400	32.558	32.711	139.7519	0.08	0.08	0.56	0.87	0.00	80	80	74	1.24	0.4	119	0.019	101	101	35.1	0.30	1.43		71.17	138.98	133.60	67.47	138.64	338	71	72	74	0.000	1.001	11.902	848	
401	32.639	32.793	140.1013	0.08	0.08	0.56	0.88	0.00	80	80	74	1.24	0.4	122	0.019	101	101	34.9	0.20	1.41		71.70	138.92	133.46	67.50	139.20	352	71	72	74	0.000	1.001	11.736	842	
402	32.721	32.874	140.4507	0.08	0.08	0.56	0.87	0.00	80	80	74	1.24	0.4	124	0.019	102	102	34.6	0.30	1.45		72.32	139.31	133.82	67.53	139.86	361	71	72	74	0.000	1.001	12.069	874	
403	32.802	32.956	140.8001	0.08	0.08	0.56	0.89	0.00	80	80	74	1.24	0.4	125	0.019	102	102	34.3	0.30	1.43		72.52	139.87	134.33	67.50	140.02	368	71	72	74	0.000	1.001	11.902	864	
404	32.884	33.038	141.1495	0.08	0.08	0.56	0.87	0.00	80	80	74	1.24	0.4	126	0.019	102	102	34.1	0.20	1.45		72.86	140.24	134.69	67.50	140.36	367	72	72	74	0.000	1.001	12.069	880	
405	32.965	33.120	141.4988	0.08	0.08	0.56	0.87	0.00	80	80	74	1.24	0.4	127	0.019	102	102	33.9	0.20	1.42		73.29	140.74	135.11	67.57	140.85	367	72	73	74	0.000	1.001	11.819	867	
406	33.046	33.201	141.8482	0.08	0.08	0.56	0.88	0.00	80	80	74	1.24	0.4	128	0.019	102	102	33.5	0.40	1.46		73.68	141.27	135.59	67.63	141.31	371	72	73	74	0.000	1.001	12.152	896	
407	33.128	33.283	142.1976	0.08	0.08	0.56	0.88	0.00	80	80	74	1.24	0.4	129	0.019	102	102	33.1	0.40	1.44		74.43	141.64	136.04	67.41	141.84	379	72	73	74	0.000	1.001	11.986	893	
408	33.209	33.365	142.547	0.08	0.08	0.56	0.88	0.00	80	80	74	1.24	0.4	130	0.019	102	102	32.8	0.30	1.41		74.79	142.17	136.46	67.47	142.27	384	72	73	74	0.000	1.001	11.736	879	
409	33.291	33.447	142.8964	0.08	0.08	0.56	0.87	0.00	80	80	74	1.24	0.4	131	0.019	102	102	32.4	0.40	1.48		75.26	142.65	136.79	67.50	142.76	389	72	73	74	0.000	1.001	12.318	928	
410	33.372	33.529	143.2457	0.08	0.08	0.56	0.88	0.00	80	80	74	1.24	0.4	132	0.019	102	102	32.1	0.30	1.48		75.82	143.04	137.13	67.66	143.48	393	72	73	74	0.000	1.001	12.318	935	
411	33.453	33.610	143.5951	0.08	0.08	0.56	0.88	0.00	80	80	74	1.24	0.4	133	0.019	102	102	31.8	0.30	1.47		76.27	143.82	137.86	67.53	143.81	397	73	73	74	0.000	1.001	12.235	934	
412	33.535	33.692	143.9445	0.08	0.08	0.56	0.88	0.00	80	80	74	1.24	0.4	134	0.019	102	102	31.4	0.40	1.46		77.03	144.16	138.16	67.50	144.53	400	73	74	74	0.000	1.001	12.152	937	
413	33.616	33.774	144.2939	0.08	0.08	0.56	0.87	0.00	80	80	74	1.24	0.4	145	0.019	103	103	31.1	0.30	1.48		77.68	144.86	138.87	67.38	145.06	412	73	74	74	0.000	1.001	12.319	958	
414	33.698	33.856	144.6433	0.08	0.08	0.56	0.87	0.00	80	80	74	1.24	0.4	162	0.019	105	105	30.5	0.60	1.47		78.34	145.45	139.34	67.57	145.91	425	73	74	74	0.000	1.001	12.235	960	
415	33.779	33.937	144.9926	0.08	0.08	0.55	0.87	0.00	80	80	74	1.23	0.4	171	0.019	106	106	29.9	0.60	1.48		79.03	146.04	139.90	67.50	146.53	436	73	74	74	0.000	1.001	12.318	975	
416	33.860	34.019	145.342	0.08	0.08	0.56	0.88	0.00	80	80	74	1.24	0.4	178	0.019	106	106	29.4	0.50	1.46		79.62	146.68	140.46	67.44	147.06	455	74	75	74	0.000	1.001	12.152	969	
417	33.942	34.101	145.6914	0.08	0.08	0.56	0.87	0.00	80	80	74	1.23	0.4	183	0.019	107	107	28.7	0.70	1.42		80.31	147.21	141.16	67.63	147.94	473	74	75	74	0.000	1.001	11.819	950	
418	34.023	34.183	146.0408	0.08	0.08	0.55	0.86	0.00	80	80	74	1.23	0.4	188	0.019	107	107	28.1	0.60	1.44		81.33	148.17	141.89	67.60	148.93	489	75	75	74	0.000	1.001	11.985	976	
419	34.105	34.265	146.3902	0.08	0.08	0.56	0.87	0.00	80	80	74	1.23	0.4	192	0.019	107	107	27.4	0.70	1.47		82.29	149.06	142.79	67.76	150.04	503	75	76	74	0.000	1.001	12.235	1008	
420	34.186	34.346	146.7395	0.08	0.08	0.56	0.87	0.00	80	80	74	1.23	0.4	196	0.019	108	108	26.7	0.70	1.45		83.47	150.07	143.68	67.79	151.26	513	75	76	74	0.000	1.001	12.068	1009	
421	34.267	34.428	147.0889	0.08	0.08	0.55	0.87	0.00	80	80	74	1.23	0.4	198	0.019	108	108	26.0	0.70	1.43		84.75	151.33	144.78	67.69	152.44	524	76	77	74	0.000	1.001	11.902	1010	
422	34.349	34.510	147.4383	0.08	0.08	0.56	0.87	0.00	80	80	74	1.23	0.4	201	0.019	108	108	25.3	0.70	1.50		85.83	152.40	145.84	67.73	153.56	531	76	77	74	0.000	1.001	12.485	1073	
423	34.430	34.592	147.7877	0.08	0.08	0.55	0.88	0.00	80	80	74	1.23	0.4	203	0.019	108	108	24.6	0.70	1.47		86.95	153.60	146.96	67.82	154.77	538	77	77	74	0.000	1.001	12.235	1065	
424																																			

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
465	37.849	38.026	162.4616	0.08	0.08	0.56	0.86	0.00	80	80	73	1.24	0.4	80	0.019	98	98	7.1	-0.10	0.94		119.16	188.68	182.77	68.83	187.98	327	74	74	73	0.000	1.001	7.822	933
466	37.930	38.108	162.811	0.08	0.08	0.56	0.87	0.00	80	80	73	1.24	0.4	80	0.019	98	98	7.1	0.00	0.95		118.99	188.48	182.40	68.76	187.75	321	74	74	73	0.000	1.001	7.906	942
467	38.011	38.190	163.1604	0.08	0.08	0.55	0.87	0.00	80	80	73	1.24	0.4	80	0.019	98	98	7.1	0.00	0.96		118.96	188.31	182.35	68.76	187.72	315	73	74	73	0.000	1.001	7.989	951
468	38.093	38.272	163.5098	0.08	0.08	0.55	0.88	0.00	80	79	73	1.24	0.4	79	0.019	98	98	7.1	0.00	0.92		118.59	188.00	182.07	68.73	187.32	309	73	74	73	0.000	1.001	7.656	909
469	38.174	38.353	163.8591	0.08	0.08	0.56	0.87	0.00	80	79	73	1.24	0.4	79	0.019	98	98	7.1	0.00	0.97		118.43	187.78	181.90	68.70	187.13	303	73	74	73	0.000	1.001	8.072	957
470	38.256	38.435	164.2085	0.08	0.08	0.55	0.87	0.00	80	79	73	1.24	0.4	79	0.019	98	98	7.1	0.00	0.95		118.10	187.58	181.53	68.76	186.87	298	73	74	73	0.000	1.001	7.906	935
471	38.337	38.517	164.5579	0.08	0.08	0.56	0.87	0.00	80	79	73	1.24	0.4	79	0.019	98	98	7.1	0.00	0.94		117.97	187.36	181.36	68.73	186.70	292	73	73	73	0.000	1.001	7.823	924
472	38.418	38.599	164.9073	0.08	0.08	0.56	0.87	0.00	79	79	73	1.24	0.4	79	0.019	98	98	7.1	0.00	0.95		117.48	187.14	181.08	68.83	186.31	287	72	73	73	0.000	1.001	7.906	930
473	38.500	38.681	165.2567	0.08	0.08	0.56	0.87	0.00	80	79	73	1.24	0.4	78	0.019	98	98	7.1	0.00	0.97		117.41	186.80	180.86	68.76	186.18	282	72	73	73	0.000	1.001	8.072	949
474	38.581	38.762	165.606	0.08	0.08	0.56	0.86	0.00	79	79	73	1.24	0.4	78	0.019	98	98	7.2	-0.10	0.93		117.11	186.52	180.72	68.64	185.75	277	72	73	73	0.000	1.001	7.739	907
475	38.663	38.844	165.9554	0.08	0.08	0.56	0.86	0.00	79	79	73	1.24	0.4	78	0.019	98	98	7.1	0.10	0.96		116.59	186.24	180.19	68.83	185.42	273	72	73	73	0.000	1.001	7.989	933
476	38.744	38.926	166.3048	0.08	0.08	0.56	0.87	0.00	79	79	73	1.24	0.4	78	0.019	98	98	7.1	0.00	0.94		116.40	186.02	179.99	68.83	185.22	268	72	73	73	0.000	1.001	7.822	912
477	38.825	39.008	166.6542	0.08	0.08	0.56	0.87	0.00	79	79	73	1.24	0.4	78	0.019	98	98	7.2	-0.10	0.95		116.13	185.74	179.82	68.73	184.86	263	72	73	73	0.000	1.001	7.906	919
478	38.907	39.089	167.0036	0.08	0.08	0.56	0.86	0.00	79	79	73	1.24	0.4	78	0.019	98	98	7.2	0.00	0.94		116.13	185.40	179.52	68.70	184.83	259	72	73	73	0.000	1.001	7.823	909
479	38.988	39.171	167.3529	0.08	0.08	0.56	0.87	0.00	79	79	73	1.24	0.4	77	0.019	98	98	7.2	0.00	0.95		115.48	185.18	179.38	68.95	184.44	255	72	73	73	0.000	1.001	7.905	914
480	39.070	39.253	167.7023	0.08	0.08	0.55	0.87	0.00	79	79	73	1.24	0.4	77	0.019	98	98	7.2	0.00	0.97		115.25	184.95	179.04	68.86	184.11	251	71	72	73	0.000	1.001	8.072	931
481	39.151	39.335	168.0517	0.08	0.08	0.56	0.88	0.00	79	79	73	1.24	0.4	77	0.019	98	98	7.3	-0.10	0.94		114.95	184.59	178.73	68.86	183.81	247	71	72	73	0.000	1.001	7.822	900
482	39.232	39.417	168.4011	0.08	0.08	0.56	0.87	0.00	79	79	73	1.24	0.4	77	0.019	98	98	7.3	0.00	0.97		114.76	184.31	178.54	68.79	183.55	243	71	72	73	0.000	1.001	8.072	927
483	39.314	39.498	168.7505	0.08	0.08	0.56	0.86	0.00	79	79	73	1.24	0.4	77	0.019	98	98	7.3	0.00	0.93		114.36	184.03	178.26	68.86	183.22	239	71	72	73	0.000	1.001	7.739	886
484	39.395	39.580	169.0998	0.08	0.08	0.56	0.87	0.00	79	79	73	1.24	0.4	77	0.019	98	98	7.3	0.00	0.98		114.30	183.77	177.98	68.76	183.06	235	71	72	73	0.000	1.001	8.155	933
485	39.477	39.662	169.4492	0.08	0.08	0.55	0.86	0.00	79	79	73	1.24	0.4	77	0.019	98	98	7.3	0.00	0.95		113.91	183.49	177.75	68.92	182.83	232	71	72	73	0.000	1.001	7.906	902
486	39.558	39.744	169.7986	0.08	0.08	0.57	0.87	0.00	79	79	73	1.24	0.4	77	0.019	98	98	7.3	0.00	0.94		113.58	183.19	177.47	68.92	182.50	228	71	72	73	0.000	1.001	7.822	889
487	39.639	39.825	170.148	0.08	0.08	0.56	0.87	0.00	79	79	73	1.24	0.4	77	0.019	98	98	7.3	0.00	0.93		113.12	182.96	177.36	68.95	182.07	225	71	72	73	0.000	1.001	7.739	876
488	39.721	39.907	170.4974	0.08	0.08	0.56	0.87	0.00	79	79	73	1.24	0.4	76	0.019	98	98	7.4	-0.10	0.96		112.82	182.68	176.99	68.92	181.74	222	71	72	73	0.000	1.001	7.989	902
489	39.802	39.989	170.8467	0.08	0.08	0.57	0.87	0.00	79	79	73	1.24	0.4	76	0.019	98	98	7.3	0.10	0.94		112.59	182.32	176.63	68.86	181.45	218	71	72	73	0.000	1.001	7.822	882
490	39.884	40.071	171.1961	0.08	0.08	0.56	0.88	0.00	79	79	73	1.24	0.4	76	0.019	98	98	7.3	0.00	0.96		112.33	182.07	176.38	68.89	181.22	215	71	72	73	0.000	1.001	7.989	898
491	39.965	40.153	171.5455	0.08	0.08	0.56	0.86	0.00	79	79	73	1.24	0.4	76	0.019	98	98	7.4	-0.10	0.96		112.04	181.73	176.18	68.99	181.02	212	70	72	73	0.000	1.001	7.989	896
492	40.046	40.234	171.8949	0.08	0.08	0.56	0.87	0.00	79	79	73	1.24	0.4																					

