U.S. ENVIRONMENTAL PROTECTION AGENCY (EPA)
CERTIFICATION OF CONFORMITY
PURSUANT TO 40 CFR PART 60 SUBPARTS AAA AND QQQQ
2015 STANDARDS OF PERFORMANCE FOR NEW RESIDENTIAL WOOD HEATERS, NEW RESIDENTIAL HYDRONIC HEATERS AND FORCED-AIR FURNACES

Disclaimer: The statutory provisions and the EPA regulations described in this document contain legally binding requirements. This document is not a substitute for those provisions or regulations, nor is it a regulation itself. In the event of a discrepancy, please refer to 40 CFR PART 60 Subparts AAA AND QQQQ, Sections 60.533(b) and 60.5475(b). This document may be revised periodically without public notice. If you have additional questions, please contact Rafael Sanchez at 202-564-7028 or via email at sanchez.rafael@epa.gov.

GENERAL INFORMATION						
Manufacturer's Name: **MF Fire, Inc.**						
Heater Type (Circle One):	~~Adjustable Burn Rate Wood Heater~~	~~Pellet Stove~~	Single Burn Rate Heater	~~Hydronic Heater~~	~~Forced Air Furnace~~	~~Other:~~
Hydronic Heater Type (Circle ALL that apply):	~~Full Storage~~	~~Partial Storage~~	~~Indoor~~	~~Outdoor~~	~~Other:~~	
Forced-Air Furnace Type (Circle One):	~~Small (less than 65,000 BTU/hr heat output)~~	~~Large (greater than 65,000 BTU/hr heat output)~~	~~Other:~~			
Fuel Tested:	Crib	~~Pellet~~	~~Cordwood~~	~~Wood Chips~~	~~Other:~~	
Model Name(s) (as it appears on test report): **NOVA**						
Model Number(s) (as it appears on test report): **Same As Model Not Above**						
Catalyst: Yes__X___ No_____						
Mailing Address: **1400 Greenmount Ave. Suite B04**						
Street Address: **1400 Greenmount Ave. Suite B04**						
City: **Baltimore**	**State:** **MD**	**ZIP Code:** **21202**				
Phone: **1-855-MFFIRE-1**	**Fax** **Not Available**	**Web Site:** **www.mffire.com**				
Address of Manufacturer: **1400 Greenmount Ave. Suite B04**						
City: **Baltimore**	**State** **MD**	**ZIP Code:** **21202**				
EPA APPROVED THIRD PARTY CERTIFIER						
Authorized Representative(s): **Robert J. Zimmerman Jr.**						
Company: **UL LLC**						
Phone: **847-664-3129**	**E-mail:** **Robert.J.Zimmermanjr@ul.com**	**Fax:** **847-272-8129**				
City: **Northbrook**	**State:** **IL**	**ZIP Code:** **60062**				
Position: **Senior Staff Engineering Associate**						

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Report Number: **1801V2**	**Date(s) of Tests:** **March 5, 2018 thru March 12, 2018**	**Date of Report:** **April 10, 2018**
Quality Assurance Plan included?: **Yes __X___ No_____**	**Wood Heater/Hydronic Heater/Forced-Air Furnace Application Included:** **Yes ____X___ No_____**	**Remarks:**

Affected Source Data Summary

This affected source has been tested to (select one):
_____2015 NSPS particulate matter emissions limit of 4.5 g/hr
__X___2020 NSPS particulate matter emissions limit of 2.0 g/hr (2.5 g/hr if cordwood)

Wood Burning Heater	**Hydronic Heater**	**Forced-Air Furnace**
Weighted particulate emission average of __3__ test runs: _1.93_ grams per hour	Maximum Output Rating:_____ Weighted particulate emission average: _____ Lbs/MMbtu output	Particulate emission average: _____ Lbs/MMbtu output
Weighted average HHV efficiency of ___3__ test runs: __70.6__%	Annual Efficiency Rating:_____	Overall thermal efficiency (HHV): _____%
	Particulate Emissions:_____	Overall Delivered Heat Efficiency: ____%

AFFIRMATIONS

- **The above-named affected source has been tested by a laboratory qualified to test and report on the emissions of this type of product under 40 CFR Part 60, Standards of Performance for New Residential Wood Heaters, New Residential Hydronic Heaters and Forced-Air Furnaces (2015 Standards).**
- **The Test Report No.__1801V2___, prepared by __Kelli O'Brien_____ and dated __April 10, 2018___, has been reviewed by __Robert J. Zimmerman Jr.____ and was found to be complete and to have used the correct procedures in accordance to the 2015 Standards.**
- **The emissions levels listed in the test report and listed above comply with the relevant particulate matter limits established by the 2015 Standards.**
- **The model listed above was tested using the following Test method(s):__28R, ASTM E2515, and CSA B415.1-10__.**
- **The permanent label and owner's manual meet the requirements of 40 CFR § 60.536 and/or § 60.5478.**
- **The above-named manufacturer, on the effective date of this certificate, was operating under a quality assurance plan, per 40 CFR § 60.533(m) and/or § 60.5475(m), that has been reviewed and approved by ___Robert J. Zimmerman Jr.___**
- **The above-named manufacturer has contracted _____UL LLC___ to conduct regular (at least annual) unannounced audits of the manufacturing facility, affected source, and quality assurance plan pursuant to 40 CFR § 60.533(m) and/or § 60.5475(m).**

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Robert J. Zimmerman Jr. – Senior Staff Engineering Associate **Print Name and Title** *Robert J. Zimmerman Jr.* **Signature of Authorized Third-Party Representative** **April 24, 2018** **Date** **This is a certification of conformity to certify that the bearer has successfully completed the requirements pursuant to the 2015 Standards.** **Third-party EPA approval expiration date: 2020-11-12** **V1 5.19.16**	**Remarks:**

NOVA

Free Standing Single Burn Rate Wood Stove

Prepared for:

MF Fire

Baltimore, Maryland

Prepared by:

ClearStak, LLC

Putnam, CT

Kelli O'Brien

Project Manager

CSL-00010

Report 1801V2

April 10, 2018

99 Canal Street

Putnam, CT 06260

860-237-8245

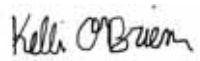
NON-CBI

1 Affidavit

MF Fire contracted ClearStak, LLC to perform emissions and efficiency testing of the single burn rate stove, Nova, in accordance with U.S. EPA's 40 CFR 60 subpart AAA, of *Standards of Performance for New Residential Wood Heaters, New Residential Hydronic Heaters and Forced Air Furnaces* (NSPS). The average PM emissions for two test runs was 1.93 g/hr., which falls below the NSPS Step 2 PM emission limit of 2.0 g/hr. An average results summary can be found in Table 1. All test results apply solely to the wood stove, Nova. This test report shall not be reproduced, except in full, without the written approval of MF Fire and ClearStak, LLC.

Table 1. Summary Results

Average Results Summary			
Burn Duration	Energy Output	PM	Efficiency (HHV)
hrs.	Btu/hr	g/hr.	%
2.48	**22,592**	**1.93**	**70.6**



Kelli O'Brien
Lab Manager

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5 Acronyms and Abbreviations

Appliance	Customer system
ASTM	American Society for Testing and Materials
Btu	British thermal unit
CO	Carbon Monoxide
CSA	Canadian Standards Association
EPA	Environmental Protection Agency
g/hr	grams, grams per hour
HHV	Higher heating value
MC	Moisture content
NSPS	Standards of Performance for New Residential Wood Heaters New Residential Hydronic Heaters and Forced-Air Furnaces, 2015.
PM	Particulate matter
ppm	Parts per million
SLM	Stack loss method
U.S.	United States

1 Introduction

1.1 Purpose

MF Fire contracted with ClearStak, LLC to perform U.S. EPA certification testing on the wood stove, Nova, a single burn rate wood stove, per subpart AAA of 40 CFR 60 for wood stoves of the revised *Standards of Performance for New Residential Wood Heaters, New Residential Hydronic Heaters and Forced-Air Furnaces* (NSPS).

1.2 The Assignment

The assignment was to measure particulate matter (PM) and efficiency at a single burn rate of the free-standing Nova wood stove. PM emissions are measured in a dilution tunnel and determined using ASTM E2515-11. The stove was operated according to Method 28R, which incorporates ASTM E2780, and was fired according to the customer's written instructions. Efficiency was determined using CSA B415.1-10.

1.3 Test Environment

ClearStak's emissions and efficiency testing laboratory is located at 99 Canal Street in Putnam, CT 06260, 236 ft. above sea level. Gravimetric analysis is performed at ClearStak's laboratory located at 479 Tolland Turnpike, Willington 06279, 689 ft. above sea level.

2 Appliance Identification

The Nova stove is a free standing single burn rate wood burning stove that uses natural draft for air flow and a catalyst for emission reduction. Primary air is vented from the back of the stove through two 2.50 in. x 0.50 in. rectangular openings. Primary air is then transferred through a U-shape square tube where it is heated and then forced downward into the firebox by the door. Secondary air is drawn from the back of the stove through a 5-7/8 in. x 0.50 in. rectangular opening and four 0.50 in. diameter holes. Secondary air is forced downward into the firebox through an array of exit holes, 0.25 in. in diameter. The primary and secondary air openings from the back of the stove is depicted in Figure 1. Air flow schematic can be found in appliance drawings in Appendix A.

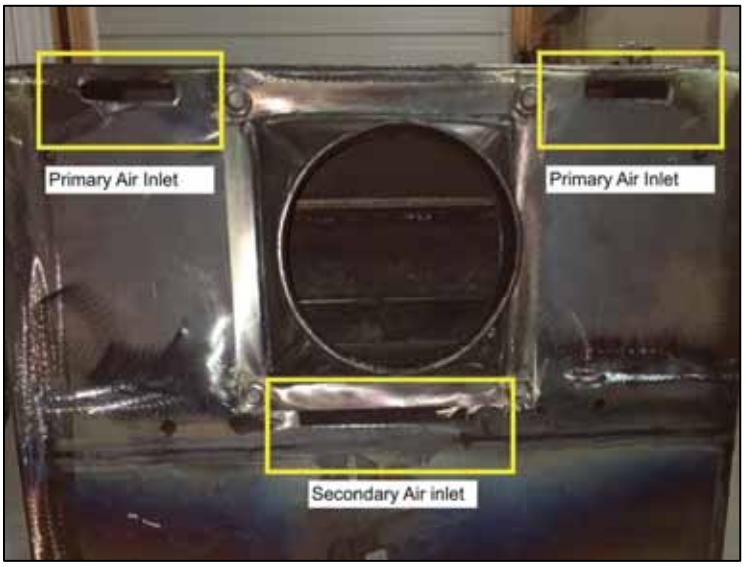


Figure 1. Primary and Secondary Air

Nova was delivered to the ClearStak emissions testing facility by MF Fire representatives, Taylor Myers and Ryan Fisher on February 6th, 2018. See Table 2 for appliance identification and Figure 2 for stove images.

Table 2. Identifies the appliance to be tested.

Appliance Identification

Appliance	Free standing single burn rate wood stove
Manufacturer	MF Fire, 1400 Greenmount Ave., Suite B04, Baltimore, MD 21202
Customer Contact	Taylor Myers, Taylor@MFFire.com
Model	Nova

Automated Control System	No, manual ignition
Serial Number	Model #002
Date of Appliance Arrival	February 6th, 2018
ClearStak Test Identification	CSL-00010
Condition	New, prototype
Aging Date	February 6th – February 28th, 2018, minimum 50 hours for catalyst
Testing Period	Three tests performed between March 5th – March 12th 2018
Catalyst	Yes, rectangular catalyst, H = 2.5 in., D = 2.0 in., W = 13 in.
Heat Exchanger Blower	No
Firebox volume	Usable firebox volume 1.63 ft^3
Outer Dimensions	H = 24 in., W = 24 - 3/8 in., D = 21- 7/8 in.
Overall Weight	303.20 lbs.

Figure 2. Stove Profile

2.1 Informative Material to be Supplied

Written instructions from the customer was supplied and attached to this report in the Appendices. See Appendix A for the customer written instructions and appliance drawings.

3 Test Arrangements and Set-Up

The appliance was assembled by MF Fire representatives, Taylor Myers and Ryan Fisher on February 6th, 2018 in the ClearStak lab. The stove was operated by ClearStak test technicians according to procedures described in the customer's written instructions and required test methods, Method 28R and CSA B415.1-10.

The appliance was placed in the center of a floor scale and positioned under the hood of the dilution tunnel as per ASTM E2515. A 6 in. diameter single wall black steel pipe was mounted to the flue exit of the stove and extended upward 8 ft. into an 8 in. diameter double wall insulated Class A floating chimney pipe for a total height of 15 ft. above the upper surface of the floor scale.

The dilution tunnel has a 12 in. diameter horizontal mixing section and a vertical 8 in. diameter sampling section. The flow rate in the dilution tunnel was maintained at a constant flow rate throughout the test cycle by using an inducer fan at a fixed frequency of 16 Hz. Samples of the dilution tunnel flow stream were extracted from the center of the 8 in. diameter section of the dilution tunnel using a dry gas meter at a constant flow rate and drawn through two 47 mm. glass fiber filters.