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
533	43.384	43.587	186.2195	0.08	0.08	0.56	0.87	0.00	79	78	72	1.24	0.4	74	0.019	97	98	7.7	0.10	0.92		102.08	170.16	165.34	67.41	169.49	139	69	70	72	0.000	1.001	7.658	783
534	43.465	43.669	186.5688	0.08	0.08	0.56	0.87	0.00	79	78	72	1.24	0.4	74	0.019	97	98	7.8	-0.10	0.90		101.85	169.85	164.98	67.31	169.16	138	69	70	72	0.000	1.001	7.491	764
535	43.546	43.751	186.9182	0.08	0.08	0.56	0.88	0.00	79	78	72	1.24	0.4	74	0.019	97	98	7.8	0.00	0.89		101.55	169.57	164.70	67.28	168.83	137	69	70	72	0.000	1.001	7.408	753
536	43.628	43.832	187.2676	0.08	0.08	0.56	0.88	0.00	79	78	72	1.24	0.4	74	0.019	97	98	7.8	0.00	0.92		101.23	169.29	164.53	67.38	168.60	136	69	70	72	0.000	1.001	7.658	776
537	43.709	43.914	187.617	0.08	0.08	0.57	0.88	0.00	79	78	72	1.24	0.4	74	0.019	97	98	7.8	0.00	1.04		100.89	169.01	163.41	67.12	168.01	135	69	70	72	0.000	1.001	8.657	874
538	43.791	43.996	187.9664	0.08	0.08	0.56	0.87	0.00	79	78	72	1.24	0.4	74	0.019	97	98	7.8	0.00	1.25		100.53	168.56	161.87	67.09	167.62	135	69	70	72	0.000	1.001	10.405	1047
539	43.872	44.078	188.3157	0.08	0.08	0.56	0.88	0.00	79	78	73	1.24	0.4	74	0.019	97	98	7.9	-0.10	1.25		100.30	168.09	161.28	67.03	167.32	134	69	70	73	0.000	1.001	10.405	1045
540	43.953	44.160	188.6651	0.08	0.08	0.57	0.87	0.00	79	78	73	1.24	0.4	74	0.019	97	98	7.9	0.00	1.26		99.81	167.72	161.00	67.09	166.90	133	69	70	73	0.000	1.001	10.488	1048
541	44.035	44.241	189.0145	0.08	0.08	0.55	0.88	0.00	79	78	73	1.24	0.4	74	0.019	97	98	7.9	0.00	1.27		99.35	167.36	160.69	67.06	166.40	133	69	70	73	0.000	1.001	10.571	1051
542	44.116	44.323	189.3639	0.08	0.08	0.56	0.87	0.00	79	78	73	1.24	0.4	74	0.019	97	98	7.9	0.00	1.24		99.02	166.88	160.30	66.99	166.01	132	69	70	73	0.000	1.001	10.322	1023
543	44.197	44.405	189.7133	0.08	0.08	0.55	0.88	0.00	79	78	73	1.24	0.4	73	0.019	97	97	7.9	0.00	1.28		98.92	166.57	159.93	66.96	165.88	131	69	70	73	0.000	1.001	10.655	1055
544	44.279	44.487	190.0626	0.08	0.08	0.56	0.87	0.00	79	78	73	1.24	0.4	73	0.019	97	97	7.9	0.00	1.27		98.42	166.10	159.46	66.90	165.32	130	69	70	73	0.000	1.001	10.571	1042
545	44.360	44.568	190.412	0.08	0.08	0.56	0.88	0.00	79	78	72	1.24	0.4	73	0.019	97	97	7.9	0.00	1.25		97.90	165.70	159.20	66.99	164.89	130	69	70	72	0.000	1.001	10.405	1020
546	44.442	44.650	190.7614	0.08	0.08	0.57	0.87	0.00	79	78	73	1.24	0.4	73	0.019	97	97	7.9	0.00	1.22		97.54	165.34	158.84	66.96	164.50	129	69	70	73	0.000	1.001	10.155	992
547	44.523	44.732	191.1108	0.08	0.08	0.56	0.87	0.00	79	78	73	1.24	0.4	74	0.019	97	98	8.0	-0.10	1.23		97.08	164.89	158.48	67.03	164.11	127	69	70	73	0.000	1.001	10.238	995
548	44.604	44.814	191.4602	0.08	0.08	0.56	0.87	0.00	79	78	72	1.24	0.4	74	0.019	97	98	7.9	0.10	1.26		96.81	164.56	158.11	66.84	163.65	127	69	70	72	0.000	1.001	10.488	1017
549	44.686	44.896	191.8095	0.08	0.08	0.56	0.86	0.00	79	78	72	1.24	0.4	74	0.019	97	98	7.9	0.00	1.26		96.45	164.14	157.75	66.93	163.38	127	69	70	72	0.000	1.001	10.488	1013
550	44.767	44.977	192.1589	0.08	0.08	0.56	0.87	0.00	79	78	72	1.24	0.4	74	0.019	97	98	8.0	-0.10	1.23		96.09	163.74	157.38	66.90	162.99	127	68	70	72	0.000	1.001	10.238	985
551	44.849	45.059	192.5083	0.08	0.08	0.56	0.87	0.00	79	78	73	1.24	0.4	74	0.019	97	98	8.0	0.00	1.22		95.79	163.46	157.02	66.87	162.66	126	68	70	73	0.000	1.001	10.155	974
552	44.930	45.141	192.8577	0.08	0.08	0.56	0.87	0.00	79	78	72	1.24	0.4	74	0.019	97	98	8.0	0.00	1.25		95.56	162.99	156.74	66.77	162.33	125	68	69	72	0.000	1.001	10.405	995
553	45.011	45.223	193.2071	0.08	0.08	0.56	0.87	0.00	79	78	72	1.24	0.4	74	0.019	97	98	8.0	0.00	1.24		95.01	162.65	156.40	66.84	161.84	125	68	69	72	0.000	1.001	10.322	982
554	45.093	45.304	193.5564	0.08	0.08	0.57	0.88	0.00	79	78	72	1.24	0.4	73	0.019	97	97	8.0	0.00	1.27		94.58	162.29	156.09	66.77	161.35	124	68	69	72	0.000	1.001	10.572	1001
555	45.174	45.386	193.9058	0.08	0.08	0.56	0.87	0.00	79	78	73	1.24	0.4	73	0.019	97	97	8.0	0.00	1.23		94.09	161.92	155.62	66.90	160.99	124	68	69	73	0.000	1.001	10.238	964
556	45.256	45.468	194.2552	0.08	0.08	0.56	0.86	0.00	79	78	73	1.24	0.4	73	0.019	97	97	8.0	0.00	1.23		93.95	161.45	155.17	66.74	160.69	124	68	69	73	0.000	1.001	10.239	963
557	45.337	45.550	194.6046	0.08	0.08	0.56	0.87	0.00	78	78	72	1.24	0.4	73	0.019	97	97	8.1	-0.10	1.25		93.69	161.11	154.95	66.77	160.46	123	68	69	72	0.000	1.001	10.405	976
558	45.418	45.632	194.954	0.08	0.08	0.56	0.87	0.00	78	78	72	1.24	0.4	73	0.019	97	97	8.0	0.10	1.26		93.29	160.80	154.58	66.68	159.97	123	68	69	72	0.000	1.001	10.489	980
559	45.500	45.713	195.3033	0.08	0.08	0.56	0.87	0.00	78	78	72	1.24	0.4	73	0.019	97	97	8.0	0.00	1.25		92.93	160.49	154.30	66.61	159.54	122	68	69	72	0.000	1.001	10.405	968
560	45.581	45.795	195.6527	0.08	0.08	0.56	0.88	0.00	78	78	73	1.24</																						

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				
601	48.918	49.148	209.9773	0.08	0.08	0.56	0.88	0.00	78	78	72	1.24	0.4	73	0.019	97	97	8.4	0.10	1.53		78.17	145.36	139.06	66.33	144.50	108	68	69	72	0.000	1.001	12.737	997	
602	49.000	49.230	210.3267	0.08	0.08	0.56	0.88	0.00	78	78	72	1.24	0.4	73	0.019	97	97	8.4	0.00	1.53		77.65	144.97	138.73	66.33	143.97	108	68	69	72	0.000	1.001	12.737	990	
603	49.081	49.312	210.676	0.08	0.08	0.57	0.86	0.00	78	78	72	1.24	0.4	73	0.019	97	97	8.5	-0.10	1.54		77.48	144.55	138.25	66.20	143.68	107	68	69	72	0.000	1.001	12.820	994	
604	49.163	49.393	211.0254	0.08	0.08	0.56	0.87	0.00	78	78	72	1.24	0.4	73	0.019	97	97	8.5	0.00	1.53		76.99	144.19	138.02	66.36	143.35	107	68	69	72	0.000	1.001	12.737	982	
605	49.244	49.475	211.3748	0.08	0.08	0.56	0.88	0.00	78	77	72	1.24	0.4	73	0.019	97	98	8.5	0.00	1.53		76.60	143.85	137.55	66.39	142.99	107	68	69	72	0.000	1.001	12.737	977	
606	49.325	49.557	211.7242	0.08	0.08	0.56	0.89	0.00	78	77	72	1.24	0.4	73	0.019	97	98	8.5	0.00	1.51		76.11	143.49	137.27	66.42	142.53	106	68	69	72	0.000	1.001	12.570	958	
607	49.407	49.639	212.0736	0.08	0.08	0.57	0.87	0.00	78	77	72	1.24	0.4	73	0.019	97	98	8.5	0.00	1.54		75.97	143.01	136.88	66.17	142.13	106	68	69	72	0.000	1.001	12.820	975	
608	49.488	49.720	212.4229	0.08	0.08	0.57	0.87	0.00	78	77	72	1.24	0.4	73	0.019	97	98	8.5	0.00	1.53		75.22	142.68	136.54	66.36	141.58	106	68	69	72	0.000	1.001	12.737	959	
609	49.570	49.802	212.7723	0.08	0.08	0.56	0.87	0.00	78	77	72	1.24	0.4	72	0.019	97	98	8.5	0.00	1.54		75.15	142.31	136.20	66.33	141.48	106	68	69	72	0.000	1.001	12.820	965	
610	49.651	49.884	213.1217	0.08	0.08	0.57	0.87	0.00	78	77	72	1.24	0.4	73	0.019	97	98	8.5	0.00	1.52		74.82	141.92	135.84	66.23	141.05	106	68	69	72	0.000	1.001	12.654	948	
611	49.732	49.966	213.4711	0.08	0.08	0.56	0.88	0.00	78	77	72	1.24	0.4	73	0.019	97	98	8.5	0.00	1.54		74.36	141.64	135.56	66.33	140.69	106	68	69	72	0.000	1.001	12.820	954	
612	49.814	50.048	213.8205	0.08	0.08	0.56	0.87	0.00	78	77	72	1.24	0.4	72	0.019	97	98	8.5	0.00	1.54		74.03	141.19	135.20	66.30	140.33	105	68	69	72	0.000	1.001	12.820	950	
613	49.895	50.129	214.1698	0.08	0.08	0.57	0.87	0.00	78	77	72	1.24	0.4	72	0.019	97	98	8.5	0.00	1.54		73.95	140.80	134.86	66.17	140.12	105	68	69	72	0.000	1.001	12.820	949	
614	49.977	50.211	214.5192	0.08	0.08	0.56	0.87	0.00	78	77	72	1.24	0.4	73	0.019	97	98	8.6	-0.10	1.54		73.56	140.46	134.55	66.26	139.82	105	68	69	72	0.000	1.001	12.820	944	
615	50.058	50.293	214.8686	0.08	0.08	0.56	0.88	0.00	78	77	72	1.24	0.4	78	0.019	98	98	8.6	0.00	1.55		73.26	140.15	134.21	66.26	139.53	118	68	69	72	0.000	1.001	12.903	946	
616	50.139	50.375	215.218	0.08	0.08	0.56	0.88	0.00	78	77	72	1.24	0.4	87	0.019	99	99	8.6	0.00	1.55		73.03	139.73	133.82	66.23	139.27	145	68	69	72	0.000	1.001	12.903	943	
617	50.221	50.456	215.5674	0.08	0.08	0.57	0.88	0.00	78	77	72	1.24	0.4	92	0.019	99	99	8.5	0.10	1.53		72.54	139.48	133.54	66.14	138.67	153	68	69	72	0.000	1.001	12.737	925	
618	50.302	50.538	215.9167	0.08	0.08	0.56	0.87	0.00	78	77	72	1.24	0.4	96	0.019	100	100	8.3	0.20	1.55		72.09	139.09	133.23	66.39	138.48	161	68	69	72	0.000	1.001	12.903	931	
619	50.384	50.620	216.2661	0.08	0.08	0.56	0.88	0.00	78	77	72	1.24	0.4	100	0.019	100	100	8.1	0.20	1.54		72.05	138.92	133.15	66.23	138.28	172	68	69	72	0.000	1.001	12.820	925	
620	50.465	50.702	216.6155	0.08	0.08	0.57	0.88	0.00	78	77	72	1.24	0.4	104	0.019	100	100	8.0	0.10	1.56		72.24	138.59	132.81	66.07	138.31	185	68	70	72	0.000	1.001	12.987	939	
621	50.546	50.784	216.9649	0.08	0.08	0.56	0.88	0.00	78	77	72	1.24	0.4	108	0.019	101	101	7.7	0.30	1.54		71.92	138.50	132.59	66.20	138.12	198	69	70	72	0.000	1.001	12.820	923	
622	50.628	50.865	217.3143	0.08	0.08	0.56	0.88	0.00	78	77	72	1.24	0.4	113	0.019	101	101	7.4	0.30	1.54		71.59	138.31	132.45	66.20	137.79	213	69	70	72	0.000	1.001	12.820	919	
623	50.709	50.947	217.6636	0.08	0.08	0.57	0.87	0.00	78	77	72	1.24	0.4	118	0.019	101	102	7.1	0.30	1.54		71.66	138.25	132.48	66.36	138.02	230	69	70	72	0.000	1.001	12.820	920	
624	50.790	51.029	218.013	0.08	0.08	0.57	0.87	0.00	78	77	72	1.24	0.4	123	0.019	102	102	6.8	0.30	1.55		71.66	138.25	132.45	66.26	137.92	248	69	70	72	0.000	1.001	12.903	926	
625	50.872	51.111	218.3624	0.08	0.08	0.58	0.88	0.00	78	77	72	1.24	0.4	128	0.019	102	103	6.6	0.20	1.51		71.98	138.16	132.39	66.20	138.18	266	69	71	72	0.000	1.001	12.570	906	
626	50.953	51.192	218.7118	0.08	0.08	0.56	0.87	0.00	78	77	72	1.24	0.4	132	0.019	103	103	6.3	0.30	1.55		71.98	138.31	132.48	66.26	138.25	284	69	71	72	0.000	1.001	12.903	930	
627	51.035	51.274	219.0612	0.08	0.08	0.56	0.88	0.00	78	77	72	1.24	0.4	137	0.019	103	103	5.9	0.40	1.64		72.11	138.47	132.34	66.14	138.25	301	69	71	72	0.000	1.001	13.653	986	
628	51.116	51.356	219.4105	0.08	0.08	0.56	0.88	0.00	78	77	72	1.24	0.4	143	0.019	104	104	5.6	0.30	1.65		72.28	138.61	132.39	66.17	138.45	323	70	71	72	0.000	1.001	13.736	994	
629	51.197	51.438	219.7599	0.08	0.08	0.56	0.88	0.00	78	77	72	1.24	0.4	148	0.019	104	104	5.3	0.30	1.61		72.70	138.73	132.65	66.07	138.77	347	70	71	72	0.000	1.001	13.403	976	
630	51.279	51.520	220.1093	0.08	0.08	0.56	0.88	0.00	78	77	72	1.24	0.4	153	0.019	104	105	5.1	0.20	1.63		73.03	138.92	132.76	66.14	139.17	365	70	72	72	0.000	1.001	13.570	992	
631	51.360	51.601	220.4587	0.08	0.08	0.56	0.88	0.00	78	77	72	1.24																							

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350x WHH new cat iv
4-66 of 4-80

[illegible]

Total Weight of Load (lb): 141.7

Total Moisture of Load (%): 22.6

Equipment Numbers:

Method 28 Hydronic Heater Run Sheets

Client: **Heatmor**Project Number: **0275WH011E.AD01** Run Number: **4**Model: **350x**Tracking Number: **2011** Date: **10/10/14**Test Crew: **A. Kravitz, J. Clark**

OMNI Equipment ID numbers: : 428A, 428B, 132, 209, 410, 417, 419, 513, 533, 559, 296-T55, 340, 353, 431, 23, 131, 343

WHH Run Notes

Preburn Settings

Target Output (%): **16-24 %**Target Output (BTU/hr): **44,800-67,200**

Preburn Notes

TIME	NOTES
1:33:00 PB	Test setting

Test Settings

Target Output (%): **16-24 %**Target Output (BTU/hr): **44,800-67,200**

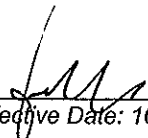
Start-Up Timeline

Fuel Loaded by: **1:45**Door Closed at: **2:30**

Notes: _____

Test Notes

TIME	NOTES
0:21:00	DAQ 11:03 = Computer 11:02
0:23:00	A front filter → B 315
0:29:00	B front → B 316
3:20:00	A front → B 317
3:39:00	A front → B 318
	B front → B 319

Technician Signature: 

Control No. P-SFDJ-0001, Effective Date: 10/8/2014

Date: **10/11/14**

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Method 28 Hydronic Heater Run Sheets

Client: HeatmorProject Number: 0275WH011E.AD01 Run Number: 4Model: 350xTracking Number: 2011Date: 10/10/14Test Crew: A. Kravitz, J. Clark

OMNI Equipment ID numbers: : 428A, 428B, 132, 209, 410, 417, 419, 513, 533, 559, 296-T55, 340, 353, 431, 23, 131, 343

WHH Supplemental Data

Start Time: 11:45Booth #: E3Stop Time: 22:36

Stack Gas Leak Check:

Initial: 0 Final: 0

Sample Train Leak Check:

A: 0.000 @ -3 "HgB: 0.002 @ -3 "Hg

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

Time	Pre Test		
	Zero	Span	Mid
	<u>9:36</u>	<u>9:40</u>	<u>9:4</u>
O ₂	<u>N/A</u>	<u>N/A</u>	<u>N/A</u>
CO ₂	<u>0.00</u>	<u>16.80</u>	<u>10.25</u>
CO	<u>0.900</u>	<u>4.295</u>	<u>2.534</u>

Post Test		
Zero	Span	Mid
<u>10:46</u>	<u>10:47</u>	<u>10:40</u>
<u>N/A</u>	<u>N/A</u>	<u>N/A</u>
<u>0.12</u>	<u>16.94</u>	<u>10.21</u>
<u>-0.007</u>	<u>4.326</u>	<u>2.602</u>

Air Velocity (ft/min): Initial: 450 Final: 450Scale Audit (lbs): Initial: 10.0 Final: 10.0Pitot Tube Leak Test: Initial: 0 Final: 0Stack Diameter (in): 8"Induced Draft: 0% Smoke Capture: 100%

Flue Pipe Cleaned Prior to First Test in Series:

Date: 10/7/14 Initials: A

	Initial	Middle	Ending
P _b (in/Hg)	<u>30.15</u>	<u>30.15</u>	<u>30.14</u>
Ambient (°F)	<u>69</u>	<u>75</u>	<u>72</u>

Tunnel Traverse	
dP (in H ₂ O)	T (°F)
<u>0.016</u>	<u>71</u>
<u>0.024</u>	
<u>0.024</u>	
<u>0.024</u>	
<u>0.022</u>	
<u>0.004*</u>	
<u>0.014</u>	
<u>0.020</u>	
<u>0.024</u>	
<u>0.022</u>	
<u>0.022</u>	
<u>0.008</u>	
Static P:	<u>-0.27</u>

0.008

Technician Signature: [Signature]
 Control No. P-SFDJ-0001, Effective Date: 10/8/2014

Date: 10/11/14

OMNI-Test Laboratories, Inc.