K-type and J-type thermocouples were positioned per Method 28R, CSA B415.1-10, and ASTM E2515 for measuring surface temperatures, gas temperatures, and room temperature. Thermocouples measuring surface temperature were placed in sheaths welded centrally on five surfaces of the stove.

3.1 Instrumentation

The following is a list of key instrumentation used for testing, Table 3. Some of these instruments and their locations are labeled in Figure 3 and Figure 4. Calibration records on instrumentation used can be found in Appendix B, submitted electronically.

Table 3. Key Instrumentation List

Part	Manufacturer	P/N	ED #
Ambient Sampler	Gallus	2000	AS-1
Analytical Balance	Ohaus	AR2140	AB-1
Anemometer	Dwyer Instruments	24A466	AN-1
Balance Calibration Weights	Troemner	100 g – 2 mg Class 1	BCW-1
Barometer 1	Cole Parmer	EW-99760-50	BR-1
Data logger	Environmental Systems Corporation	8832	DL-1
Display (unit)	Sartorius	MIS2UR-V2	DU-2
Front Half Filter Holder	Tefzel	410-21-47	FF-01,03,04,05,07,08,12,14,17,18,20,21,

Gas Analyzer 1	Thermo-Scientific	60i	GA-1
Gas Analyzer 2	SIEMENS	Ultramat 23	GA-2
Humidity Gauge 2	Control Company	4096	HG-4
Inclined Manometer	Dwyer	115	MN-1
Isokinetic Stack Sampler 1	Graseby Nutech (Thermo Scientifc)	2010A	SS-1
Isokinetic Stack Sampler 2	Graseby-Anderson (Thermo Scientific)	2010A	SS-2
J Type Thermocouple	Omega	TT-J-24-SLE-50	A23-1
K Type Thermocouple	Omega	KQIN-18U	A07-1, A24-1, A25-1, A26-1, A27 -1, A28-1, A29-1, A32-1, A33-1, A34-1, A35-1, A36-1
Pitot Tube 1	Dwyer Instruments	160F	PT-1
Scale	Sartorius	CAPP1U-1000HH-LU	SWT-1
Scale Calibration Weight Unit	Troemner	2 Kg Class F	SWU-1
Stopwatch	Fisher Scientific	14-649-50	SW-8,9
Tape Measure	Starrett	KTX12-12-N	TM-3
Tunnel Blower	Cincinnati Fan	WAF/HTF - 12	TB-1
Wood Moisture Meter 2	Delmhorst	J-2000	WMM-2

Figure 3. Stove installed on scale installed on test stand

Figure 4. PM sampling locations

3.2 Test Fuel

The test fuel used was a Douglas Fir dimensional lumber, grade 2 or better, at an average of 19-25 % moisture content. The crib(s) comprised of three 2" x 4" and two 4" x 4" pieces. The fuel loading density for a wood stove is 7.0 lbs./ft^3 +/- 0.7 lbs./ft^3. The weight of a full test crib was determined to be 11.44 lbs. +/- 1.141 lbs. based on a firebox volume of 1.63 ft^3, as shown in the sketch provided in Figure 5. The test fuel charge piece lengths were all 14.50 in., which closely approximates 5/6th the dimensions of the firebox length and were arranged in parallel to the longest firebox dimension. Figure 6 demonstrates an example of the test fuel crib used for testing. Refer to Appendix C for detailed fuel analysis per test run.

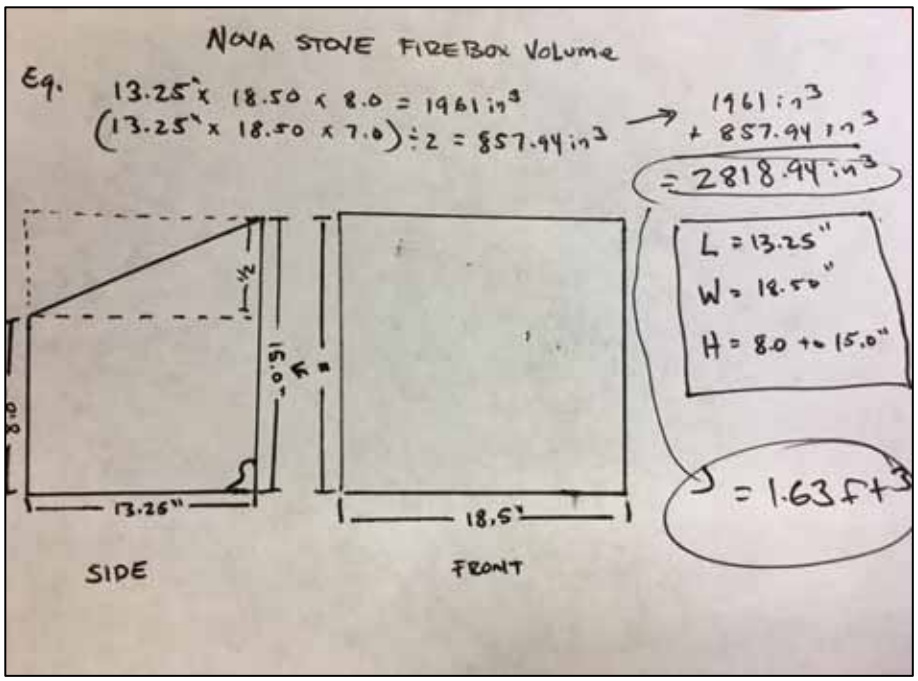


Figure 5. Firebox volume

Figure 6. Test fuel crib example

4 Operation Procedure

Testing procedures follow the test methods: Method 28R, ASTM E2780, CSA B-415.1-10, ASTM E2515-11 and methods referenced within.

All test preparation and measurements were conducted by personnel of the laboratory responsible for the submission of the test report.

4.1 Onsite Personnel and Roles

Kelli O'Brien: Lab Manager, Test Technician

Brian Vinal: Test Technician

4.2 Observers

There were no representatives of MF Fire physically present during certification testing, however, the customer was able to view temperature and gas data live through mobile/web Kelvin application.

4.3 Sampling

Two dual filter dry sampling train systems were used in collecting particulate samples from the dilution tunnel. Two sampling trains collected particulate from an 8 in. diameter dilution tunnel and one sampling train collected particulate from ambient air. All particulate sampling conditions were in compliance with ASTM E2515-11 and collected every 10 minutes. At the end of each test run, filters were removed from their housings; filters were desiccated for 24 hours, and then weighed to a constant weight per ASTM E2515-11 section 10. Front half probe assemblies were rinsed with acetone, with help of a Teflon brush, and dried down in clean beakers and weighed to a constant weight per ASTM E2515 and EPA Method 5. Other sampling and analytical procedures used followed EPA Methods 1,2,3,4,5, and 28 and CSA B-415.1-10.

4.4 Flue Gas Analysis

Flue gas temperature was measured using k-type thermocouples in the stack of the appliance and in the dilution tunnel per ASTM E2515. CO, CO_2, and O_2 concentrations were measured in the stack of the appliance per CSA B415.1-10. Gaseous emission concentrations were collected and stored as 1-minute averages.

4.5 Temperature Measurements

Surface and catalyst temperatures were measured using calibrated k-type thermocouples and installed according to Method 28R. Surface k-type thermocouples were positioned in welded metal sleeves on the central surfaces of the wood stove's sides, bottom, top and back faces. Temperature measurements were collected and stored as 1-minute averages.

5 Results and Data Summary

The stove's emissions from two of three test runs conforms to 2020 NSPS, Step 2, with an average PM emission rate of 1.93 g/hr. See Appendix C for all test run data per run.

Table 4. Emissions Summary A

		Θ	W_{fuel}	MC_{ave}	Q_{out}	E_T	E_1	$E_{g/hr}$	$E_{g/kg}$	H_{SLM}
Run #	Date	Test Duration	Wood Weight	Wood Moisture	Heat Output (CSA)	Total PM Emissions	Startup PM Emissions	PM Rate	PM Factor (CSA)	Overall Efficiency HHV
		hrs.	lb.	%	Btu/hr	g	g	g/hr.	g/kg	%
1	3/5/18	2.63	11.72	22.53	19,959	5.19	5.08	1.97	1.26	67.9
3	3/12/18	2.32	11.88	21.22	25,224	4.39	4.11	1.89	1.04	73.2
Average		**2.48**	**11.8**	**21.88**	**22,592**	**4.79**	**4.60**	**1.93**	**1.15**	**70.6**

Table 5. Emissions Summary B

Run #	Date	Burn Rate	CSA B415 CO	CSA B415 CO	CSA B415 CO
		kg/hr.	g/hr.	g/kg dry	g/MJ Output
1	3/5/18	1.56	9.49	6.06	0.45
3	3/12/18	1.83	11.58	6.32	0.44
Average		**1.70**	**10.54**	**6.19**	**0.45**

5.1 Description of Test Conditions

Table 6. Testing Laboratory Conditions

Run #	Date	Room Temperature (˚F)		Barometric Pressure (in. Hg)		Relative Humidity (%)	
		Before	After	Before	After	Before	After
1	3/5/18	65	73	29.7	29.7	40	30
3	3/12/18	68	75	29.8	29.7	37	29

Table 7. Sampling Conditions

Dilution Tunnel					PM Sampling
		Velocity	Flow rate	Temperature	Flow rate
Run #	Date	Ft./sec.	Dscfm	˚F	dscfm
1	3/5/18	15.2	294	98.03	0.240
3	3/12/18	15.4	297	102.4	0.233

5.2 Temperatures

Table 8. Average Surface Temperature

Average Surface Temperatures				
		Beginning Average Surface Temperature	Ending Average Surface Temperature	Average Change in Surface Temperature
Run #	Date	˚F	˚F	˚F
1	3/5/18	333.7	320.8	12.9
3	3/12/18	325.4	348.2	22.8

Table 9 Average Catalyst Temperatures

Catalyst Temperatures				
		Beginning Catalyst Temperature	Ending Catalyst Temperature	Average Catalyst Temperature
Run #	Date	˚F	˚F	˚F
1	3/5/18	824.0	685.1	817.9
3	3/12/18	911.0	644.9	834.5

5.3 Process Operation Comments

Technician notes, comments, and observations, and fuel bed adjustments were recorded in the Kelvin application. All notes recorded in Kelvin are attached in Appendix D.

5.4 Information and Comments

ClearStak uses Alternate Test Method Alt-126 for determining particulate emissions from the front half filter probe assemblies. Approval of this test method is found in Appendix E in a letter from the EPA.

ClearStak collects the particulate matter recovery and weights of the front half filter probe assembly by applying procedures regarding acetone probe rinses described in section 8.7 of EPA Method 5, *Determination of Particulate Matter Emissions from Stationary Sour*ces, in place of using the sample recovery procedure required in section 10.2.2 of ASTM E2515-11, *Standard Test Method for Determination of Particulate Matter Emissions Collected by a Dilution Tunnel* per requirement of 40 CFR 60 part AAA and QQQQ. The difference between the two recovery procedures is that EPA Method 5 determines particulate matter of the probe by collecting the particulate through acetone rinses and dried down beakers, rather than weighing the entire 100+ gram probe assembly before and after a test to evaluate recovery values measured in milligrams.

ClearStak performs gravimetric analysis of all particulate matter samples at an offsite location and not in the emission testing laboratory to ensure quality low mass measurements uninfluenced by ground vibrations. The rinse is then transferred from the jar to clean and desiccated pre-weighed beakers where they are dried down, desiccated, and then weighed in 6-hour intervals until two consecutive weights are achieved within 0.2 mg, as required in ASTM E2515-11.

6 Quality Control and Assurance Procedures and Results

Calibration procedures and checks were conducted per EPA Method 28R, Method 5, and ASTM E2515. Calibration certificates and checks can be found in Appendix B and Appendix C, Calibration Data. Appendix F. is a copy of ClearStak Credentials.

Test method quality control procedures, including but not limited to, leak checks, volume checks, stratification checks, and proportionality results were followed in procedures outlined in section 4 and can be found in the raw data for each test run, Appendix C.

6.1 Unit Seal

The appliance was sealed with a ClearStak seal, noting the model, manufacture, and ClearStak test ID, and then metal band strapped to a wooden pallet for return to the Customer for storage.

7 Statement of Uncertainty

The average combined estimated uncertainty of measurement for PM emissions is 4.79 g. +/- 1.13 g. at 95% Confidence. The average expanded uncertainty of measurement for efficiency is 70.6% +/- 5.3% at 95% Confidence. Calculations can be found in Appendix C.

As referenced from Method 28, it is not possible to specify the precision of the procedure in this test method because the appliance operation and fueling protocols and the appliances themselves produce variable amounts of emissions and cannot be used to determine reproducibility or repeatability of this method.

As referenced from Method 28, no definite information can be presented on the bias of the procedure in this test method for measuring solid fuel biomass heater emissions because no material having an accepted reference value is available.

The test results apply only to the specific appliance tested and do not apply to other products produced by the Customer. The Customer agrees not to reproduce, duplicate, copy, sell, resell or exploit for any purpose, any portion of this report without written approval from ClearStak.

8 References

80 FR 13671 Standards of Performance for New Residential Wood Heaters New Residential Hydronic Heaters and Forced-Air Furnaces, 2015, (NSPS).