Manufacturer: Heatmor
Model: 350x
Date: 10/10/14
Run: 4
Control #: 2011
Test Duration: 645
Output Category: II

Technicians: A. Kravitz

Test Results in Accordance with CSA B415.1-09

	HHV Basis	LHV Basis
Overall Efficiency	70.5%	75.9%
Combustion Efficiency	93.6%	93.6%
Heat Transfer Efficiency	75%	81.1%

Output Rate (kJ/h)	70,831	67,191	(Btu/h)
Burn Rate (kg/h)	5.05	11.14	(lb/h)
Input (kJ/h)	100,509	95,344	(Btu/h)

Test Load Weight (dry kg)	54.33	119.74	dry lb
MC wet (%)	18.43		
MC dry (%)	22.59		
Particulate (g)	0		
CO (g)	4,833		
Test Duration (h)	10.75		

Emissions	Particulate	CO
g/MJ Output	0.00	6.35
g/kg Dry Fuel	0.00	88.96
g/h	0.00	449.60
lb/MM Btu Output	0.00	14.75

Air/Fuel Ratio (A/F)	9.20
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VERSION:

2.3

3/23/2010

*Model: 350X
Heatmor
105 Industrial Park Ct. NE, P.O. Box 787
Warroad, MN 56763*

Run 5

Hydronic Heating Appliances - Test Method 28 WHH Results

Manufacturer: Heatmor
 Model: 350X
 Tracking No.: 2011
 Project No.: 0275WB011E.AD01
 Run: 5
 Test Date: November 7, 2014

Burn Rate	22.05 kg/hr dry
Average Tunnel Temperature	212 degrees Fahrenheit
Average Gas Velocity in Dilution Tunnel - vs	10.1 feet/second
Average Gas Flow Rate in Dilution Tunnel - Qsd	22411 dscf/hour
Average Delta p	0.019 inches H2O
Average Delta H	0.53 inches H2O
Total Time of Test	156 minutes

	SAMPLE TRAIN 1	SAMPLE TRAIN 2	AMBIENT SAMPLE TRAIN
Total Sample Volume - Vm	12.02 cubic feet	11.88 cubic feet	60.84 cubic feet
Average Gas Meter Temperature	69 degrees Fahrenheit	69 degrees Fahrenheit	65 degrees Fahrenheit
Total Sample Volume (Standard Conditions) - Vmstd	12.3 dscf	12.2 dscf	61.6 dscf
Total Particulates - mn	9.9 mg	8.8 mg	0.6 mg
Particulate Concentration (dry-standard)	0.00081 grams/dscf	0.00072 grams/dscf	0.000010 grams/dscf
Particulate Emission Rate	46.38 grams	41.42 grams	
Difference from Average	2.48 grams	2.48 grams	
Results Are Acceptable			

AVERAGE	
Total Sample Volume - Vm	11.95 cubic feet
Average Gas Meter Temperature	69 degrees Fahrenheit
Total Sample Volume (Standard Conditions) - Vmstd	12.2 dscf
Total Particulates - mn	
Particulate Concentration (dry-standard)	0.00075 grams/dscf
Particulate Emission Rate	43.90 grams
7.5% of the average emission rate	3.29 grams

Hydronic Heating Appliances - Test Method 28 WHH
Test Data

Run: 5

Manufacturer: Heatmor

Model: 350X

Tracking No.: 2011

Project No.: 0275WB011E.AD01

Test Date: November 7, 2014

Technician: A. Kravitz

Beginning Clock Time: 13:53

Recording Interval: 1 min.

Total Sampling Time: 156 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	0.014	0.024	0.026	0.026	0.018	0.006	0.014	0.020	0.024	0.020	0.022	0.010	*H2O
Initial Temp.	206	204	204	203	203	203	202	202	202	201	201	201	oF
Air Velocity: Initial: <50 Final: <50													
Scale Audit: Pre: 10.0 Post: 10.0													
Pitot Tube Leak Test: Pre: 0 Post: 0 Induced Draft: 0													
Flue Pipe Cleaned Prior to First Test in Series: % Smoke Capture: 100													
Date: 10/7/2014													

PM Control Module:

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: -0.300 "H2O

Pitot Tube Cp: 0.99

Meter Box Y Factor: (1) 1.007 (2) 1.012 (amb) 0.989

Barometric Pressure: Begin Middle End Average 30.45 30.43 30.40 "Hg

Signature/Date:

Tunnel Velocity: 10.13 ft/sec.

Initial Tunnel Flow: 367.0 scfm

Average Tunnel Flow: 373.5 scfm

Tunnel Area: 0.785 ft2

Post-Test Leak Check (1): 0.001 cfm@"Hg

Post-Test Leak Check (2): 0.009 cfm@"Hg

Fuel Moisture (dry basis %): 23.1

Total Particulate (1): 9.9

Total Particulate (2): 8.8

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	0.03	1.00	65	65	64	1.64	1.00	203	0.019			155.6		4.13		93.7	156.7	136.3	61.0	154.6	411	66	66	64	-0.025	1.001	34.405	
1	0.077	0.076	0.390	0.08	0.08	0.56	0.80	1.00	65	65	64	1.21	0.50	124	0.019	94	94	155.3	0.30	4.10		93.4	156.1	136.2	61.0	154.4	377	67	67	64	-0.024	1.001	34.155	3193
2	0.154	0.152	0.780	0.08	0.08	0.56	0.81	1.00	66	65	64	1.21	0.50	117	0.019	93	93	155.0	0.30	4.10		92.6	155.4	135.6	61.1	153.5	346	67	68	64	-0.024	1.001	34.155	3167
3	0.231	0.228	1.170	0.08	0.08	0.56	0.81	1.00	66	65	64	1.20	0.50	140	0.019	95	95	154.2	0.80	4.12		91.2	154.4	134.8	61.2	152.4	354	68	69	64	-0.027	1.001	34.321	3132
4	0.308	0.305	1.560	0.08	0.08	0.56	0.82	1.00	66	65	64	1.20	0.50	152	0.019	96	96	152.8	1.40	4.11		90.7	153.7	134.2	61.2	151.9	361	66	67	64	-0.028	1.001	34.238	3110
5	0.385	0.381	1.950	0.08	0.08	0.56	0.82	1.00	66	65	64	1.19	0.50	168	0.019	97	98	151.7	1.10	4.11		90.7	153.5	134.1	61.2	151.6	443	65	65	64	-0.038	1.001	34.237	3107
6	0.462	0.457	2.340	0.08	0.08	0.56	0.82	1.00	66	65	64	1.17	0.50	188	0.019	99	99	149.9	1.80	4.10		90.8	153.6	134.3	61.2	151.7	553	65	65	64	-0.043	1.001	34.154	3103
7	0.539	0.533	2.730	0.08	0.08	0.55	0.82	1.00	66	65	64	1.15	0.50	202	0.019	100	100	148.2	1.70	4.13		91.0	153.9	134.4	61.2	152.1	624	66	65	64	-0.043	1.001	34.404	3134
8	0.616	0.609	3.120	0.08	0.08	0.55	0.81	1.00	66	65	64	1.13	0.50	211	0.019	101	101	146.9	1.30	4.09		91.2	154.2	134.7	61.2	152.3	646	66	66	64	-0.045	1.001	34.071	3112
9	0.693	0.685	3.510	0.08	0.08	0.55	0.81	1.00	66	65	64	1.11	0.50	217	0.019	101	101	145.3	1.60	4.13		91.7	154.6	134.8	61.2	152.6	657	67	67	64	-0.045	1.001	34.404	3158
10	0.770	0.762	3.900	0.08	0.08	0.54	0.88	1.00	66	65	64	1.10	0.50	221	0.019	101	102	143.8	1.50	4.12		92.3	155.2	135.3	61.2	153.2	663	68	68	64	-0.046	1.001	34.321	3170
11	0.847	0.838	4.290	0.08	0.08	0.54	0.83	1.00	66	66	64	1.07	0.50	224	0.019	102	102	141.8	2.00	4.10		93.1	156.1	136.1	61.2	154.0	668	70	68	64	-0.046	1.001	34.154	3184
12	0.925	0.914	4.680	0.08	0.08	0.53	0.83	1.00	66	66	64	1.06	0.50	226	0.019	102	102	140.3	1.50	4.08		93.8	156.8	136.7	61.2	154.8	672	71	69	64	-0.047	1.001	33.988	3192
13	1.002	0.990	5.070	0.08	0.08	0.53	0.82	1.00	66	66	64	1.05	0.50	228	0.019	102	102	138.7	1.60	4.09		94.4	157.7	137.4	61.2	155.6	676	72	70	64	-0.046	1.001	34.071	3221
14	1.079	1.066	5.460	0.08	0.08	0.53	0.81	1.00	66	66	64	1.04	0.50	230	0.019	102	102	137.0	1.70	4.10		95.5	158.4	137.9	61.2	156.4	678	73	70	64	-0.046	1.001	34.154	3265
15	1.156	1.142	5.850	0.08	0.08	0.53	0.76	1.00	66	66	64	0.98	0.30	231	0.019	102	102	135.5	1.50	3.97		96.5	159.2	139.2	61.2	157.3	680	74	72	64	-0.046	1.001	33.071	3196
16	1.233	1.218	6.240	0.08	0.08	0.55	0.82	1.00	66	66	64	0.79	0.00	232	0.019	102	102	133.8	1.70	4.11		97.0	160.1	139.3	61.2	158.2	683	75	74	64	-0.047	1.001	34.237	3325
17	1.310	1.295	6.630	0.08	0.08	0.09	0.77	1.00	66	66	64	1.63	-0.10	233	0.019	102	102	131.7	2.10	4.09		97.8	161.0	139.9	61.2	158.9	685	68	74	64	-0.047	1.001	34.071	3337
18	1.387	1.371	7.020	0.08	0.08	0.39	0.59	1.00	66	66	64	1.17	-0.90	233	0.019	102	102	130.1	1.60	4.02		99.2	161.9	141.0	61.1	160.0	687	73	73	64	-0.047	1.001	33.488	3327
19	1.464	1.447	7.410	0.08	0.08	0.55	0.31	1.00	66	66	64	1.15	0.50	235	0.019	102	102	128.3	1.80	4.12		99.8	162.7	141.2	60.9	160.6	689	77	69	64	-0.047	1.001	34.322	3429
20	1.541	1.523	7.800	0.08	0.08	0.55	0.87	1.00	67	66	64	1.14	0.50	235	0.019	102	102	126.7	1.60	4.09		100.5	163.6	142.0	61.0	161.5	690	78	73	64	-0.047	1.001	34.072	3428
21	1.618	1.599	8.190	0.08	0.08	0.54	0.86	1.00	67	67	64	1.12	0.50	236	0.019	102	102	124.9	1.80	4.10		101.5	164.4	142.6	61.0	162.4	692	79	72	64	-0.048	1.001	34.155	3471
22	1.695	1.675	8.580	0.08	0.08	0.54	0.87	1.00	67	67	64	1.10	0.50	237	0.019	102	102	123.4	1.50	4.08		102.5	165.3	143.4	61.1	163.2	693	80	73	64	-0.047	1.001	33.988	3489
23	1.772	1.752	8.970	0.08	0.08	0.53	0.81	1.00	67	67	64	1.03	0.40	238	0.019	102	102	121.6	1.80	4.03		103.4	166.0	144.2	61.1	164.1	695	81	74	64	-0.047	1.001	33.572	3474
24	1.849	1.828	9.360	0.08	0.08	0.52	0.78	1.00	67	67	64	0.98	0.40	238	0.019	102	102	119.8	1.80	4.03		103.8	166.9	145.0	61.1	165.0	697	81	74	64	-0.047	1.001	33.572	3488
25	1.926	1.904	9.750	0.08	0.08	0.54	0.76	1.00	67	67	64	0.71	0.30	239	0.019	102	102	118.3	1.50	4.06		104.5	167.8	145.5	61.2	165.7	698	82	75	64	-0.048	1.001	33.821	3537
26	2.003	1.980	10.140	0.08	0.08	0.18	0.83	1.00	67	67	64	1.33	0.00	239	0.019	102	102	116.6	1.70	4.08		105.6	168.6	146.0	61.2	166.6	698	75	76	64	-0.047	1.001	33.988	3593
27	2.080	2.056	10.530	0.08	0.08	0.54	0.55	1.00	67	67	64	1.14	-0.90	240	0.019	103	103	115.0	1.60	4.10		106.2	169.4	146.4	61.2	167.3	700	78	75	64	-0.047	1.001	34.154	3631
28	2.157	2.132	10.920	0.08	0.08	0.54	0.71	1.00	67	67	65	1.13	0.20	240	0.019	103	103	113.1	1.90	4.09		107.3	170.3	147.2	61.1	168.2	700	79	76	65	-0.047	1.001	34.071	3661
29	2.234	2.208	11.310	0.08	0.08	0.54	0.83	1.00	67	67	65	1.11	0.10	240	0.019	103	103	111.7	1.40	4.09		108.0	171.0	147.8	61.1	168.9	700	80	79	65	-0.048	1.001	34.071	3684
30	2.311	2.285	11.700	0.08	0.08	0.54	0.79	1.00	67	67	64	1.10	0.00	240	0.019	103	103	109.8	1.90	4.09		108.8	171.9	148.5	61.1	169.9	700	80	78	64	-0.047	1.001	34.071	3712
31	2.388	2.361	12.090	0.08	0.08	0.54	0.83	1.00	67	68	64	1.07	-0.10	240	0.019	103	102	108.2	1.60	4.08		109.6	172.7</											

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	2.619	2.589	13.260	0.08	0.08	0.54	0.80	1.00	68	68	65	-0.04	-0.20	239	0.019	102	102	103.4	1.50	4.14		111.6	174.8	150.5	61.2	172.6	701	78	79	65	-0.047	1.001	34.488	3853			
35	2.697	2.665	13.650	0.08	0.08	0.55	0.82	1.00	68	68	65	-0.12	-0.40	239	0.019	102	102	101.8	1.60	4.38		111.7	175.4	149.6	61.2	172.8	700	79	79	65	-0.047	1.001	36.487	4082			
36	2.774	2.742	14.040	0.08	0.08	0.54	0.80	1.00	68	68	65	-0.27	-0.50	239	0.019	102	102	100.2	1.60	4.50		112.1	176.0	149.6	61.2	173.2	698	79	79	65	-0.047	1.001	37.487	4206			
37	2.851	2.818	14.430	0.08	0.08	0.52	0.81	1.00	68	68	65	-0.29	-1.00	238	0.019	102	102	98.9	1.30	4.85		111.8	176.6	148.1	61.1	173.0	697	80	80	65	-0.048	1.001	40.402	4524			
38	2.928	2.894	14.820	0.08	0.08	0.50	0.69	1.00	68	68	65	1.64	-2.00	238	0.019	102	102	97.3	1.60	5.19		111.4	176.9	146.6	61.2	172.7	697	78	79	65	-0.047	1.001	43.235	4823			
39	3.005	2.970	15.211	0.08	0.08	0.06	0.17	1.00	68	68	65	1.64	1.00	238	0.019	102	102	95.8	1.50	5.21		111.9	177.2	146.9	61.0	172.9	694	76	76	65	-0.047	1.001	43.402	4863			
40	3.082	3.046	15.601	0.08	0.08	0.45	0.07	1.00	68	68	64	1.20	1.00	237	0.019	102	102	94.3	1.50	5.19		111.9	177.2	146.7	60.9	172.9	691	81	77	64	-0.048	1.001	43.236	4844			
41	3.159	3.122	15.991	0.08	0.08	0.55	0.33	1.00	68	68	65	1.18	0.40	237	0.019	102	102	92.8	1.50	5.21		111.8	177.4	146.9	60.9	173.0	690	82	79	65	-0.047	1.001	43.403	4860			
42	3.236	3.198	16.381	0.08	0.08	0.55	0.84	1.00	68	68	65	1.17	0.40	237	0.019	102	102	91.4	1.40	5.21		112.4	177.5	146.9	60.9	173.1	690	81	81	65	-0.048	1.001	43.403	4882			
43	3.313	3.275	16.771	0.08	0.08	0.55	0.84	1.00	68	69	65	1.17	0.40	236	0.019	102	102	89.9	1.50	5.55		112.3	177.6	145.7	60.9	172.7	687	81	82	65	-0.048	1.001	46.235	5199			
44	3.390	3.351	17.161	0.08	0.08	0.54	0.84	1.00	68	69	64	1.16	0.40	235	0.019	102	102	88.5	1.40	5.76		110.7	177.4	144.1	60.9	171.5	684	81	82	64	-0.047	1.001	47.985	5320			
45	3.467	3.427	17.551	0.08	0.08	0.54	0.83	1.00	68	69	64	1.15	0.40	235	0.019	102	102	86.8	1.70	5.75		110.6	177.0	143.7	60.8	171.2	682	82	83	64	-0.045	1.001	47.902	5303			
46	3.544	3.503	17.941	0.08	0.08	0.54	0.83	1.00	68	69	64	1.15	0.40	234	0.019	102	102	85.6	1.20	5.79		110.1	176.8	143.6	60.7	171.0	681	82	83	64	-0.048	1.001	48.235	5317			
47	3.621	3.579	18.331	0.08	0.08	0.54	0.82	1.00	69	69	65	1.14	0.40	234	0.019	102	102	84.4	1.20	5.73		110.1	176.5	143.7	60.7	170.9	681	82	84	65	-0.045	1.001	47.736	5261			
48	3.698	3.655	18.721	0.08	0.08	0.54	0.82	1.00	69	69	65	1.13	0.40	234	0.019	102	102	82.7	1.70	5.75		110.2	176.6	143.5	60.7	170.9	679	82	84	65	-0.047	1.001	47.902	5286			
49	3.775	3.731	19.111	0.08	0.08	0.53	0.81	1.00	69	69	65	1.13	0.40	233	0.019	102	102	81.5	1.20	5.81		109.3	176.2	143.1	60.7	170.4	674	83	84	65	-0.046	1.001	48.402	5298			
50	3.852	3.808	19.501	0.08	0.08	0.53	0.80	1.00	69	69	65	1.12	0.40	232	0.019	102	102	79.9	1.60	5.82		109.6	176.1	143.0	60.6	170.3	673	83	85	65	-0.045	1.001	48.486	5322			
51	3.929	3.884	19.891	0.08	0.08	0.53	0.81	1.00	69	69	65	1.11	0.40	232	0.019	102	102	78.7	1.20	5.81		109.7	176.1	143.0	60.6	170.2	672	83	85	65	-0.046	1.001	48.403	5317			
52	4.006	3.960	20.281	0.08	0.08	0.47	0.80	1.00	69	69	65	-11.80	0.30	232	0.019	102	102	77.3	1.40	5.66		110.0	175.9	143.6	60.6	170.3	673	82	86	65	-0.045	1.001	47.153	5194			
53	4.083	4.036	20.671	0.08	0.08	0.53	0.79	1.00	69	69	65	0.27	0.30	231	0.019	101	102	76.1	1.20	5.72		109.8	175.9	143.3	60.7	170.4	672	83	86	65	-0.045	1.001	47.653	5240			
54	4.160	4.112	21.061	0.08	0.08	0.53	0.82	1.00	69	69	65	0.17	0.30	231	0.019	101	102	74.6	1.50	5.81		109.1	175.7	142.6	60.6	169.8	669	84	86	65	-0.045	1.001	48.403	5285			
55	4.237	4.188	21.451	0.08	0.08	0.52	0.79	1.00	69	69	65	0.15	-1.00	230	0.019	101	101	73.4	1.20	5.82		109.0	175.6	142.6	60.6	169.8	665	84	83	65	-0.046	1.001	48.486	5290			
56	4.314	4.265	21.841	0.08	0.08	0.52	0.25	1.00	69	69	65	0.15	1.00	229	0.019	101	101	71.8	1.60	5.79		108.6	175.3	142.3	60.6	169.4	662	85	82	65	-0.045	1.001	48.236	5245			
57	4.392	4.341	22.231	0.08	0.08	0.52	0.90	1.00	69	69	65	0.15	0.40	229	0.019	101	101	70.5	1.30	5.78		108.6	175.1	142.3	60.6	169.3	660	84	85	65	-0.045	1.001	48.153	5236			
58	4.469	4.417	22.621	0.08	0.08	0.53	0.83	1.00	69	69	65	0.11	0.40	229	0.019	101	101	69.2	1.30	5.77		108.3	174.9	142.1	60.6	169.0	659	83	84	65	-0.046	1.001	48.069	5211			
59	4.546	4.493	23.011	0.08	0.08	0.54	0.83	1.00	69	69	65	0.11	0.40	229	0.019	101	101	67.8	1.40	5.78		108.1	174.7	142.0	60.6	169.0	656	82	83	65	-0.046	1.001	48.153	5211			
60	4.623	4.569	23.401	0.08	0.08	0.54	0.83	1.00	69	69	65	0.10	0.40	228	0.019	101	101	66.8	1.00	5.77		108.3	174.5	142.2	60.6	168.8	653	82	83	65	-0.044	1.001	48.069	5214			
61	4.700	4.645	23.791	0.08	0.08	0.53	0.83	1.00	69	69	65	0.10	0.40	227	0.019	101	101	65.4	1.40	5.73		107.9	174.2	141.9	60.6	168.5	649	82	83	65	-0.045	1.001	47.736	5156			
62	4.777	4.721	24.181	0.08	0.08	0.54	0.83	1.00	69	70	65	0.10	0.40	227	0.019	101	101	63.9	1.50	5.76		107.6	174.2	141.8	60.6	168.4	644	82	83	65	-0.044	1.001	47.986	5169			
63	4.854	4.798	24.571	0.08	0.08	0.53	0.83	1.00	69	69	65	0.10	0.40	226	0.019	101	101	62.7	1.20	5.77		107.6	174.0	141.7	60.6	168.2	643	82	83	65	-0.044	1.001	48.069	5178			
64	4.931	4.874	24.961	0.08	0.08	0.52	0.83	1.00	69	70	65	0.02	0.40	226	0.019	101	101	61.6	1.10	5.76		106.9	173.7	141.4	60.6	168.0	642	79	83								