ASTM E2515-11, Standard Test Method for Determination of Particulate Matter Emissions Collected by a Dilution Tunnel, ASTM International, West Conshohocken, PA, 2011, www.astm.org

9 Appendices

Appendix A. Customer Supplied Documents

Appendix B. ClearStak Instrumentation Records

Appendix C. Test Run Data

Appendix D. Kelvin Summary Notes

Appendix E. EPA Letter

Appendix F. ClearStak Credentials

CSL-00010

Appendix A

ENGINEERING DRAWINGS
REDACTED

EPA Test procedure

Do not open the bypass in the EPA test model!

Establish thick coal bed by doing at least 1 full burn before pre-burn.

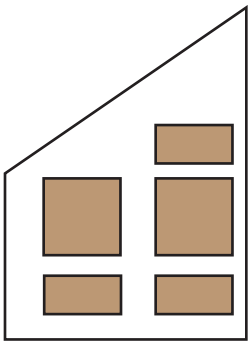
Pre-burn with door slightly cracked to maintain high heat

15 minutes before test remove all ash and small coals, leaving only large coals.

If Catalyst is not at 800 F prior to test start, add more pre-burn fuel and wait 15 more minutes.

Rake coals so there is a channel in the middle, spanning from the front to the back, with a slight bunching of coals near the front:

Load wood as follows:



Shut the door within 1 minute of initial loading

CSL-00010

Appendix B

DICK MUNNS COMPANY
LIQUID & GAS FLOW CALIBRATION

ISO 17025 ACCREDITED
CL-122

CERTIFICATE OF CALIBRATION

CUSTOMER:	**CLEAR STAK** PUTNAM CT	**CALIBRATION DATE:**	01/16/18
PO NUMBER:	KELLI O'BRIEN	**CALIBRATION DUE:**	01/16/19
INST. MANUFACTURER:	AIRTOX/ SCHLUMBERGER	**PROCEDURE:**	NAVAIR 17-20MG-02
INST. DESCRIPTION:	AIR SAMPLER/ STACK SAMPLER	**CALIBRATION FLUID:**	AIR @ 14.7 PSIA 70 F
MODEL NUMBER:	GALLUS 2000 (AL-307744)	**STANDARD(S) USED:**	A4, A24 DUE 06-2020
SERIAL NUMBER:	003035641	**NIST TRACE #' S:**	1446135470, 1453926155
RATED UNCERTAINTY:	+/- 1 % RD.	**AMBIENT CONDITIONS:**	768 mm HGA 53 % RH 70 F
UNCERTAINTY GIVEN:	TOTAL measurement uncertainty: +/- .190 % RD. K=2	**CERTIFICATE FILE #:**	471999.18

NOTES: AS RECEIVED/ AS LEFT WITHIN SPECS. REFERENCE CONDITIONS ARE: 760 mm HGA 70 F

TEST POINT NUMBER	UUT INDICATED SCMH PD.METER	DM.STD. ACTUAL SCMH PD.METER	CORRECTION FACTOR	UUT INDICATED L/ MIN FLOW	DM.STD. ACTUAL SLPM FLOW
1	0.0478	0.048	1.0038	1	1.009
2	0.1007	0.101	1.0032	2	2.013
3	0.4978	0.499	1.0024	3	3.024
4	1.0003	1.002	1.0017	4	4.036
5	1.5016	1.505	1.0022	5	5.058
6	1.9930	1.997	1.0020	GAUGE	GAUGE
7	2.2433	2.248	1.0021	"HG VAC.	"HG VAC.
8	2.4960	2.501	1.0020	0-20	0-20
		AVERAGE	1.00243		

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 • 11133 Winners Circle • Los Alamitos, CA 90720
Phone (714) 827-1215 • Fax (714) 827-0823

Date: 1/16/2018

Approved By:

Calibration Technician:

Tektronix®

ACCREDITED

CALIBRATION CERT #2357.21

Certificate of Calibration

13081905

Instrument Identification

Company ID: 1087
CLEARSTAK
KELLI OBRIEN
99 CONAL STREET
PUTMAN , CT 06260

PO Number: CS17120

Instrument ID: **M26AA**
Manufacturer: DWYER
Description: THERMO ANEMOMETER

Model Number: 471B-1
Serial Number: M26AA

Accuracy: Air Velocity: ±3% of Full Scale. Temperature: ±0.5°F.

Certificate Information

Reason For Service: CALIBRATION
Type of Cal: ACCREDITED 17025 WITH UNCERTAINTIES
As Found Condition: IN TOLERANCE
As Left Condition: IN TOLERANCE
Procedure: CSWW-CP-AIR1 ISSUE DATE 2 MAR 2017

Technician: JAMES PRESTON
Cal Date 13Dec2017
Cal Due Date: 13Dec2018
Interval: 12 MONTHS
Temperature: 25.0 C
Humidity: 20.7 %

Remarks: *# Denotes unaccredited nominal. Replaced 9 volt battery. Data report attached.*

Tektronix certifies the performance of the above instrument has been verified using test equipment of known accuracy, which is traceable to a National Standards Laboratory (NIST, NPL, PTB). The policies and procedures used comply with ISO/IEC 17025:2005. This certificate shall not be reproduced, except in full, without the written approval of the calibration facility. Reported uncertainties are expanded uncertainties expressed at approximately the 95% confidence level using a coverage of k=2.

This certificate and associated attachments relate only to the metrological quantities presented in this report. No representation is made about the long-term stability of this unit. Any number of factors can influence the calibration that may cause the unit to drift out of specification before the calibration interval has expired.

 Data Report Attached.

Approved By: JAMES PRESTON
Service Representative

Issue Date: 12/13/2017

Calibration Standards

NIST Traceable#	Inst. ID#	Description	Manufacturer	Model	Cal Date	Date Due
12044098	01-1672	THERMOMETER, HANDHELD, 1 CHANNEL	HART SCIENTIFIC	1521	20Jan2017	20Jan2018
12070503	01-2006	SECONDARY REFERENCE PROBE	FLUKE/HART	5615-12	27Jan2017	27Jan2018
12565539	01-DA01	NON-ISOLATED PRESSURE MODULE, 0 TO 2	ASHCORFT	AQS-1	27Jun2017	27Jun2018

Tektronix®

ACCREDITED

CALIBRATION CERT #2357.21

Certificate of Calibration

13081905

Calibration Standards

NIST Traceable#	Inst. ID#	Description	Manufacturer	Model	Cal Date	Date Due
12345092	01-TEMP9	PROBE	NEWPORT ELECTRC	ITHP-5-DB9	19Apr2017	19Apr2018
12562534	SP-0263	HANDHELD CALIBRATOR	ASHCROFT	ATE-100	26Jun2017	26Jun2018
12334398 REV 1	01-1951	ANEMOMETER	OMEGA	HHF-142	05Apr2017	05Apr2018

Tektronix

Certificate Number: 13081905
Manufacturer: DWYER
Model Number: 471B-1
ID / Asset Number: M26AA
Calibration Date: 12/13/2017

Function / Range	Nominal Value	As Found	Result	As Left	Result	Min	Max	Units	Uncertainty
AIR VELOCITY FPM									
AIR VELOCITY FPM	#200.0	203.0	Pass	Same	Pass	20.0	380.0	fpm	5.1 fpm
	500.0	488.0	Pass	Same	Pass	320.0	680.0	fpm	4.4 fpm
	1000.0	945.0	Pass	Same	Pass	820.0	1180.0	fpm	2.4 fpm
	2000.0	1898.0	Pass	Same	Pass	1820.0	2180.0	fpm	5.5 fpm
	4000.0	3843.0	Pass	Same	Pass	3820.0	4180.0	fpm	9.4 fpm
TEMPERATURE °F									
TEMPERATURE °F	77.0	76.6	Pass	Same	Pass	76.5	77.5	°F	0.13 °F

Accredited Calibration Datasheets may contain measurements that are not covered by the Scope of Accreditation. These measurements are indicated by a pound sign (#).
Measurements with an (*) indicates an Indeterminate Guardband Pass or Fail - Guardbanding is determined by the Measurement Uncertainty Method

********END OF MEASUREMENT REPORT********

Atlantic Scale Co., Inc.
136 Washington Avenue Nutley, NJ 07110 * Tel: 973-661-7090 * Fax: 973-661-3651 * www.atlanticscale.com

ISO/IEC 17025:2005
Calibration Cert No. 2736.01

WEIGHT CALIBRATION CERTIFICATE

Certificate for: ClearStak, LLC
99 Canal Street
Putnam, CT 06260

Certificate Number: 18-68566
Serial Number: 42652
ID Number: 7228-OW
Date of Calibration: 05-February-2018
Next Calibration Due: 05-February-2019

Weight Info

Weight Range: (100g-2mg) 19pc Set
Accuracy Class: (ASTM E 617) 1
Manufacturer: Troemner
Construction: Type II (100g-1g); Type I (500mg-2mg)
Material: S/S (100g-50mg, 5mg); Al (20mg's, 10mg, 2mg)

Laboratory Info

Weight(s) Received: 31-January-2018
Date of Certificate Issue: 05-February-2018
Condition of Weight(s): Good
Procedure: SWI-10.08
Weighing Design: SOP 4 NISTIR 6969

Certificate Information

Traceability Statement:
Atlantic Scale certifies the weights listed within this certificate have been calibrated against reference standards that are directly traceable to NIST. The Weighing Design used in this calibration is derived from NIST testing methods for Precision Mass Calibrations. This Certificate represents a calibration within the scope of accreditation of ISO/IEC 17025, General Requirements for the Competence of Calibration and Testing Laboratories. The data listed only applies to the weights specifically documented in this report.

Uncertainty Statement:
A best estimate of possible inaccuracy of the measured values, due to both systematic and random components. The Combined Uncertainty includes the uncertainty reported for the standard and the uncertainty for the measurement process. The Combined Uncertainty is multiplied by the Coverage Factor, k=2, to give an Expanded Uncertainty, and a Confidence Level of 95%.

As Found Values & Tolerance Disposition:
The value of the weight as received by Atlantic Scale after a light cleaning and before any adjustment. When determining the tolerance disposition of a particular weight, the As Found Weight Value is rounded to the same significant figures as the documented tolerance.

Conventional Mass Values:
Weight Values documented in this report are Conventional Mass Values (i.e. results from weighing in air). For a weight taken at 20 ° C, the conventional mass is the mass of a reference weight with a density of 8000 kg/m^3 for which it balances in air of denisty of 1.2 kg/m^3.

Construction Type:
Type I weights are of one-piece construction with no adjustment cavities. These weights can not be adjusted to a heavier value. Type II weights are of two-piece construction with some form of an adjusting cavity for adding and removing weight.

Air Density & Magnitude of Air Buoyancy:
The Air Density (Temperature, Barometric Pressure, and Rel. Humidity taken at the time of the calibration) is calculated to determine the mass value and adjust for any air buoyancy corrections. The Magnitude of Air Bouyancy Correction is the adjustment made to compensate for the lifting effect from air on the weight during calibration.

Comments: Weights were within tolerance

ASC1060.3

Atlantic Scale Co., Inc.
136 Washington Avenue Nutley, NJ 07110 * Tel: 973-661-7090 * Fax: 973-661-3651 * www.atlanticscale.com

ISO/IEC 17025:2005
Calibration Cert No. 2736.01

WEIGHT CALIBRATION CERTIFICATE

Certificate for: ClearStak, LLC
99 Canal Street
Putnam, CT 06260

Certificate Number: 18-68566
Serial Number: 42652
ID Number: 7228-OW
Date of Calibration: 05-February-2018
Next Calibration Due: 05-February-2019

Signatures

Calibrated By: Mark Keefe
Mass Metrologist
Mark Keefe

Approved By: Fred J. Algieri
Mass Technical Manager

Conventional Mass Values & Tolerance Data

Nominal Value	As Found Weight Value	As Left Weight Value	(ASTM E 617) 1 Allowable Tolerance Range (+ / -)			As Found Disposition
100 g	99.999991 g	99.999991 g	100.00025 g	↔	99.99975 g	In Tolerance
50 g	50.000048 g	50.000048 g	50.00012 g	↔	49.99988 g	In Tolerance
20 g	19.999990 g	19.999990 g	20.000074 g	↔	19.999926 g	In Tolerance
20 g*	19.999965 g	19.999965 g	20.000074 g	↔	19.999926 g	In Tolerance
10 g	9.999964 g	9.999964 g	10.000050 g	↔	9.999950 g	In Tolerance
5 g	4.9999837 g	4.9999837 g	5.000034 g	↔	4.999966 g	In Tolerance
2 g	1.9999900 g	1.9999900 g	2.000034 g	↔	1.999966 g	In Tolerance
2 g*	2.0000006 g	2.0000006 g	2.000034 g	↔	1.999966 g	In Tolerance
1 g	1.0000032 g	1.0000032 g	1.000034 g	↔	0.999966 g	In Tolerance
500 mg	500.0019 mg	500.0019 mg	500.010 mg	↔	499.990 mg	In Tolerance
200 mg	200.0008 mg	200.0008 mg	200.010 mg	↔	199.990 mg	In Tolerance
200 mg*	199.9923 mg	199.9923 mg	200.010 mg	↔	199.990 mg	In Tolerance
100 mg	99.9918 mg	99.9918 mg	100.010 mg	↔	99.990 mg	In Tolerance
50 mg	50.0038 mg	50.0038 mg	50.010 mg	↔	49.990 mg	In Tolerance
20 mg	19.9971 mg	19.9971 mg	20.010 mg	↔	19.990 mg	In Tolerance
20 mg*	20.0005 mg	20.0005 mg	20.010 mg	↔	19.990 mg	In Tolerance
10 mg	9.9983 mg	9.9983 mg	10.010 mg	↔	9.990 mg	In Tolerance
5 mg	5.0034 mg	5.0034 mg	5.010 mg	↔	4.990 mg	In Tolerance
2 mg	2.0065 mg	2.0065 mg	2.050 mg	↔	1.950 mg	In Tolerance

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NIST Traceable
Calibration Report

REPORT NUMBER 1317978

Reference Number: **1147936**
PO Number: **CCP507**

Clearstak LLC
99 Canal St
Putnam, CT 06260-1909 United States

ACCREDITED
CALIBRATION CERT #1442.01

Manufacturer: Cole-Parmer
Model Number: 99760-50
Description: Pressure, Barometer
Asset Number: BR-1
Serial Number: 150198541
Procedure: DS Control Company 4199

Calibration Date: 12/02/2017
Calibration Due Date: 06/02/2018
Condition As Found: In Tolerance
Condition As Left: In Tolerance After Adjustment

Remarks:
NIST-traceable calibration performed on the unit referenced above in accordance with customer requirements, published specifications and the lab's standard operating procedures. Unit was received in-tolerance but adjusted to deliver readings closer to nominal.