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	6.164	6.092	31.201	0.08	0.08	0.52	0.80	1.00	70	70	65	-5.96	0.30	218	0.019	100	100	44.0	0.90	5.09		106.9	171.8	143.4	60.9	167.8	602	78	82	65	-0.043	1.001	42.403	4540	
81	6.241	6.168	31.591	0.08	0.08	1.37	0.74	1.00	70	70	65	1.13	-0.10	217	0.019	100	100	42.9	1.10	5.08		106.8	171.7	143.2	60.9	167.7	600	79	82	65	-0.042	1.001	42.320	4527	
82	6.318	6.245	31.981	0.08	0.08	0.55	0.58	1.00	70	70	65	1.13	-6.90	217	0.019	100	100	41.7	1.20	5.10		106.4	171.5	143.0	60.9	167.4	600	81	79	65	-0.043	1.001	42.486	4528	
83	6.395	6.321	32.371	0.08	0.08	0.55	0.78	1.00	70	70	65	1.13	-7.50	217	0.019	100	100	40.9	0.80	5.04		106.4	171.4	143.1	60.9	167.4	607	81	79	65	-0.043	1.001	41.986	4473	
84	6.472	6.397	32.761	0.08	0.08	0.53	0.93	1.00	70	70	65	1.12	0.40	218	0.019	100	100	39.7	1.20	5.10		106.5	171.6	143.1	60.9	167.6	614	81	80	65	-0.044	1.001	42.486	4531	
85	6.549	6.473	33.151	0.08	0.08	0.54	0.83	1.00	70	70	65	1.11	0.30	218	0.019	100	100	38.7	1.00	5.08		106.6	171.6	143.3	60.9	167.7	617	81	81	65	-0.043	1.001	42.320	4515	
86	6.626	6.549	33.541	0.08	0.08	0.54	0.83	1.00	70	70	66	1.12	0.40	219	0.019	100	100	37.8	0.90	5.11		107.1	171.8	143.5	60.9	167.8	618	79	80	66	-0.043	1.001	42.569	4565	
87	6.703	6.625	33.931	0.08	0.08	0.54	0.83	1.00	70	71	66	1.12	0.30	219	0.019	100	100	36.8	1.00	5.09		106.7	171.7	143.2	60.9	167.7	618	78	80	66	-0.043	1.001	42.403	4530	
88	6.780	6.701	34.321	0.08	0.08	0.53	0.84	1.00	70	71	66	1.11	0.30	219	0.019	100	100	36.0	0.80	5.04		106.9	171.9	143.7	61.0	168.0	618	78	80	66	-0.043	1.001	41.986	4494	
89	6.857	6.778	34.711	0.08	0.08	0.52	0.82	1.00	70	71	66	1.10	0.40	218	0.019	100	100	34.9	1.10	5.05		107.2	171.9	143.7	60.9	168.1	618	78	80	66	-0.044	1.001	42.069	4515	
90	6.934	6.854	35.101	0.08	0.08	0.53	0.82	1.00	70	71	66	1.11	0.40	218	0.019	100	100	33.9	1.00	5.06		107.4	172.1	143.8	61.0	168.1	619	78	80	66	-0.043	1.001	42.153	4533	
91	7.011	6.930	35.491	0.08	0.08	0.53	0.83	1.00	71	71	66	1.09	0.30	218	0.019	100	100	33.2	0.70	5.02		106.9	172.2	144.0	60.9	168.2	618	78	80	66	-0.042	1.001	41.820	4478	
92	7.088	7.006	35.881	0.08	0.08	0.54	0.82	1.00	71	71	66	1.10	0.40	217	0.019	100	100	32.2	1.00	5.04		107.1	172.2	144.0	61.0	168.2	611	78	80	66	-0.042	1.001	41.986	4503	
93	7.165	7.082	36.271	0.08	0.08	0.53	0.82	1.00	71	71	66	1.10	0.40	216	0.019	100	100	31.2	1.00	5.05		107.4	172.3	143.8	60.9	168.3	606	78	80	66	-0.042	1.001	42.069	4524	
94	7.242	7.158	36.661	0.08	0.08	0.54	0.82	1.00	71	71	66	1.10	0.30	215	0.019	100	100	30.3	0.90	5.03		107.4	172.2	143.9	61.0	168.2	603	78	79	66	-0.042	1.001	41.903	4504	
95	7.319	7.235	37.051	0.08	0.08	0.54	0.82	1.00	71	71	66	1.08	0.30	214	0.019	100	100	29.7	0.60	4.97		107.5	172.0	144.3	60.9	168.2	598	78	79	66	-0.042	1.001	41.403	4458	
96	7.396	7.311	37.441	0.08	0.08	0.53	0.86	1.00	71	71	66	1.10	0.30	213	0.019	100	100	28.8	0.90	5.07		107.3	172.2	143.7	61.0	168.2	594	78	79	66	-0.041	1.001	42.236	4539	
97	7.473	7.387	37.831	0.08	0.08	0.53	0.88	1.00	71	71	66	1.10	0.30	212	0.019	100	100	28.2	0.60	5.06		107.1	171.9	143.5	60.9	167.9	591	78	79	66	-0.041	1.001	42.153	4519	
98	7.550	7.463	38.221	0.08	0.08	0.54	0.86	1.00	71	71	65	1.10	0.30	212	0.019	100	100	27.3	0.90	5.04		106.9	171.7	143.4	60.9	167.7	590	78	79	65	-0.042	1.001	41.986	4494	
99	7.627	7.539	38.611	0.08	0.08	0.54	0.86	1.00	71	71	66	1.09	0.30	211	0.019	100	100	26.4	0.90	5.05		107.0	171.8	143.6	60.9	167.8	590	78	79	66	-0.041	1.001	42.069	4507	
100	7.704	7.615	39.001	0.08	0.08	0.53	0.85	1.00	71	71	66	1.10	0.30	211	0.019	100	100	25.7	0.70	5.06		106.5	171.7	143.4	61.0	167.7	589	78	79	66	-0.041	1.001	42.153	4494	
101	7.781	7.691	39.391	0.08	0.08	0.53	0.86	1.00	71	71	66	1.10	0.30	210	0.019	100	100	25.0	0.70	5.06		107.0	171.8	143.6	61.0	167.8	587	78	79	66	-0.041	1.001	42.153	4518	
102	7.858	7.768	39.781	0.08	0.08	0.54	0.85	1.00	71	71	66	1.09	0.30	210	0.019	100	100	24.1	0.90	5.04		106.8	171.6	143.3	61.0	167.5	584	78	79	66	-0.041	1.001	41.986	4491	
103	7.936	7.844	40.171	0.08	0.08	0.54	0.85	1.00	71	71	66	1.09	0.30	209	0.019	99	99	23.7	0.40	5.07		106.4	171.6	143.3	61.0	167.5	581	77	79	66	-0.041	1.001	42.236	4499	
104	8.013	7.920	40.561	0.08	0.08	0.53	0.83	1.00	71	71	66	1.09	0.30	208	0.019	99	99	22.8	0.90	5.06		106.4	171.4	143.1	61.0	167.4	578	77	79	66	-0.040	1.001	42.152	4491	
105	8.090	7.996	40.951	0.08	0.08	0.53	0.83	1.00	71	71	66	1.09	0.30	207	0.019	99	99	22.3	0.50	5.05		106.2	171.2	143.1	61.0	167.2	574	77	78	66	-0.040	1.001	42.069	4471	
106	8.167	8.072	41.341	0.08	0.08	0.54	0.83	1.00	71	71	66	1.09	0.30	206	0.019	99	99	21.5	0.80	5.05		106.4	171.3	143.1	61.0	167.3	572	77	78	66	-0.039	1.001	42.069	4480	
107	8.244	8.148	41.731	0.08	0.08	0.55	0.83	1.00	71	71	66	1.10	0.30	205	0.019	99	99	21.0	0.50	5.06		106.1	171.0	142.9	61.0	166.9	569	77	78	66	-0.039	1.001	42.152	4479	
108	8.321	8.225	42.121	0.08	0.08	0.53	0.82	1.00	71	71	66	1.09	0.30	205	0.019	99	99	20.2	0.80	5.08		106.3	171.0	143.0	61.0	167.0	569	77	78	66	-0.040	1.001	42.319	4503	
109	8.398	8.301	42.511	0.08	0.08	0.54	0.83	1.00	71	71	66	1.10	0.30	205	0.019	99	99	19.5	0.70	5.04		105.8	170.9	143.0	61.0	166.9	570	77	77	66	-0.040	1.001	41.986	4446	
110	8.475	8.377	42.901	0.08	0.08	0.55	0.83	1.00	71	71	66	1.10	0.30	204	0.019	99	99	18.7	0.80	5.04		105.5	170.7	142.7	61.0	166.8	567	76	77	66					