Standards Utilized

Asset No.	Manufacturer	Model No.	Description	Cal. Date	Due Date
CP50124	Druck Inc.	DPI 142	Barometer, Indicator	07/08/2017	07/31/2018

Calibration Data

FUNCTION TESTED	Nominal Value	As Found	Out of Tol	As Left	Out of Tol	CALIBRATION TOLERANCE
Increasing Barometric Pressure Test	960.0 mbar	964.0		962.0		955.2 to 964.8 mbar [EMU 0.11 mbar][TUR 44:1]
	1000.0 mbar	1003.5		1001.5		995.0 to 1005.0 mbar [EMU 0.11 mbar][TUR 45:1]
	1050.0 mbar	1047.0		1045.0		1044.8 to 1055.2 mbar [EMU 0.11 mbar][TUR 48:1]
Decreasing Barometric Pressure Test	1000.0 mbar	1004.5		1002.5		995.0 to 1005.0 mbar [EMU 0.11 mbar][TUR 45:1]
	960.0 mbar	964.5		962.5		955.2 to 964.8 mbar [EMU 0.11 mbar][TUR 44:1]
Ambient Pressure	990.0 mbar	994.0		992.0		985.1 to 994.9 mbar [EMU 0.11 mbar][TUR 45:1]

Temperature: 20° C
Humidity: 39% RH
Rpt. No.: 1317978

Calibration Performed By:				Quality Reviewer:	
Ren, Jenny	339	Metrologist	847-327-5327	Szplit, Tony	12/04/2017
Name	ID #	Title	Phone	Name	Date

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Praxair Distribution Mid-Atlantic
One Steel Road East,
Morrisville, PA 19067
Tel: (800) 638-6360 Fax:(215) 736 5240
PGVP ID: F32015

DocNumber: 000014928

CERTIFICATE OF ANALYSIS / EPA PROTOCOL GAS

Customer & Order Information:

PRAXAIR PKG DURHAM CT HS
89 COMMERCE CIRCLE
DURHAM CT 06422

Praxair Order Number: 70018077
Customer P. O. Number:
Customer Reference Number:

Fill Date: 12/4/2015
Part Number: NI CD5CO20E-AS
Lot Number: 304125338501
Cylinder Style & Outlet: AS CGA 590
Cylinder Pressure & Volume: 2000 psig 140 cu ft

Certified Concentration:

Expiration Date:		12/9/2023	NIST Traceable
Cylinder Number:		CC72581	Analytical Uncertainty:
2491	ppm	CARBON MONOXIDE	± 0.6 %
4.98	%	CARBON DIOXIDE	± 0.7 %
5.00	%	OXYGEN	± 0.4 %
	Balance	NITROGEN	

Certification Information: *Certification Date:* 12/9/2015 *Term:* 96 Months *Expiration Date:* 12/9/2023

This cylinder was certified according to the 2012 EPA Traceability Protocol, Document #EPA-600/R-12/531, using Procedure G1. Do Not Use this Standard if Pressure is less than 100 PSIG.

Analytical Data: (R=Reference Standard; Z=Zero Gas; C=Gas Candidate)

1. Component: CARBON MONOXIDE

Requested Concentration: 2500 ppm
Certified Concentration: 2491 ppm
Instrument Used: HORIBA VIA-3000 S/N Y9EY78L6
Analytical Method: NDIR
Last Multipoint Calibration: 11/23/2015

First Analysis Data:						Date:	12/9/2015
Z:	0	R:	4997	C:	2487	Conc:	2492
R:	4997	Z:	0	C:	2485	Conc:	2490
Z:	0	C:	2487	R:	4995	Conc:	2492
UOM:	PPM			Mean Test Assay:			2491 PPM

Reference Standard Type: GMIS
Ref. Std. Cylinder #: SA14089
Ref. Std. Conc: 5006 PPM
Ref. Std. Traceable to SRM #: 2638A
SRM Sample #: 55-E-47
SRM Cylinder #: FF23337

Second Analysis Data:						Date:	
Z:	0	R:	0	C:	0	Conc:	0
R:	0	Z:	0	C:	0	Conc:	0
Z:	0	C:	0	R:	0	Conc:	0
UOM:	PPM			Mean Test Assay:			0 PPM

2. Component: CARBON DIOXIDE

Requested Concentration: 5 %
Certified Concentration: 4.98 %
Instrument Used: SIEMENS ULTRAMAT 5E S/N: D2-412
Analytical Method: NON-DISPERSIVE INFRARED
Last Multipoint Calibration: 11/23/2015

First Analysis Data:						Date:	12/9/2015
Z:	0	R:	15.25	C:	4.99	Conc:	4.98
R:	15.27	Z:	0	C:	4.99	Conc:	4.98
Z:	0	C:	4.99	R:	15.23	Conc:	4.98
UOM:	%			Mean Test Assay:			4.98 %

Reference Standard Type: GMIS
Ref. Std. Cylinder #: SA6799
Ref. Std. Conc: 15.23 %
Ref. Std. Traceable to SRM #: 2745
SRM Sample #: 9-C-34
SRM Cylinder #: CAL016129

Second Analysis Data:						Date:	
Z:	0	R:	0	C:	0	Conc:	0
R:	0	Z:	0	C:	0	Conc:	0
Z:	0	C:	0	R:	0	Conc:	0
UOM:	%			Mean Test Assay:			0 %

3. Component: OXYGEN

Requested Concentration: 5 %
Certified Concentration: 5.00 %
Instrument Used: SIEMENS OXYMAT 5F
Analytical Method: PARAMAGNETIC
Last Multipoint Calibration: 11/20/2015

First Analysis Data:						Date:	12/9/2015
Z:	0	R:	12.02	C:	5	Conc:	5
R:	12	Z:	0	C:	5	Conc:	5
Z:	0	C:	5	R:	12.02	Conc:	5
UOM:	%			Mean Test Assay:			5 %

Reference Standard Type: SRM
Ref. Std. Cylinder #: CC110316
Ref. Std. Conc: 12.01%
Ref. Std. Traceable to SRM #: 2653A
SRM Sample #: 71-E-24
SRM Cylinder #: FF18300

Second Analysis Data:						Date:	
Z:	0	R:	0	C:	0	Conc:	0
R:	0	Z:	0	C:	0	Conc:	0
Z:	0	C:	0	R:	0	Conc:	0
UOM:	%			Mean Test Assay:			0 %

PRAXAIR

Praxair Distribution Mid-Atlantic
One Steel Road East,
Morrisville, PA 19067
Tel: (800) 638-6360 Fax:(215) 736 5240

PGVP ID: F32015

DocNumber: 000014929

CERTIFICATE OF ANALYSIS / EPA PROTOCOL GAS

Customer & Order Information:

PRAXAIR PKG DURHAM CT HS
89 COMMERCE CIRCLE
DURHAM CT 06422

Praxair Order Number: 70018077
Customer P. O. Number:
Customer Reference Number:

Fill Date: 12/9/2015
Part Number: NI CD11CO15E-AS
Lot Number: 304125337504
Cylinder Style & Outlet: AS CGA 590
Cylinder Pressure & Volume: 2000 psig 140 cu. ft.

Certified Concentration:

Expiration Date:		12/9/2023	NIST Traceable
Cylinder Number:		CC160141	Analytical Uncertainty:
5011	ppm	CARBON MONOXIDE	± 0.5 %
10.91	%	CARBON DIOXIDE	± 0.6 %
10.98	%	OXYGEN	± 0.2 %
	Balance	NITROGEN	

Certification Information: Certification Date: 12/9/2015 Term: 96 Months Expiration Date: 12/9/2023

This cylinder was certified according to the 2012 EPA Traceability Protocol, Document #EPA-600/R-12/531, using Procedure G1. Do Not Use this Standard if Pressure is less than 100 PSIG.

Analytical Data: (R=Reference Standard, Z=Zero Gas, C=Gas Candidate)

1. Component: CARBON MONOXIDE

Requested Concentration: 5000 ppm
Certified Concentration: 5011 ppm
Instrument Used: HORIBA VIA-3000 S/N Y9EY7BLE
Analytical Method: NDIR
Last Multipoint Calibration: 11/23/2015

First Analysis Data:						Date:	12/9/2015
Z:	0	R:	4997	C:	5000	Conc:	5010
R:	4997	Z:	0	C:	5002	Conc:	5012
Z:	0	C:	5002	R:	4995	Conc:	5012
UOM:	PPM			Mean Test Assay:			5011 PPM

Reference Standard Type: GMIS
Ref. Std. Cylinder #: SA14099
Ref. Std. Conc: 5006 PPM
Ref. Std. Traceable to SRM #: 2636A
SRM Sample #: 55-E-47
SRM Cylinder #: FF23337

Second Analysis Data:						Date:	
Z:	0	R:	0	C:	0	Conc:	0
R:	0	Z:	0	C:	0	Conc:	0
Z:	0	C:	0	R:	0	Conc:	0
UOM:	PPM			Mean Test Assay:			0 PPM

2. Component: CARBON DIOXIDE

Requested Concentration: 11 %
Certified Concentration: 10.91 %
Instrument Used: SIEMENS ULTRAMAT 5E S/N: 02-412
Analytical Method: NON-DISPERSIVE INFRARED
Last Multipoint Calibration: 11/23/2015

First Analysis Data:						Date:	12/9/2015
Z:	0	R:	15.25	C:	10.94	Conc:	10.93
R:	15.27	Z:	0	C:	10.91	Conc:	10.9
Z:	0	C:	10.92	R:	15.23	Conc:	10.91
UOM:	%			Mean Test Assay:			10.91 %

Reference Standard Type: GMIS
Ref. Std. Cylinder #: SA6799
Ref. Std. Conc: 15.23 %
Ref. Std. Traceable to SRM #: 2745
SRM Sample #: 9-C-34
SRM Cylinder #: CAL016129

Second Analysis Data:						Date:	
Z:	0	R:	0	C:	0	Conc:	0
R:	0	Z:	0	C:	0	Conc:	0
Z:	0	C:	0	R:	0	Conc:	0
UOM:	%			Mean Test Assay:			0 %

3. Component: OXYGEN

Requested Concentration: 11 %
Certified Concentration: 10.98 %
Instrument Used: SIEMENS OXYMAT 5F
Analytical Method: PARAMAGNETIC
Last Multipoint Calibration: 11/23/2015

First Analysis Data:						Date:	12/9/2015
Z:	0	R:	12.02	C:	10.98	Conc:	10.98
R:	12	Z:	0	C:	10.98	Conc:	10.98
Z:	0	C:	10.98	R:	12.02	Conc:	10.98
UOM:	%			Mean Test Assay:			10.98 %

Reference Standard Type: SRM
Ref. Std. Cylinder #: CC110316
Ref. Std. Conc: 12.01%
Ref. Std. Traceable to SRM #: 2658A
SRM Sample #: 71-E-24
SRM Cylinder #: FF18300

Second Analysis Data:						Date:	
Z:	0	R:	0	C:	0	Conc:	0
R:	0	Z:	0	C:	0	Conc:	0
Z:	0	C:	0	R:	0	Conc:	0
UOM:	%			Mean Test Assay:			0 %

PRAXAIR

Praxair Distribution Mid-Atlantic
One Steel Road East,
Morrisville, PA 19067
Tel: (800) 638-6360 Fax:(215) 736 5240

PGVP ID: F32015

DocNumber: 000014908

CERTIFICATE OF ANALYSIS / EPA PROTOCOL GAS

Customer & Order Information:

PRAXAIR PKG DURHAM CT HS
89 COMMERCE CIRCLE
DURHAM CT 06422

Praxair Order Number: 70018077
Customer P. O. Number:
Customer Reference Number:

Fill Date: 12/3/2015
Part Number: NI CD0CO31E-AS
Lot Number: 304125337503
Cylinder Style & Outlet: AS CGA 590
Cylinder Pressure & Volume: 2000 psig 140 cu ft

Certified Concentration:

Expiration Date:	12/7/2023	NIST Traceable
Cylinder Number:	SA2659	Analytical Uncertainty:
9639 ppm	CARBON MONOXIDE	± 0.9 %
19.77 %	CARBON DIOXIDE	± 0.3 %
21.03 %	OXYGEN	± 0.2 %
Balance	NITROGEN	

Certification Information: *Certification Date:* 12/7/2015 *Term:* 98 Months *Expiration Date:* 12/7/2023

This cylinder was certified according to the 2012 EPA Traceability Protocol, Document #EPA-600/R-12/531, using Procedure G1. Do Not Use this Standard if Pressure is less than 100 PSIG.

Analytical Data: (R=Reference Standard, Z=Zero Gas, C=Gas Candidate)

1. Component: CARBON MONOXIDE

Requested Concentration: 9850 ppm
Certified Concentration: 9639 ppm
Instrument Used: HORIBA VIA-3000 S/N Y9EY78L6
Analytical Method: NDIR
Last Multipoint Calibration: 11/23/2015

First Analysis Data:						Date:	12/7/2015
Z:	0	R:	39370	C:	9640	Conc:	9639
R:	39370	Z:	0	C:	9640	Conc:	9639
Z:	0	C:	9640	R:	39350	Conc:	9639
UOM:	PPM			Mean Test Assay:			9639 PPM

Reference Standard Type: GMIS
Ref. Std. Cylinder #: SA12367
Ref. Std. Conc: 3.936 %
Ref. Std. Traceable to SRM #: 2042a
SRM Sample #: 51-D-21
SRM Cylinder #: FF23113

Second Analysis Data:						Date:	
Z:	0	R:	0	C:	0	Conc:	0
R:	0	Z:	0	C:	0	Conc:	0
Z:	0	C:	0	R:	0	Conc:	0
UOM:	PPM			Mean Test Assay:			0 PPM

2. Component: CARBON DIOXIDE

Requested Concentration: 20 %
Certified Concentration: 19.77 %
Instrument Used: SIEMENS ULTRAMAT 5E S/N: 02-412
Analytical Method: NON-DISPERSIVE INFRARED
Last Multipoint Calibration: 11/23/2015

First Analysis Data:						Date:	12/7/2015
Z:	0	R:	19.83	C:	19.8	Conc:	19.74
R:	19.81	Z:	0	C:	19.85	Conc:	19.79
Z:	0	C:	19.82	R:	1978	Conc:	19.76
UOM:	%			Mean Test Assay:			19.77 %

Reference Standard Type: SRM
Ref. Std. Cylinder #: CC102926
Ref. Std. Conc: 19.75%
Ref. Std. Traceable to SRM #: 2745
SRM Sample #: 9-C-34
SRM Cylinder #: CAL016129

Second Analysis Data:						Date:	
Z:	0	R:	0	C:	0	Conc:	0
R:	0	Z:	0	C:	0	Conc:	0
Z:	0	C:	0	R:	0	Conc:	0
UOM:	%			Mean Test Assay:			0 %

3. Component: OXYGEN

Requested Concentration: 21.03 %
Certified Concentration: 21.03 %
Instrument Used: SIEMENS OXYMAT 5F
Analytical Method: PARAMAGNETIC
Last Multipoint Calibration: 11/20/2015

First Analysis Data:						Date:	12/7/2015
Z:	0	R:	21.16	C:	21.06	Conc:	21.03
R:	21.16	Z:	0	C:	21.06	Conc:	21.03
Z:	0	C:	21.04	R:	21.18	Conc:	21.01
UOM:	%			Mean Test Assay:			21.03 %

Reference Standard Type: SRM
Ref. Std. Cylinder #: CC182161
Ref. Std. Conc: 21.14 %
Ref. Std. Traceable to SRM #: 2659A
SRM Sample #: 71-E-24
SRM Cylinder #: FF18300

Second Analysis Data:						Date:	
Z:	0	R:	0	C:	0	Conc:	0
R:	0	Z:	0	C:	0	Conc:	0
Z:	0	C:	0	R:	0	Conc:	0
UOM:	%			Mean Test Assay:			0 %

PRAXAIR

Praxair Distribution Mid-Atlantic
One Steel Road East,
Morrisville, PA 19067
Tel: (800) 638-6360 Fax:(215) 736 5240

PGVP ID: F32016

DocNumber: 000019149

CERTIFICATE OF ANALYSIS / EPA PROTOCOL GAS

Customer & Order Information:

CLEARSTAK LLC
PO BOX 109
PUTNAM CT 06260

Praxair Order Number: 85618572
Customer P. O. Number: CS15107
Customer Reference Number:

Fill Date: 11/21/2016
Part Number: NI CD11CO17E-AS
Lot Number: 304322329603
Cylinder Style & Outlet: AS CGA 590
Cylinder Pressure & Volume: 2000 psig 140 cu. ft.

Certified Concentration:

Expiration Date:	11/28/2024	NIST Traceable
Cylinder Number:	CC139181	Analytical Uncertainty:
2.00 %	CARBON MONOXIDE	± 0.8 %
10.78 %	CARBON DIOXIDE	± 0.5 %
10.90 %	OXYGEN	± 0.2 %
Balance	NITROGEN	

Certification Information: Certification Date: 11/28/2016 Term: 96 Months Expiration Date: 11/28/2024

This cylinder was certified according to the 2012 EPA Traceability Protocol, Document #EPA-600/R-12/531, using Procedure G1. Do Not Use this Standard if Pressure is less than 100 PSIG.

Analytical Data: (R=Reference Standard, Z=Zero Gas, C=Gas Candidate)

1. Component: CARBON MONOXIDE

Requested Concentration: 2 %
Certified Concentration: 2.00 %
Instrument Used: HORIBA VIA-3000 S/N Y9EY7BL6
Analytical Method: NDIR
Last Multipoint Calibration: 11/10/2016

First Analysis Data:						Date:	11/28/2016
Z:	0	R:	4	C:	2.03	Conc:	2
R:	4	Z:	0	C:	2.03	Conc:	2
Z:	0	C:	2.03	R:	4	Conc:	2
UOM:	%			Mean Test Assay:			2 %

Reference Standard Type: GMIS
Ref. Std. Cylinder # : SA12387
Ref. Std. Conc: 3.936 %
Ref. Std. Traceable to SRM # : 2642a
SRM Sample # : 51-D-21
SRM Cylinder # : FF23113

Second Analysis Data:						Date:	
Z:	0	R:	0	C:	0	Conc:	0
R:	0	Z:	0	C:	0	Conc:	0
Z:	0	C:	0	R:	0	Conc:	0
UOM:	PPM			Mean Test Assay:			0 PPM

2. Component: CARBON DIOXIDE

Requested Concentration: 11 %
Certified Concentration: 10.78 %
Instrument Used: SIEMENS ULTRAMAT SE S/N: D2-412
Analytical Method: NON-DISPERSIVE INFRARED
Last Multipoint Calibration: 11/9/2016

First Analysis Data:						Date:	11/28/2016
Z:	0	R:	16.37	C:	11.06	Conc:	10.78
R:	16.39	Z:	0	C:	11.06	Conc:	10.78
Z:	0	C:	11.06	R:	16.38	Conc:	10.78
UOM:	%			Mean Test Assay:			10.78 %

Reference Standard Type: GMIS
Ref. Std. Cylinder # : CC103982
Ref. Std. Conc: 17.91 %
Ref. Std. Traceable to SRM # : 2745
SRM Sample # :
SRM Cylinder # :

Second Analysis Data:						Date:	
Z:	0	R:	0	C:	0	Conc:	0
R:	0	Z:	0	C:	0	Conc:	0
Z:	0	C:	0	R:	0	Conc:	0
UOM:	%			Mean Test Assay:			0 %

3. Component: OXYGEN

Requested Concentration: 11 %
Certified Concentration: 10.90 %
Instrument Used: SIEMENS OXYMAT 5F
Analytical Method: PARAMAGNETIC
Last Multipoint Calibration: 11/9/2016

First Analysis Data:						Date:	11/28/2016
Z:	0	R:	21.22	C:	10.88	Conc:	10.9
R:	21.24	Z:	0	C:	10.88	Conc:	10.9
Z:	0	C:	10.88	R:	21.24	Conc:	10.9
UOM:	%			Mean Test Assay:			10.9 %

Reference Standard Type: GMIS
Ref. Std. Cylinder # : CC8852
Ref. Std. Conc: 21.32%
Ref. Std. Traceable to SRM # : 2659A
SRM Sample # : 71-E-24
SRM Cylinder # : FF18300

Second Analysis Data:						Date:	
Z:	0	R:	0	C:	0	Conc:	0
R:	0	Z:	0	C:	0	Conc:	0
Z:	0	C:	0	R:	0	Conc:	0
UOM:	%			Mean Test Assay:			0 %

Praxair Distribution Mid-Atlantic
One Steel Road East,
Morrisville, PA 19067
Tel: (800) 638-6360 Fax:(215) 736 5240
PGVP ID: F32016

DocNumber: 000019149

CERTIFICATE OF ANALYSIS / EPA PROTOCOL GAS

Analyzed by: Jeff Gosner

Certified by: Jessica Goodman

cincinnati fan

Form: OMM-15-0509
Effective: 5/4/09
Supersedes: OMM-15-0507
Part No.: 01236

Installation, Safety, Operation & Maintenance Instructions And Parts List
For Models TAF, WAF, HTF & WAF/HTF, Belt Drive Tube Axial Fans
Arrangement 9

NOTE

READ ENTIRE MANUAL, INCLUDING "SECTION IV. INITIAL UNIT STARTUP" BEFORE ATTEMPTING TO INSTALL AND OPERATE THIS EQUIPMENT.

FAN SPECIFICATIONS

FAN SERIAL NUMBER: 1415817 **MFG. DATE:** 12/23/14

NOTE: The serial number above is a required reference for any assistance. It is stamped on the fan nameplate.

FAN SPECIFICATIONS:

Model: WAF/HTF-12 **Propeller Number:** SPECIAL

FAN PERFORMANCE DATA: (If entered on order)

CFM: 855 **SP:** 1.480 (Inches of Water Gauge) **Motor BHP:** 0.630

Density: 0.064 **Altitude:** _____ (Ft. above S.L.) **Airstream Temperature:** 160 °F.

Fan RPM: 3350 **Maximum Safe Fan RPM:** Call for > 3350 **DO NOT EXCEED THIS RPM**

MOTOR DATA: (This section is completed only if the motor was supplied by Cincinnati Fan)

HP: 1 **RPM:** 3450 **Voltage:** 190/380/50 & 208-230/460/60 **Phase:** 3

Hz: 60 **Frame Size:** 56 **Enclosure:** TEFC **Efficiency:** Std Eff

IF Motor is EXP, Class(es) & Group(s) are: _____

Manufacturers Model Number: 00136ES3E56-S **CFV Part Number:** 37270W

DRIVE DATA:

Fan Sheave: AK32H **Motor Sheave:** AS32X5/8 **Belts:** AX32

No. of Grooves: 1 Fixed Speed: ☑ Adjustable Speed: ☐

ATTENTION: RECEIVING DEPARTMENT

All Cincinnati Fan products are packaged to minimize any damage during shipment. The freight carrier is responsible for delivering all items in their original condition as received from Cincinnati Fan. The individual receiving this equipment is responsible for inspecting this unit for any obvious or concealed damage. If any damage is found, it should be noted on the bill of lading before the freight is accepted and the receiver must file a claim with the freight carrier.

LONG TERM STORAGE NOTICE

If this fan will NOT be installed and put into operation within 30 days, refer to the "Long Term Storage Instructions" on page 15. Failure to follow all applicable long term storage instructions, will void your warranty. This fan should be stored indoors in a clean, dry location.

Certificate #	00127-BAL-6
Issue Date	2/28/18
Dept. Location	Willington

Instrument ID	AB-1
As Found	In Tolerance
As Left	In Tolerance

Calibration Performed	LTP-00004
Calibration Date	2/28/18
Next Calibration Due Date	6/28/18

Location	**Willington**	**CT**
Location Temperature*	68	deg F
Relative Humidity**	30	%RH
Start Time	15:11	
End Time	15:55	

*Laboratory temperarure must be in the range of 10°C - 30C (50°F to 86°F)
**Relative humidity shall never exceed 85%

Manufacturer	OHAUS	
Model	Adventurer	
Capacity	210	g
Division	0.0001	g

Technician Name	Kelli O'Brien

This report attests that the above stated Instrument has been calibrated with standards traceable to National Institute of Standards and Technology (NIST) within the acceptable tolerance of 0.2 mg. The calibrated reference test weights are within the span required for intended laboratory use and are not beyond the normal capacity specified above.