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						
126	9.708	9.595	49.142	0.08	0.08	0.55	0.84	1.00	71	71	66	1.12	0.30	194	0.019	98	98	10.8	0.10	5.07		101.5	166.2	139.2	60.6	162.0	530	74	74	66	-0.037	1.001	42.238	4293			
127	9.785	9.671	49.532	0.08	0.08	0.56	0.83	1.00	71	71	66	1.10	0.30	193	0.019	98	98	10.3	0.50	5.06		101.4	165.8	139.2	60.6	162.0	529	74	74	66	-0.037	1.001	42.155	4280			
128	9.862	9.748	49.922	0.08	0.08	0.55	0.84	1.00	71	71	66	1.10	0.30	193	0.019	98	98	9.6	0.70	5.06		101.0	165.4	138.9	60.7	161.6	529	74	74	66	-0.038	1.001	42.154	4262			
129	9.939	9.824	50.312	0.08	0.08	0.55	0.84	1.00	71	71	66	1.12	0.30	193	0.019	98	98	9.5	0.10	5.06		100.2	165.1	138.6	60.7	161.2	531	74	74	66	-0.037	1.001	42.154	4231			
130	10.016	9.900	50.702	0.08	0.08	0.56	0.84	1.00	71	71	66	1.12	0.30	193	0.019	98	98	8.8	0.70	5.06		100.3	165.3	138.7	60.9	161.2	531	74	74	66	-0.037	1.001	42.153	4232			
131	10.093	9.976	51.092	0.08	0.08	0.56	0.85	1.00	71	71	66	1.12	0.30	193	0.019	98	98	8.5	0.30	4.97		100.0	164.7	138.7	60.9	161.0	528	74	74	66	-0.037	1.001	41.403	4146			
132	10.170	10.052	51.482	0.08	0.08	0.55	0.84	1.00	71	71	66	1.10	0.30	192	0.019	98	98	8.1	0.40	5.12		99.6	164.6	138.2	60.9	160.6	524	74	74	66	-0.038	1.001	42.653	4253			
133	10.247	10.128	51.872	0.08	0.08	0.55	0.84	1.00	71	71	66	1.12	0.30	191	0.019	98	98	7.6	0.50	5.05		99.5	164.2	138.0	60.9	160.3	519	74	74	66	-0.037	1.001	42.069	4189			
134	10.324	10.205	52.262	0.08	0.08	0.55	0.84	1.00	71	71	66	1.12	0.30	190	0.019	98	98	7.2	0.40	5.05		99.2	163.8	137.7	60.9	160.0	516	75	74	66	-0.037	1.001	42.069	4179			
135	10.401	10.281	52.652	0.08	0.08	0.55	0.84	1.00	71	71	66	1.11	0.30	189	0.019	98	98	6.8	0.40	5.08		98.4	163.5	137.5	60.9	159.6	513	75	74	66	-0.037	1.001	42.320	4171			
136	10.478	10.357	53.042	0.08	0.08	0.55	0.84	1.00	71	71	66	1.12	0.30	189	0.019	98	98	6.6	0.20	5.09		98.1	163.1	137.2	60.9	159.3	512	75	74	66	-0.036	1.001	42.403	4164			
137	10.555	10.433	53.432	0.08	0.08	0.55	0.85	1.00	71	71	66	1.08	0.30	188	0.019	98	98	6.1	0.50	5.08		98.0	162.6	136.8	60.9	158.8	509	75	74	66	-0.036	1.001	42.319	4153			
138	10.632	10.509	53.822	0.08	0.08	0.55	0.84	1.00	71	71	66	1.10	0.30	188	0.019	98	98	5.8	0.30	4.89		98.1	162.5	137.5	60.9	159.0	508	75	74	66	-0.036	1.001	40.737	4000			
139	10.709	10.585	54.212	0.08	0.08	0.55	0.84	1.00	71	71	66	1.11	0.30	187	0.019	98	98	5.2	0.60	5.10		97.4	162.0	136.2	61.0	158.0	505	75	74	66	-0.035	1.001	42.486	4145			
140	10.786	10.661	54.602	0.08	0.08	0.55	0.84	1.00	71	71	66	1.12	0.30	186	0.019	98	98	5.0	0.20	5.08		97.0	161.6	136.0	60.9	157.7	499	75	74	66	-0.036	1.001	42.319	4112			
141	10.863	10.738	54.992	0.08	0.08	0.55	0.84	1.00	71	72	66	1.10	0.30	185	0.019	98	98	4.8	0.20	5.11		97.0	161.4	135.9	60.9	157.5	495	75	74	66	-0.036	1.001	42.569	4136			
142	10.940	10.814	55.382	0.08	0.08	0.56	0.84	1.00	71	72	66	1.12	0.30	184	0.019	98	97	4.3	0.50	5.06		96.5	161.2	135.6	60.9	157.2	490	75	74	66	-0.035	1.001	42.153	4072			
143	11.017	10.890	55.772	0.08	0.08	0.56	0.84	1.00	71	72	66	1.12	0.30	183	0.019	98	97	4.0	0.30	5.08		95.9	160.6	135.3	61.0	156.8	489	74	74	66	-0.035	1.001	42.319	4063			
144	11.094	10.966	56.162	0.08	0.08	0.54	0.84	1.00	71	72	66	1.09	0.30	183	0.019	98	97	3.6	0.40	5.10		95.5	160.2	134.9	61.0	156.4	488	75	74	66	-0.035	1.001	42.486	4061			
145	11.171	11.042	56.552	0.08	0.08	0.50	0.84	1.00	71	72	66	1.08	0.30	183	0.019	98	97	3.5	0.10	5.10		95.0	159.8	134.6	61.0	156.0	487	73	74	66	-0.035	1.001	42.486	4040			
146	11.248	11.118	56.942	0.08	0.08	0.54	0.85	1.00	71	72	66	1.11	0.30	182	0.019	97	97	3.2	0.30	5.10		94.7	159.5	134.5	61.0	155.7	488	73	74	66	-0.035	1.001	42.486	4026			
147	11.325	11.194	57.332	0.08	0.08	0.56	0.84	1.00	71	72	66	1.12	0.30	182	0.019	97	97	3.0	0.20	5.07		94.5	159.1	134.1	61.0	155.3	485	73	74	66	-0.034	1.001	42.236	3996			
148	11.403	11.271	57.722	0.08	0.08	0.55	0.84	1.00	71	72	65	1.12	0.30	181	0.019	97	97	2.5	0.50	5.08		94.0	158.8	134.0	61.0	155.0	482	73	74	65	-0.034	1.001	42.319	3983			
149	11.480	11.347	58.112	0.08	0.08	0.56	0.85	1.00	71	72	66	1.13	0.30	181	0.019	97	97	2.2	0.30	5.02		93.6	158.3	133.7	61.0	154.6	479	73	74	66	-0.034	1.001	41.819	3920			
150	11.557	11.423	58.502	0.08	0.08	0.56	0.84	1.00	71	71	65	1.13	0.30	180	0.019	97	97	2.1	0.10	5.08		93.1	158.1	133.5	61.0	154.5	477	74	74	65	-0.034	1.001	42.319	3944			
151	11.634	11.499	58.892	0.08	0.08	0.55	0.85	1.00	71	71	66	1.08	0.30	179	0.019	97	97	1.5	0.60	5.05		93.2	157.8	133.2	61.0	154.0	475	74	74	66	-0.034	1.001	42.069	3924			
152	11.711	11.575	59.282	0.08	0.08	0.57	0.85	1.00	71	71	66	1.12	0.30	179	0.019	97	97	1.3	0.20	5.07		92.5	157.2	132.7	60.9	153.3	474	73	74	66	-0.034	1.001	42.237	3912			
153	11.788	11.651	59.672	0.08	0.08	0.57	0.84	1.00	71	71	66	1.13	0.30	179	0.019	97	97	1.2	0.10	5.08		92.5	156.9	132.5	60.8	153.1	473	73	74	66	-0.034	1.001	42.320	3921			
154	11.865	11.728	60.062	0.08	0.08	0.56	0.85	1.00	71	71	66	1.13	0.30	179	0.019	97	97	0.6	0.60	5.09		92.2	156.6	132.2	60.7	152.7	474	73	74	66	-0.034	1.001	42.404	3915			
155	11.942	11.804	60.452	0.08	0.08	0.57	0.85	1.00	71	71	65	1.12	0.30	179	0.019	97	97	0.6	0.00	5.08		91.6	156.1	131.8	60.7	152.3	475	73	74	65	-0.034	1.001	42.321	3881			
156	12.019	11.880	60.842	0.08	0.08	0.56	0.84	1.00	71	71	66	1.13	0.30	178	0.019	97	97	-0.2	0.80	5.08		91.6	156.0	131.8	60.7	152.1	475	73	74	66	-0.034	1.001	42.321	3882			

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				
	12.019	11.880	60.842	0.08	0.08	0.53	0.80	1.00	69.34	69.43	65.20			211.77	0.02	99.99	99.99			4.97	#DIV/0!	103.4	168.1	141.2	60.9	164.3		76.80	77.17		-0.04		4301.80		

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[illegible]

Total Weight of Load (lb): 150.2

Total Moisture of Load (%): 23.1

Equipment Numbers:

Run Notes

Client: HeatmorModel: 350XProject #: 0275WB011E.AD01Tracking #: 2011Run #: 5 Date: 11/7/14Test Crew: A. Krawitz, J. ClarkOMNI 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 @ 1:50PRIMARY AIR: Set @ 1:50OTHER: N/ADESCRIBE OR SKETCH TEST SETTINGS BELOW:
(SETTINGS MUST BE ACCURATE AND REPRODUCIBLE)

PRIMARY:

Target Output: 100%

SECONDARY: N/ATERTIARY: N/AFAN: AutoTechnician signature: [Signature]Date: 11/7/14

Supplemental Data EPA 5G/5H

Client: Heatmor

Model: 350X

Project #: 0275WB011E.AD01

Tracking #: 2011

Date: 11/7/14 Run #: 5 Booth: E3

Test Crew: A. Kravitz, J. Clark Start Time: 13:53 Stop Time: 16:29

OMNI Equipment #(s): 132, 209, 410, 417, 419, 513, 533, 559

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	Pre Test			Post Test		
	Zero	Span	Mid	Zero	Span	Mid
Time	11:52	11:54	11:56	16:38	16:42	16:44
O ₂	N/A			N/A		
CO ₂	0.00	16.80	10.16	0.23	16.80	10.29
CO	0.000	4.295	2.498	0.015	4.293	2.516
CO ₂ (DT)	N/A			N/A		

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

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: 10/6/14 Initials: AK

	Initial	Middle	Ending
P _b (in/Hg)	30.45	30.43	30.40
Ambient (°F)	64	65	65

Tunnel Traverse	
dP (in H ₂ O)	T(°F)
0.014	206
0.024	204
0.026	204
0.026	203
0.028	203
0.006	203
0.014	202
0.020	202
0.024	202
0.020	201
0.022	201
0.010	201
Static P:	-0.30

Technician signature: AK

Date: 12/3/14

OMNI-Test Laboratories, Inc.

Manufacturer: Heatmor
Model: 350x
Date: 11/07/14
Run: 5
Control #: 2011
Test Duration: 156
Output Category: IV

Technicians: A Kravitz

Test Results in Accordance with CSA B415.1-09

	HHV Basis	LHV Basis
Overall Efficiency	68.7%	74.0%
Combustion Efficiency	94.9%	94.9%
Heat Transfer Efficiency	72%	78.0%

Output Rate (kJ/h)	300,293	284,860	(Btu/h)
Burn Rate (kg/h)	21.97	48.42	(lb/h)
Input (kJ/h)	436,929	414,474	(Btu/h)

Test Load Weight (dry kg)	57.12	125.90	dry lb
MC wet (%)	19.0873048		
MC dry (%)	23.59		
Particulate (g)	0		
CO (g)	4,022		
Test Duration (h)	2.60		

Emissions	Particulate	CO
g/MJ Output	0.00	5.15
g/kg Dry Fuel	0.00	70.40
g/h	0.00	1546.75
lb/MM Btu Output	0.00	11.97

Air/Fuel Ratio (A/F)	7.90
----------------------	------

VERSION:

2.3

3/23/2010

*Model: 350X
Heatmor
105 Industrial Park Ct. NE, P.O. Box 787
Warroad, MN 56763*

Section 5

Testing Results

Table 1A - 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 ²	Hrs	lb	% DB	Btu	Btu	Btu
IV	1 ¹	Max Capacity	N/A	271099	100%	2.3	149.2	22.2	975330	1050055	614490
I	3	< 15% of max	<38,337	36452	14.3%	15.33	147.2	21.47	967976	1042137	558936
II	4	16-24% of max	40,893 - 61,340	58287	22.8%	10.75	146.8	22.56	956779	1030082	626580
III	2	25-50% of max	63,895 - 127,791	118740	46.5%	5.47	149.6	22.59	974818	1049504	649111
IV	5	Max capacity	N/A	255582	100.0%	2.60	155.6	23.13	1009408	1086744	664513

¹Run not included in weighted average, see test discussion

²Percent of max based on Test Run 5 results

Table 1B - Data Summary Part B

			T2 Min	E_T	E	E	$E_{\text{g/hr}}$	$E_{\text{g/kg}}$	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	%	%
IV	1 ¹	Max capacity	135.2	84.3	0.30	0.13	37.2	1.5	58.5	70.3
I	3	< 15% of max	133.6	92.5	0.36	0.16	6.0	1.7	53.6	70.6
II	4	16-24% of max	131.8	89.0	0.31	0.13	8.3	1.6	60.8	70.5
III	2	25-50% of max	121.7	75.9	0.26	0.11	13.9	1.4	61.8	70.9
IV	5	Max capacity	131.8	43.9	0.15	0.06	16.9	0.8	61.1	68.7

¹Run not included in weighted average, see test discussion

Table 1C - Hang Tag Information

MANUFACTURER:	Heatmor		
MODEL NUMBER:	350X		
8-HOUR OUTPUT RATING:	$Q_{out-8hr}$	89753	Btu/hr
8-HOUR AVERAGE EFFICIENCY:	$\eta_{avg-8hr}$	61.4%	(Using higher heating value)
		66.1%	(Using lower heating value)
ANNUAL EFFICIENCY RATING:	η_{avg}	58.0%	(Using higher heating value)
		62.4%	(Using lower heating value)
PARTICLE EMISSIONS:	E_{avg}	9.3	GRAMS/HR (average)
		0.31	LBS/MILLION Btu OUTPUT

Table 2 - Year Round Use Weighting

Category	Weighting Factor (F_i)	$\eta_{del,i} \times F_i$	$E_{g/MJ,i} \times F_i$	$E_{g/kg,i} \times F_i$	$E_{lb/MMBtu Out,i} \times F_i$	$E_{g/hr,i} \times F_i$
I	0.437	23.4	0.07	0.74	0.16	2.64
II	0.238	14.5	0.03	0.39	0.07	1.97
III	0.275	17.0	0.03	0.38	0.07	3.82
IV	0.05	3.1	0.00	0.04	0.00	0.84
Totals	1	58.0	0.13	1.5	0.31	9.3

TEST RESULTS AND DISCUSSION

A total of five test runs were performed on the 350X boiler. The four test runs included in the weighted average were conducted in the following categories based on the manufacturer's rated heat capacity: one at 15% or less of maximum capacity (Category I); one at 16-24% of capacity (Category II); one at 25-50% of capacity (Category III); and one at the manufacturer's rated heat capacity (Category IV). Test Run 1 was invalidated as it exceeded the emission rate cap of 18.0 g/hr and was therefore not included in the weighted average.