Increasing-Load Test

Expected (g)	Actual (g)	Difference (g)	Pass/Fail	
0.0050	0.0051	0.0001	Pass	
0.1000	0.1000	0.0000	Pass	
1.0000	1.0001	0.0001	Pass	
20.0000	20.0001	0.0001	Pass	
100.0000	100.0000	0.0000	Pass	

Expected (g)	Actual (g)	Difference (g)	Pass/Fail	
0.0050	0.0049	0.0001	Pass	
0.1000	0.0999	0.0001	Pass	
1.0000	1.0000	0.0000	Pass	
20.0000	20.0000	0.0000	Pass	
100.0000	100.0001	0.0001	Pass	

Expected (g)	Actual (g)	Difference (g)	Pass/Fail	
0.0050	0.0049	0.0001	Pass	
0.1000	0.1000	0.0000	Pass	
1.0000	1.0000	0.0000	Pass	
20.0000	20.0001	0.0001	Pass	
100.0000	100.0001	0.0001	Pass	

Technician Signature: Kelli O'Brien

Quality Review:

Decreasing-Load Test

Expected (g)	Actual (g)	Difference (g)	Pass/Fail	
100.0000	100.0001	0.0001	Pass	
20.0000	20.0001	0.0001	Pass	
1.0000	1.0000	0.0000	Pass	
0.1000	0.1000	0.0000	Pass	
0.0050	0.0050	0.0000	Pass	

Expected (g)	Actual (g)	Difference (g)	Pass/Fail	
100.0000	100.0001	0.0001	Pass	
20.0000	20.0000	0.0000	Pass	
1.0000	1.0000	0.0000	Pass	
0.1000	0.0999	0.0001	Pass	
0.0050	0.0049	0.0001	Pass	

Expected (g)	Actual (g)	Difference (g)	Pass/Fail	
100.0000	100.0000	0.0000	Pass	
20.0000	19.9999	0.0001	Pass	
1.0000	1.0000	0.0000	Pass	
0.1000	0.1000	0.0000	Pass	
0.0050	0.0050	0.0000	Pass	

Shift Test

	Expected (g)	Actual (g) Q1	Actual (g) Q2	Actual (g) Q3	Actual (g) Q4	Average Difference (g)	Pass/Fail	Deviation
1	20.0000	20.0002	19.9999	20.0000	20.0001	0.0001	Pass	1E-08
2	20.0000	20.0001	19.9999	20.0000	20.0001	0.0001	Pass	5.625E-09
3	20.0000	20.0001	19.9999	20.0000	20.0001	0.0001	Pass	5.625E-09

Repeatability

g	Average	Stdev	
0.0050	0.0050	8.2E-05	
0.1000	0.1000	5.164E-05	
1.0000	1.0000	4.0825E-05	
20.0000	20.0000	8.16497E-05	
100.0000	100.0001	5.163978E-05	

Technician Signature: Kelli OBrien

Quality Review:

Certificate #	00127-BAL-6
Issue Date	2/28/18
Dept. Location	Willington

Instrument ID	AB-1
As Found	In Tolerance
As Left	In Tolerance

Calibration Performed	LTP-00004
Calibration Date	2/8/18
Next Calibration Due Date	6/28/18

Location	**Willington**	**CT**
Location Temperature*	64	deg F
Relative Humidity**	25	%RH
Start Time	11:26	
End Time	11:54	

*Laboratory temperarure must be in the range of 10°C - 30C (50°F to 86°F)
**Relative humidity shall never exceed 85%

Manufacturer	OHAUS	
Model	Adventurer	
Capacity	210	g
Division	0.0001	g

Technician Name	Brian Vinal

This report attests that the above stated Instrument has been calibrated with standards traceable to National Institute of Standards and Technology (NIST) within the acceptable tolerance of 0.2 mg. The calibrated reference test weights are within the span required for intended laboratory use and are not beyond the normal capacity specified above.

Increasing-Load Test

Expected (g)	Actual (g)	Difference (g)	Pass/Fail	
0.0050	0.0049	0.0001	Pass	
0.1000	0.0999	0.0001	Pass	
1.0000	1.0000	0.0000	Pass	
20.0000	20.0000	0.0000	Pass	
100.0000	99.9998	0.0002	Pass	

Expected (g)	Actual (g)	Difference (g)	Pass/Fail	
0.0050	0.0048	0.0002	Pass	
0.1000	0.1000	0.0000	Pass	
1.0000	1.0000	0.0000	Pass	
20.0000	20.0001	0.0001	Pass	
100.0000	99.9999	0.0001	Pass	

Expected (g)	Actual (g)	Difference (g)	Pass/Fail	
0.0050	0.0049	0.0001	Pass	
0.1000	0.1000	0.0000	Pass	
1.0000	1.0000	0.0000	Pass	
20.0000	20.0000	0.0000	Pass	
100.0000	99.9999	0.0001	Pass	

Technician Signature: _____

Quality Review: Kelli O'Brien

Decreasing-Load Test

Expected (g)	Actual (g)	Difference (g)	Pass/Fail	
100.0000	99.9998	0.0002	Pass	
20.0000	20.0000	0.0000	Pass	
1.0000	1.0000	0.0000	Pass	
0.1000	0.1000	0.0000	Pass	
0.0050	0.0049	0.0001	Pass	

Expected (g)		Difference (g)	Pass/Fail	
100.0000	99.9999	0.0001	Pass	
20.0000	20.0001	0.0001	Pass	
1.0000	0.9999	0.0001	Pass	
0.1000	0.0999	0.0001	Pass	
0.0050	0.0049	0.0001	Pass	

Expected (g)	Actual (g)	Difference (g)	Pass/Fail	
100.0000	99.9999	0.0001	Pass	
20.0000	20.0001	0.0001	Pass	
1.0000	1.0000	0.0000	Pass	
0.1000	0.1000	0.0000	Pass	
0.0050	0.0049	0.0001	Pass	

Shift Test

	Expected (g)	Actual (g) Q1	Actual (g) Q2	Actual (g) Q3	Actual (g) Q4	Average Difference (g)	Pass/Fail	Deviation
1	20.0000	20.0000	19.9999	20.0000	20.0002	0.0001	Pass	5.625E-09
2	20.0000	20.0001	20.0000	20.0000	20.0002	0.0001	Pass	5.625E-09
3	20.0000	20.0001	19.9999	19.9999	20.0001	0.0001	Pass	1E-08

Repeatability

g	Average	Stdev	
0.0050	0.0049	4.1E-05	
0.1000	0.1000	5.164E-05	
1.0000	1.0000	4.0825E-05	
20.0000	20.0001	5.47723E-05	
100.0000	99.9999	5.163978E-05	

Technician Signature: _____

Quality Review: Kelli O'Brien

PARAMETER / EQUIPMENT : **J type Sample Sensors (A23)**
UNIT UNDER TEST : **LTP -000005**
RANGE : **32- 109 deg F**

Prepared By :
Kelli O'Brien
05 Feb 2018

NOMINAL : **32** **deg F**
Units

Reviewed By:
Kelli O'Brien
05 Feb 2018

REFERENCE STANDARDS & ANCILLARY EQUIPMENT

Manufacturer - Model	Description	ID #	Cal Intv'l	Cal Exp. Date
Thermoworks PT 100	RTD	REF-1	1 Yr	20-Dec-18

	TYPE A DESCRIPTION	UNCERT	UNITS	SENS	DIST	DEG	MULT	STD UNC	VARIANCE
1	Repeatability & Reproducibility	0.22669	deg F	1	Normal	5	1.11053339	0.251743	0.063374375

	TYPE B - FIXED VALUE DESCRIPTION	UNCERT	UNITS	SENS	DIST	DEG	DIV	STD UNC	VARIANCE
1	Test thermocouple Readout	0.05000	deg F	1	Rect	1E+01	1.732	0.028868	0.000833382
2	Reference Standard Uncertainty	0.05000	deg F	1	Normal	1E+00	2	0.025000	0.000625000
3	Reference Standard Specification	0.01980	deg F	1	Normal	1E+00	1	0.019800	0.000392040
4	Reference Standard Readout	0.00500	deg F	1	Rect	1E+02	1.732	0.002887	0.000008334
5	Temperature Influence	0.00000	deg F	1	Normal	1E+02	1	0.000000	0.000000000
6									

	TYPE B - VARIABLE VALUE DESCRIPTION	UNCERT	UNITS	SENS	DIST	DEG	DIV	STD UNC	VARIANCE

Combined Uncertainty	0.25540777	deg F
Expanded Uncertainty k=2	**0.51081555**	deg F

NOTES :

A1 Repeatability and Reproducibility from data below

B1 Resolution of the device under test, divided by 2
B2 Uncertainty from calibration cert #13107194 (Tektronix)
B3 Stability from calibration cert #13107194 (Tektronix)
B4 Resolution of the device under test, divided by 2
B5
B6
B7
B8
B9
B10
B11
B12

Type A Data

LINE No. : 1
BUDGET DESCRIPTION : Repeatability and Reproducibility
UNITS : deg F

0.2266863	**STANDARD DEVIATION (in Units)**
5	**EFFECTIVE DEGREES OF FREEDOM**

# of Rdgs	VALUE	DATE	TECH #	TEMP deg F	ROOM TEMP deg F
1	33.9	1/22/18	Brian Vinal	**deg F**	66
2	33.5	1/22/18	Brian Vinal	**deg F**	66
3	34.1	1/22/18	Brian Vinal	**deg F**	66
4	33.7	1/22/18	Kelli O'Brien	**deg F**	66
5	33.5	1/22/18	Kelli O'Brien	**deg F**	66
6	33.6	1/22/18	Kelli O'Brien	**deg F**	66

PARAMETER / EQUIPMENT : **J type Sample Sensors (A23)**
UNIT UNDER TEST : **LTP -000005**
RANGE : **32- 109 deg F**

Prepared By :
Kelli O'Brien
05 Feb 2018

NOMINAL : **109** **deg F**
Units

Reviewed By:
Kelli O'Brien
06 Feb 2018

REFERENCE STANDARDS

Manufacturer - Model	Description	ID #	Cal Int'l	Cal Exp. Date
Thermoworks PT 100	RTD	REF-1	1 Yr	20-Dec-18

TYPE A DESCRIPTION		UNCERT	UNITS	SENS	DIST	DEG	MULT	STD UNC	VARIANCE
1	Repeatability and Reproducibility	0.1471960	deg F	1	Normal	5	1.110533394	0.163466	0.026721162

TYPE B - FIXED VALUE DESCRIPTION		UNCERT	UNITS	SENS	DIST	DEG	DIV	STD UNC	VARIANCE
1	Test thermocouple Readout	0.05000	deg F	1	Rect	1E+01	1.732	0.028868	0.000833382
2	Reference Standard Uncertainty	0.10000	deg F	1	Normal	1E+00	2	0.050000	0.002500000
3	Reference Standard Stability	0.01980	deg F	1	Normal	1E+00	1	0.019800	0.000392040
4	Reference Standard Readout	0.00500	deg F	1	Rect	1E+02	1.732	0.002887	0.000008334
5	Temperature Influence	0.00000	deg F	1	Normal	1E+02	1	0.000000	0.000000000
6									

TYPE B - VARIABLE VALUE DESCRIPTION	UNCERT	UNITS	SENS	DIST	DEG	DIV	STD UNC	VARIANCE

Sanity check
88%
3%
8%
1%
0%
0%
0%
0.030454918 Ttl Var

Combined Uncertainty 0.17451338 deg F
Expanded Uncertainty k=2 **0.34902675** deg F

NOTES :
A1 Repeatability and Reproducibility from data below

B1 Resolution of the device under test, divided by 2
B2 Uncertainty from calibration cert #13107194 (Tektronix)
B3 Stability from calibration cert #13107194 (Tektronix)
B4 Resolution of the device under test, divided by 2
B5
B6
B7
B8
B9
B10
B11
B12

Type A Data

LINE No. : 1
BUDGET DESCRIPTION : Repeatability and Reproducibility
UNITS : deg F

0.1471960 **STANDARD DEVIATION (in Units)**
5 **EFFECTIVE DEGREES OF FREEDOM**

# of Rdgs	VALUE	DATE	TECH #	TEMP	ROOM TEMP deg F
1	110.3	1/22/18	Brian Vinal	deg F	66
2	110.3	1/22/18	Brian Vinal	deg F	66
3	110.4	1/22/18	Brian Vinal	deg F	66
4	110.4	1/22/18	Kelli O'Brien	deg F	66
5	110.4	1/22/18	Kelli O'Brien	deg F	66
6	110.7	1/22/18	Kelli O'Brien	deg F	66

PARAMETER / EQUIPMENT : **K type Sample Sensors (A24, A 25, A26, A27, A28, A29, A30,)**
UNIT UNDER TEST : **LTP -000005**
RANGE : **32- 124 deg F**

Prepared By :
Kelli O'Brien
05 Feb 2018

NOMINAL : **32** **deg F**
Units

Reviewed By:
Kelli O'Brien
06 Feb 2018

REFERENCE STANDARDS & ANCILLARY EQUIPMENT

Manufacturer - Model	Description	ID #	Cal Intv'l	Cal Exp. Date
Thermoworks PT 100	RTD	REF-1	1 Yr	20-Dec-18

	TYPE A DESCRIPTION	UNCERT	UNITS	SENS	DIST	DEG	MULT	STD UNC	VARIANCE
1	Repeatability & Reproducibility	0.8632209	deg F	1	Normal	41	1.012367	0.873896	0.763694805