The 350X furnace meets EPA's WHH Program Phase II emissions level of 0.32 lbs/mmbtu heat output. The 350X furnace qualifies for year-round use.

Emissions (lb/mmbtu output)	
Heating Season	0.28
Year-Round Use	0.31

The average Btu/hr for 8-hour burn time was measured to be **89753 Btu/hr**. The average efficiency for 8-hour burn time was measured to be **61.4%**.

The precision and accuracy of the emissions and heating efficiency results presented in this report cannot be specified because of the unmeasured variability of results that would occur between identical appliances and fueling protocols. It is estimated, using precision data from similar sampling and measurement methods that the precision of the results presented in this report are +/- 10 to 12% of the emissions values and +/- 3 to 4 percentage points of thermal efficiency.

Section 6

Example Calculations

Equations and Sample Calculations – Wood-fired Hydronic Heater

Manufacturer:	Heatmor
Model:	350X
Run:	3
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
$E_{lb/MMBtu \text{ input}}$	Emission rate, lb/MMBtu input
$E_{lb/MMBtu \text{ output}}$	Emission rate, lb/MMBtu output
$E_{g/kg}$	Emission rate, g/kg
$E_{g/hr}$	Emission rate, g/hr
$E_{g/hr \text{ 10,000 BTU}}$	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,

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

$$\%M_w = \frac{21.47 \times 100}{21.47 + 100}$$

$$\%M_w = 17.68 \%$$

$$W_{wd} = 147.2 \text{ lbs}$$

$$W_{wd} = 147.2 \times 0.4536 \text{ kg/lb}$$

$$W_{wd} = 66.8 \text{ kg}$$

$$BR = \frac{60 \times 66.8}{920} \times \frac{100 - 17.68}{100}$$

$$BR = 3.58 \text{ kg/hr}$$

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:

$$m_n = \underline{1.4} + \underline{18.2} + \underline{0.1}$$

$$m_n = \underline{19.7} \text{ mg}$$

Using equation for Train 2:

$$m_n = \underline{0.8} + \underline{17.0} + \underline{1.4}$$

$$m_n = \underline{19.2} \text{ mg}$$

$V_{m(std)}$ – 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:

$$V_{m(std)} = \underline{73.3} \times \underline{1.01} \times 17.64 \times \frac{(\underline{30.06} + \underline{0.54})}{(\underline{78.45} + 460)}$$

$$V_{m(std)} = \underline{72.78} \text{ ft}^3$$

Using equation for Train 2:

$$V_{m(std)} = \underline{73.988} \times \underline{1.01} \times 17.64 \times \frac{(\underline{30.06} + \underline{0.83})}{(\underline{78.35} + 460)}$$

$$V_{m(std)} = \underline{73.89} \text{ ft}^3$$

Using equation for ambient train:

$$V_{m(std)} = \underline{361.4} \times \underline{0.99} \times 17.64 \times \frac{(\underline{30.06} + \underline{0.00})}{(\underline{73.24} + 460)}$$

$$V_{m(std)} = \underline{355.39} \text{ ft}^3$$

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:

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

$$V_s = \frac{1}{1} \times 85.49 \times \frac{0.99}{1} \times \frac{0.128}{1} \times \left(\frac{\frac{93.802}{30.057} + \frac{460}{13.6}}{\frac{-0.27}{13.6}} \right)^{1/2} \times 28.78$$

$$V_s = \underline{8.69} \text{ ft/s}$$

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

** 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:

$$C_s = 0.001 \times \frac{19.7}{72.78}$$

$$C_s = \underline{0.000271} \text{ g/dscf}$$

For Train 2

$$C_s = 0.001 \times \frac{19.2}{73.89}$$

$$C_s = \underline{0.000260} \text{ g/dscf}$$

For Ambient Train

$$C_s = 0.001 \times \frac{1.2}{355.39}$$

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

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:

$$Q_{sd} = 3600 \times (1 - 0.02) \times \underline{8.69} \times \underline{0.785} \times \frac{528}{\underline{93.8} + 460} \times \frac{\underline{30.057} + \frac{-0.27}{13.6}}{29.92}$$

$$Q_{sd} = \underline{23030.75} \text{ dscf/hr}$$

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

$$E_T = (0.000271 - 0.000003) \times 23030.75 \times 920 / 60$$

$$E_T = 94.40 \text{ g}$$

For Train 2

$$E_T = (0.000260 - 0.000003) \times 23030.8 \times 920 / 60$$

$$E_T = 90.57 \text{ g}$$

Average

$$E = 92.48 \text{ g}$$

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

$$7.5\% \text{ of the average} = 6.94$$

$$\text{Train 1 difference} = 1.91$$

$$\text{Train 2 difference} = 1.91$$

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:

$$\begin{aligned} MC_{avg} = & (\underline{10.4} \times \underline{23.9} + \underline{10.7} \times \underline{25.4} + \underline{10.9} \times \underline{26.2} + \\ & \underline{9.7} \times \underline{19.3} + \underline{9.6} \times \underline{20.3} + \underline{9.7} \times \underline{21.6} + \\ & \underline{9.6} \times \underline{19.3} + \underline{9.8} \times \underline{19.3} + \underline{9.7} \times \underline{20.9} + \\ & \dots + (\underline{147.2} - \underline{141.6}) \times 10) / \underline{147.2} \end{aligned}$$

$$MC_{avg} = \underline{21.5} \%$$

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):

$$PR = \left(\frac{920 \times 0.08 \times 8.688 \times (78.45 + 460) \times (110.0 + 460)}{1 \times 73.3 \times 8.815 \times (70.00 + 460) \times (93.8 + 460)} \right) \times 100$$

$$PR = 103.1 \%$$

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

$$Q_{in} = (\underline{147.2} / (1 + (\underline{21.5} / 100))) \times 8600$$

$$Q_{in} = \underline{1042137} \text{ Btu}$$

For the Lower heating value

$$Q_{in} = (\underline{147.2} / (1 + (\underline{21.5} / 100))) \times 7988$$

$$Q_{in} = \underline{967976} \text{ Btu}$$

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 :

$$C_p = 1.0014 + (-0.000003485 \times \underline{68.64})$$

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

$$\sigma = (62.56 + (-0.0003413 \times \underline{68.64}) + (-0.00006225 \times \underline{68.6}^2)) \times 0.1337$$

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

$$\left| \sum (C_p \times \Delta T \times M \times t) \right| = 1.001 \times \underline{59.21} \times \underline{0.98} \times \underline{8.32} \times 1$$

$$\left| \sum (C_p \times \Delta T \times M \times t) \right| = 483 \text{ Btu}$$

$$\left| \sum (C_p \times \Delta T \times M \times t) \right| = \underline{503173} \text{ Btu}$$

$$Q_{out} = \underline{503173} + (\underline{3159} \times 0.1 + \underline{1.001} \times \underline{2170}) \times (\underline{166.61} - \underline{146.15})$$

$$Q_{out} = \underline{554073} \text{ Btu}$$

Heat Output Rate, Btu/hr

Test Method 28 WHH section 13.5.2

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

Sample calculation:

$$\text{Heat output rate} = \frac{554073.3}{(\frac{920}{60})}$$

$$\text{Heat output rate} = \frac{36135}{\text{Btu/hr}}$$

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

Test Method 28 WHH section 13.5.3

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

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

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

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

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

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

Sample calculation:

$$E_{g/MJ} = \underline{92.48} / (\underline{554073} \times 0.001055)$$

$$E_{g/MJ} = \underline{0.158} \text{ g/MJ}$$

Using higher heat value

$$E_{lb/MMBtu\ input} = (\underline{92.48} / 453.59) / (\underline{1042137} \times 10^{-6})$$

$$E_{lb/MMBtu\ input} = \underline{0.196} \text{ lb/MMBtu input}$$

Using lower heat value

$$E_{lb/MMBtu\ input} = (\underline{92.48} / 453.59) / (\underline{967976} \times 10^{-6})$$

$$E_{lb/MMBtu\ input} = \underline{0.211} \text{ lb/MMBtu input}$$

$$E_{lb/MMBtu\ output} = (\underline{92.48} / 453.59) / (\underline{558936} \times 10^{-6})$$

$$E_{lb/MMBtu\ output} = \underline{0.365} \text{ lb/MMBtu output}$$

$$E_{g/kg} = \underline{92.48} / ((\underline{147.2} \times 0.4536) / (1 + \underline{21.5} / 100))$$

$$E_{g/kg} = \underline{1.683} \text{ g/kg}$$

$$E_{g/hr} = \underline{92.48} / (\underline{920} / 60)$$

$$E_{g/hr} = \underline{6.031} \text{ g/hr}$$

$$E_{g/hr\ 10,000\ Btu} = \frac{\underline{92.48}}{((\underline{920} / 60) \times (\underline{558936} / 10,000))}$$

$$E_{g/hr\ 10,000\ Btu} = \underline{0.108} \text{ g/hr 10,000 Btu}$$

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:

$$\eta_{del} = (\underline{558936} / \underline{1042137}) \times 100$$

$$\eta_{del} = \underline{53.63} \%$$

$$\eta_{delLHV} = (\underline{558936} / \underline{967976}) \times 100$$

$$\eta_{delLHV} = \underline{57.74} \%$$

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:

$$E_{avg} = \frac{1.68}{1.4} \times 0.175 + \frac{1.64}{1.4} \times 0.275 + \frac{1.37}{1.4} \times 0.450 + \frac{0.77}{1.4} \times 0.100$$
$$E_{avg} = 1.4 \text{ g/kg}$$

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

$$\eta_{avg} = \frac{53.63}{58.0} \times 0.437 + \frac{60.83}{58.0} \times 0.238 + \frac{61.85}{58.0} \times 0.275 + \frac{61.15}{58.0} \times 0.050$$
$$\eta_{avg} = 58.0 \%$$

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:

$$Btu/hr = \underline{58287} + \{(8 - \underline{10.8}) \times [(\underline{118740} - \underline{58287}) / (\underline{5.46667} - \underline{10.75})]\}$$

$$Btu/hr = \underline{89753} \text{ for 8 hour burn time}$$