	TYPE B - FIXED VALUE DESCRIPTION	UNCERT	UNITS	SENS	DIST	DEG	DIV	STD UNC	VARIANCE
1	Test thermocouple Readout	0.05000	deg F	1	Rect	1E+01	1.732	0.028868	0.000833382
2	Reference Standard Uncertainty	0.05000	deg F	1	Normal	1E+00	2	0.025000	0.000625000
3	Reference Standard Specification	0.01980	deg F	1	Normal	1E+00	1	0.019800	0.000392040
4	Reference Standard Readout	0.00500	deg F	1	Rect	1E+02	1.732	0.002887	0.000008334
5	Temperature Influence	0.00000	deg F	1	Normal	1E+02	1	0.000000	0.000000000
6									

	TYPE B - VARIABLE VALUE DESCRIPTION	UNCERT	UNITS	SENS	DIST	DEG	DIV	STD UNC	VARIANCE

Combined Uncertainty	0.87495918	deg F
Expanded Uncertainty k=2	**1.74991835**	deg F

NOTES :

A1 Repeatability and Reproducibility from data below

B1 Resolution of the device under test, divided by 2
B2 Uncertainty from calibration cert #13107194 (Tektronix)
B3 Stability from calibration cert #13107194 (Tektronix)
B4 Resolution of the device under test, divided by 2
B5
B6
B7
B8
B9
B10
B11
B12

Type A Data

LINE No. : 1
BUDGET DESCRIPTION : Repeatability and Reproducibility
UNITS : deg F

0.8632209	**STANDARD DEVIATION (in Units)**
41	**EFFECTIVE DEGREES OF FREEDOM**

# of Rdgs	VALUE	DATE	TECH #	TEMP deg F	ROOM TEMP deg F
1	32.1	1/23/18	Brian Vinal	**deg F**	68
2	32.3	1/23/18	Brian Vinal	**deg F**	68
3	32.3	1/23/18	Brian Vinal	**deg F**	68
4	32.5	1/23/18	Kelli O'Brien	**deg F**	68
5	32.5	1/23/18	Kelli O'Brien	**deg F**	68
6	32.1	1/23/18	Kelli O'Brien	**deg F**	68
7	33.0	1/23/18	Brian Vinal	**deg F**	66
8	32.3	1/23/18	Brian Vinal	**deg F**	66
9	32.3	1/23/18	Brian Vinal	**deg F**	66
10	32.3	1/23/18	Kelli O'Brien	**deg F**	66
11	32.3	1/23/18	Kelli O'Brien	**deg F**	66
12	32.3	1/23/18	Kelli O'Brien	**deg F**	66
13	32.2	1/25/18	Brian Vinal	**deg F**	65
14	32.2	1/25/18	Brian Vinal	**deg F**	65
15	32.2	1/25/18	Brian Vinal	**deg F**	65
16	32.2	1/25/18	Kelli O'Brien	**deg F**	65
17	32.2	1/25/18	Kelli O'Brien	**deg F**	65
18	32.2	1/25/18	Kelli O'Brien	**deg F**	65
19	32.2	1/26/18	Brian Vinal	**deg F**	68
20	32.0	1/26/18	Brian Vinal	**deg F**	68
21	32.0	1/26/18	Brian Vinal	**deg F**	68
22	32.1	1/26/18	Kelli O'Brien	**deg F**	68
23	32.0	1/26/18	Kelli O'Brien	**deg F**	68
24	32.0	1/26/18	Kelli O'Brien	**deg F**	68
25	31.6	1/26/18	Brian Vinal	**deg F**	65
26	31.8	1/26/18	Brian Vinal	**deg F**	65
27	31.5	1/26/18	Brian Vinal	**deg F**	65
28	31.8	1/26/18	Kelli O'Brien	**deg F**	65
29	31.6	1/26/18	Kelli O'Brien	**deg F**	65
30	31.6	1/26/18	Kelli O'Brien	**deg F**	65

PARAMETER / EQUIPMENT : **K type Sample Sensors (A24, A 25, A26, A27, A28, A29, A30,)**
UNIT UNDER TEST : **LTP -000005**
RANGE : **32- 124 deg F**

Prepared By :
Kelli O'Brien
05 Feb 2018

NOMINAL : **124** **deg F** (Units)

Reviewed By:
Kelli O'Brien
05 Feb 2018

REFERENCE STANDARDS

Manufacturer - Model	Description	ID #	Cal Intv'l	Cal Exp. Date
Thermoworks PT 100	RTD	REF-1	1 Yr	20-Dec-18

TYPE A DESCRIPTION		UNCERT	UNITS	SENS	DIST	DEG	MULT	STD UNC	VARIANCE
1	Repeatability and Reproducibility	1.6104930	deg F	1	Normal	41	1.012367001	1.630410	2.658236534

TYPE B - FIXED VALUE DESCRIPTION		UNCERT	UNITS	SENS	DIST	DEG	DIV	STD UNC	VARIANCE
1	Test thermocouple Readout	0.05000	deg F	1	Rect	1E+01	1.732	0.028868	0.000833382
2	Reference Standard Uncertainty	0.10000	deg F	1	Normal	1E+00	2	0.050000	0.002500000
3	Reference Standard Stability	0.01980	deg F	1	Normal	1E+00	1	0.019800	0.000392040
4	Reference Standard Readout	0.00500	deg F	1	Rect	1E+02	1.732	0.002887	0.000008334
5	Temperature Influence	0.00000	deg F	1	Normal	1E+02	1	0.000000	0.000000000
6									

TYPE B - VARIABLE VALUE DESCRIPTION	UNCERT	UNITS	SENS	DIST	DEG	DIV	STD UNC	VARIANCE

Combined Uncertainty		1.63155456	deg F
Expanded Uncertainty k=2		**3.26310912**	deg F

Sanity check	
	100%
	0%
	0%
	0%
	0%
	0%
2.661970290	Ttl Var

NOTES :

A1 Repeatability and Reproducibility from data below

B1 Resolution of the device under test, divided by 2
B2 Uncertainty from calibration cert #13107194 (Tektronix)
B3 Stability from calibration cert #13107194 (Tektronix)
B4 Resolution of the device under test, divided by 2
B5
B6
B7
B8
B9
B10
B11
B12

Type A Data

LINE No. : 1
BUDGET DESCRIPTION : Repeatability and Reproducibility
UNITS : deg F

1.6104930 STANDARD DEVIATION (in Units)
41 EFFECTIVE DEGREES OF FREEDOM

# of Rdgs	VALUE	DATE	TECH #	TEMP	ROOM TEMP deg F
1	124.1	1/23/18	Brian Vinal	deg F	68
2	124.3	1/23/18	Brian Vinal	deg F	68
3	124.1	1/23/18	Brian Vinal	deg F	68
4	123.3	1/23/18	Kelli O'Brien	deg F	68
5	123.6	1/23/18	Kelli O'Brien	deg F	68
6	124.0	1/23/18	Kelli O'Brien	deg F	68
7	127.1	1/23/18	Brian Vinal	deg F	66
8	127.1	1/23/18	Brian Vinal	deg F	66
9	127.1	1/23/18	Brian Vinal	deg F	66
10	127.4	1/23/18	Kelli O'Brien	deg F	66
11	127.2	1/23/18	Kelli O'Brien	deg F	66
12	127.1	1/23/18	Kelli O'Brien	deg F	66
13	123.1	1/25/18	Brian Vinal	deg F	65
14	123.5	1/25/18	Brian Vinal	deg F	65
15	123.2	1/25/18	Brian Vinal	deg F	65
16	124.4	1/25/18	Kelli O'Brien	deg F	65
17	124.0	1/25/18	Kelli O'Brien	deg F	65
18	124.2	1/25/18	Kelli O'Brien	deg F	65
19	127.0	1/26/18	Brian Vinal	deg F	68
20	126.8	1/26/18	Brian Vinal	deg F	68
21	127.0	1/26/18	Brian Vinal	deg F	68
22	127.0	1/26/18	Kelli O'Brien	deg F	68
23	127.0	1/26/18	Kelli O'Brien	deg F	68
24	127.2	1/26/18	Kelli O'Brien	deg F	68
25	123.2	1/26/18	Brian Vinal	deg F	65
26	123.2	1/26/18	Brian Vinal	deg F	65
27	123.2	1/26/18	Brian Vinal	deg F	65
28	123.4	1/26/18	Kelli O'Brien	deg F	65
29	123.2	1/26/18	Kelli O'Brien	deg F	65
30	123.4	1/26/18	Kelli O'Brien	deg F	65
31	124.4	1/26/18	Brian Vinal	deg F	65
32	124.3	1/26/18	Brian Vinal	deg F	65
33	124.4	1/26/18	Brian Vinal	deg F	65
34	124.0	1/26/18	Kelli O'Brien	deg F	65
35	124.5	1/26/18	Kelli O'Brien	deg F	65
36	124.5	1/26/18	Kelli O'Brien	deg F	65
37	126.6	1/29/18	Brian Vinal	deg F	65

38	126.9	1/29/18	Brian Vinal	**deg F**	65
39	126.3	1/29/18	Brian Vinal	**deg F**	65
40	126.3	1/29/18	Kelli O'Brien	**deg F**	65
41	126.6	1/29/18	Kelli O'Brien	**deg F**	65
42	126.7	1/29/18	Kelli O'Brien	**deg F**	65

PARAMETER / EQUIPMENT : **K type Unit Stack Sensors (A07, A32)**
UNIT UNDER TEST : **LTP -000005**
RANGE : **32- 400 deg F**

Prepared By :
Kelli O'Brien
05 Feb 2018

Reviewed By:
Kelli O'Brien
06 Feb 2018

NOMINAL : **32** **deg F**
Units

REFERENCE STANDARDS & ANCILLARY EQUIPMENT

Manufacturer - Model	Description	ID #	Cal Intv'l	Cal Exp. Date
Thermoworks PT 100	RTD	REF-1	1 Yr	20-Dec-18

	TYPE A DESCRIPTION	UNCERT	UNITS	SENS	DIST	DEG	MULT	STD UNC	VARIANCE
1	Repeatability & Reproducibility	0.2587148	deg F	1	Normal	11	1.04759136	0.271027	0.073455831

	TYPE B - FIXED VALUE DESCRIPTION	UNCERT	UNITS	SENS	DIST	DEG	DIV	STD UNC	VARIANCE
1	Test thermocouple Readout	0.05000	deg F	1	Rect	1E+01	1.732	0.028868	0.000833382
2	Reference Standard Uncertainty	0.05000	deg F	1	Normal	1E+00	2	0.025000	0.000625000
3	Reference Standard Specification	0.01980	deg F	1	Normal	1E+00	1	0.019800	0.000392040
4	Reference Standard Readout	0.00500	deg F	1	Rect	1E+02	1.732	0.002887	0.000008334
5	Temperature Influence	0.00000	deg F	1	Normal	1E+02	1	0.000000	0.000000000
6									

	TYPE B - VARIABLE VALUE DESCRIPTION	UNCERT	UNITS	SENS	DIST	DEG	DIV	STD UNC	VARIANCE

Combined Uncertainty	0.27443503	deg F
Expanded Uncertainty k=2	**0.54887006**	deg F

NOTES :

A1 Repeatability and Reproducibility from data below

B1 Resolution of the device under test, divided by 2
B2 Uncertainty from calibration cert #13107194 (Tektronix)
B3 Stability from calibration cert #13107194 (Tektronix)
B4 Resolution of the device under test, divided by 2
B5
B6
B7
B8
B9
B10
B11
B12

Type A Data

LINE No. : 1
BUDGET DESCRIPTION : Repeatability and Reproducibility
UNITS : deg F

0.2587148	**STANDARD DEVIATION (in Units)**
11	**EFFECTIVE DEGREES OF FREEDOM**

# of Rdgs	VALUE	DATE	TECH #	TEMP deg F	ROOM TEMP deg F
1	32.9	1/22/18	Brian Vinal	**deg F**	66
2	32.7	1/22/18	Brian Vinal	**deg F**	66
3	33.0	1/22/18	Brian Vinal	**deg F**	66
4	32.6	1/22/18	Kelli O'Brien	**deg F**	66
5	32.6	1/22/18	Kelli O'Brien	**deg F**	66
6	32.9	1/22/18	Kelli O'Brien	**deg F**	66
7	32.8	1/22/18	Brian Vinal	**deg F**	66
8	32.7	1/22/18	Brian Vinal	**deg F**	66
9	33.1	1/22/18	Brian Vinal	**deg F**	66
10	33.3	1/22/18	Kelli O'Brien	**deg F**	66
11	33.1	1/22/18	Kelli O'Brien	**deg F**	66
12	32.4	1/22/18	Kelli O'Brien	**deg F**	66

PARAMETER / EQUIPMENT : **K type Unit Stack Sensors (A07, A32)**
UNIT UNDER TEST : **LTP -000005**
RANGE : **32- 400 deg F**

Prepared By :
Kelli O'Brien
05 Feb 2018

NOMINAL : **400** **deg F** (Units)

Reviewed By:
Kelli O'Brien
06 Feb 2018

REFERENCE STANDARDS

Manufacturer - Model	Description	ID #	Cal Intv'l	Cal Exp. Date
Thermoworks PT 100	RTD	REF-1	1 Yr	20-Dec-18

TYPE A DESCRIPTION		UNCERT	UNITS	SENS	DIST	DEG	MULT	STD UNC	VARIANCE
1	Repeatability and Reproducibility	0.3342790	deg F	1	Normal	11	1.047591365	0.350188	0.122631463

TYPE B - FIXED VALUE DESCRIPTION		UNCERT	UNITS	SENS	DIST	DEG	DIV	STD UNC	VARIANCE
1	Test thermocouple Readout	0.05000	deg F	1	Rect	1E+01	1.732	0.028868	0.000833382
2	Reference Standard Uncertainty	0.10000	deg F	1	Normal	1E+00	2	0.050000	0.002500000
3	Reference Standard Stability	0.01980	deg F	1	Normal	1E+00	1	0.019800	0.000392040
4	Reference Standard Readout	0.00500	deg F	1	Rect	1E+02	1.732	0.002887	0.000008334
5	Temperature Influence	0.00000	deg F	1	Normal	1E+02	1	0.000000	0.000000000
6									

TYPE B - VARIABLE VALUE DESCRIPTION	UNCERT	UNITS	SENS	DIST	DEG	DIV	STD UNC	VARIANCE

Sanity check
97%
1%
2%
0%
0%
0%
0%
0.126365219 Ttl Var

Combined Uncertainty 0.35547886 deg F
Expanded Uncertainty k=2 **0.71095772** deg F

NOTES :
A1 Repeatability and Reproducibility from data below

B1 Resolution of the device under test, divided by 2
B2 Uncertainty from calibration cert #13107194 (Tektronix)
B3 Stability from calibration cert #13107194 (Tektronix)
B4 Resolution of the device under test, divided by 2
B5
B6
B7
B8
B9
B10
B11
B12

Type A Data

LINE No. : 1
BUDGET DESCRIPTION : Repeatability and Reproducibility
UNITS : deg F

0.3342790 **STANDARD DEVIATION (in Units)**
11 **EFFECTIVE DEGREES OF FREEDOM**

# of Rdgs	VALUE	DATE	TECH #	TEMP	ROOM TEMP deg F
1	399.6	1/22/18	Brian Vinal	**deg F**	66
2	400.2	1/22/18	Brian Vinal	**deg F**	66
3	399.9	1/22/18	Brian Vinal	**deg F**	66
4	400.0	1/22/18	Kelli O'Brien	**deg F**	66
5	399.7	1/22/18	Kelli O'Brien	**deg F**	66
6	399.7	1/22/18	Kelli O'Brien	**deg F**	66
7	399.6	1/22/18	Brian Vinal	**deg F**	66
8	399.4	1/22/18	Brian Vinal	**deg F**	66
9	399.9	1/22/18	Brian Vinal	**deg F**	66
10	400.1	1/22/18	Kelli O'Brien	**deg F**	66
11	399.0	1/22/18	Kelli O'Brien	**deg F**	66
12	400.0	1/22/18	Kelli O'Brien	**deg F**	66

Calibration complies with ISO/IEC 17025, ANSI/NCSL Z540-1, and 9001

Cert. No.: 4096-8014959

Traceable® Certificate of Calibration for Digital Humidity/Temp. Meter

Instrument Identification:

Model: 4096 S/N: 160816582 Manufacturer: Control Company

Standards/Equipment:

Description	Serial Number	Due Date	NIST Traceable Reference
Chilled Mirror Hygrometer	31874/H2048MCR	10/12/16	13366
Digital Thermometer	140156093	3/08/17	4000-7479903

Certificate Information:

Technician: 104 Procedure: CAL-17 Cal Date: 10/03/16 Due Date: 10/03/18

Test Conditions: 23.4°C 52.0 %RH 1015 mBar

Calibration Data: (New Instrument)

Unit(s)	Nominal	As Found	In Tol	Nominal	As Left	In Tol	Min	Max	±U	TUR
%RH		N.A.		46.66	46	Y	43	51	1.3	3.1:1
°C		N.A.		24.465	24	Y	23	25	0.59	1.7:1

This Instrument was calibrated in compliance with ISO/IEC 17025:2005 and ANSI/NCSL Z540-1-1994 Part 1.

A Test Uncertainty Ratio of at least 4:1 is maintained unless otherwise stated and is calculated using the expanded measurement uncertainty. Uncertainty evaluation includes the instrument under test and is calculated in accordance with the ISO "Guide to the Expression of Uncertainty in Measurement" (GUM). The uncertainty represents an expanded uncertainty using a coverage factor k=2 to approximate a 95% confidence level. In tolerance conditions are based on test results falling within specified limits with no reduction by the uncertainty of the measurement. The results contained herein relate only to the item calibrated. This certificate shall not be reproduced except in full, without written approval of Control Company.

The calibration results published in this certificate were obtained using equipment capable of producing results that are traceable to NIST and through NIST to the International System of Units (SI).

Nominal=Standard's Reading; As Left=Instrument's Reading; In Tol=In Tolerance; Min/Max=Acceptance Range; ±U=Expanded Measurement Uncertainty; TUR=Test Uncertainty Ratio; Accuracy=±(Max-Min)/2; Min = As Left Nominal(Rounded) - Tolerance; Max = As Left Nominal(Rounded) + Tolerance; Date=MM/DD/YY

Nicol Rodriguez, Quality Manager

Aaron Judice, Technical Manager

Maintaining Accuracy:

In our opinion once calibrated your Digital Humidity/Temp. Meter should maintain its accuracy. There is no exact way to determine how long calibration will be maintained. Digital Humidity/Temp. Meters change little, if any at all, but can be affected by aging, temperature, shock, and contamination.

Recalibration:

This device was calibrated using a single test point. Should additional test points be required, please contact Control Company for factory calibration and re-certification traceable to National Institute of Standards and Technology.

CONTROL COMPANY 12554 Galveston RD Suite B230 Webster TX USA 77598
Phone 281 482-1714 Fax 281 482-9448 service@control3.com www.control3.com

DICK MUNNS COMPANY
LIQUID & GAS FLOW CALIBRATION

ISO 17025 ACCREDITED CL-122

CERTIFICATE OF CALIBRATION

CUSTOMER:	**CLEAR STAK** PUTNAM CT	**CALIBRATION DATE:**	01/16/18
PO NUMBER:	KELLI O'BRIEN	**CALIBRATION DUE:**	01/16/19
INST. MANUFACTURER:	NUTECH	**PROCEDURE:**	NAVAIR 17-20MG-02
INST. DESCRIPTION:	AIR SAMPLER/ STACK SAMPLER	**CALIBRATION FLUID:**	AIR @ 14.7 PSIA 70 F
MODEL NUMBER:	2010A GRASEBY ANDERSEN (2010.00)	**STANDARD(S) USED:**	A4, A24 DUE 06-2020
SERIAL NUMBER:	80994	**NIST TRACE #' S:**	1446135470, 1453926155
RATED UNCERTAINTY:	+/- 1 % RD.	**AMBIENT CONDITIONS:**	768 mm HGA 53 % RH 70 F
UNCERTAINTY GIVEN:	TOTAL measurement uncertainty: +/- .190 % RD. K=2	**CERTIFICATE FILE #:**	471997.18

NOTES: AS RECEIVED/ AS LEFT WITHIN SPECS. REFERENCE CONDITIONS ARE: 760 mm HGA 70 F

TEST POINT NUMBER	UUT INDICATED SCFH PD.METER	DM.STD. ACTUAL SCFH PD.METER	CORRRECTION FACTOR	UUT INDICATED INCH H2O PRESS	DM.STD. ACTUAL INCH H2O PRESS
1	5.0184	5.05	1.0063	1	1.00
2	19.9561	20.07	1.0057	4	4.00
3	35.0990	35.26	1.0046	6	6.00
4	49.7961	49.95	1.0031	8	8.00
5	64.8916	65.04	1.0023	10	10.00
6	79.6649	79.87	1.0026	GAUGE	GAUGE
7	95.0355	95.32	1.0030	"HG VAC.	"HG VAC.
8	109.7648	110.13	1.0033	0-30	0-30
		AVERAGE	1.00386	TEMPERATURE	TEMPERATURE
				F DEG.	F DEG.
				70	70.04

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 • 11133 Winners Circle • Los Alamitos, CA 90720
Phone (714) 827-1215 • Fax (714) 827-0823

Date: 1/16/2018

Approved By:

Calibration Technician:

DICK MUNNS COMPANY
LIQUID & GAS FLOW CALIBRATION

ISO 17025 ACCREDITED CL-122

CERTIFICATE OF CALIBRATION

CUSTOMER:	**CLEAR STAK** PUTNAM CT	**CALIBRATION DATE:**	01/16/18
PO NUMBER:	KELLI O'BRIEN	**CALIBRATION DUE:**	01/16/19
INST. MANUFACTURER:	NUTECH	**PROCEDURE:**	NAVAIR 17-20MG-02
INST. DESCRIPTION:	AIR SAMPLER/ STACK SAMPLER	**CALIBRATION FLUID:**	AIR @ 14.7 PSIA 70 F
MODEL NUMBER:	2010A GRASEBY ANDERSEN (MST-C1)	**STANDARD(S) USED:**	A4, A24 DUE 06-2020
SERIAL NUMBER:	90389	**NIST TRACE #' S:**	1446135470, 1453926155
RATED UNCERTAINTY:	+/- 1 % RD.	**AMBIENT CONDITIONS:**	768 mm HGA 53 % RH 70 F
UNCERTAINTY GIVEN:	TOTAL measurement uncertainty: +/- .190 % RD. K=2	**CERTIFICATE FILE #:**	471998.18

NOTES: AS RECEIVED/ AS LEFT WITHIN SPECS. REFERENCE CONDITIONS ARE: 760 mm HGA 70 F

TEST POINT NUMBER	UUT INDICATED SCFH PD.METER	DM.STD. ACTUAL SCFH PD.METER	CORRRECTION FACTOR	UUT INDICATED INCH H2O PRESS	DM.STD. ACTUAL INCH H2O PRESS
1	4.9538	4.98	1.0053	1	1.00
2	19.8253	19.91	1.0043	4	4.00
3	35.0441	35.15	1.0030	6	6.00
4	49.8708	49.96	1.0018	8	8.00
5	64.8846	65.02	1.0021	10	10.00
6	79.6649	79.87	1.0026	GAUGE	GAUGE
7	94.8892	95.21	1.0034	"HG VAC.	"HG VAC.
8	109.5745	109.92	1.0032	0-30	0-30
		AVERAGE	1.00320	TEMPERATURE	TEMPERATURE
				F DEG.	F DEG.
				73	73.03

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 • 11133 Winners Circle • Los Alamitos, CA 90720
Phone (714) 827-1215 • Fax (714) 827-0823

Date: 1/16/2018

Approved By:

Calibration Technician:

Calibration complies with ISO 9001 ISO/IEC 17025 AND ANSI/NCSL Z540-1

Cert. No.: 1333-8847784

Calibration Certificate No. 1750.01

Traceable® Certificate of Calibration for Kaleidoscope Stopwatch

Manufactured for and distributed by: Fisher Scientific, 300 Industry Drive, Pittsburgh, PA 15275-1001

Instrument Identification:

Model Numbers: 14-649-53, 11526893 S/N: 170684205 Manufacturer: Control Company

Standards/Equipment:

Description	Serial Number	Due Date	NIST Traceable Reference
Non-contact Frequency Counter	26.6 2025	3/27/18	1000406563

Certificate Information:

Technician: 150 Procedure: CAL-01 Cal Date: 10/02/17 Due Date: 10/02/19

Test Conditions: 24.2°C 68.0 %RH 1013 mBar

Calibration Data: (New Instrument)

Unit(s)	Nominal	As Found	In Tol	Nominal	As Left	In Tol	Min	Max	±U	TUR
Sec/24hr		N.A.		0.000	1.400	Y	-8.640	8.640	0.037	>4:1

This Instrument was calibrated using Instruments Traceable to National Institute of Standards and Technology.

A Test Uncertainty Ratio of at least 4:1 is maintained unless otherwise stated and is calculated using the expanded measurement uncertainty. Uncertainty evaluation includes the instrument under test and is calculated in accordance with the ISO "Guide to the Expression of Uncertainty in Measurement" (GUM). The uncertainty represents an expanded uncertainty using a coverage factor to approximate a 95% confidence level. In tolerance conditions are based on test results falling within specified limits with no reduction by the uncertainty of the measurement. The results contained herein relate only to the item calibrated. This certificate shall not be reproduced except in full, without written approval of Control Company.

Nominal=Standard's Reading; As Left=Instrument's Reading; In Tol=In Tolerance; Min/Max=Acceptance Range; ±U=Expanded Measurement Uncertainty; TUR=Test Uncertainty Ratio; Accuracy=±(Max/Min)/2; Min = Nominal(Rounded) - Tolerance; Max = Nominal(Rounded) + Tolerance; Date=MM/DD/YY

Nicol Rodriguez, Quality Manager

Aaron Judice, Technical Manager

Maintaining Accuracy:

In our opinion once calibrated your Kaleidoscope Stopwatch should maintain its accuracy. There is no exact way to determine how long calibration will be maintained. Kaleidoscope Stopwatchs change little, if any at all, but can be affected by aging, temperature, shock, and contamination.

Recalibration:

For factory calibration and re-certification traceable to National Institute of Standards and Technology contact Control Company.

CONTROL COMPANY 12554 Galveston RD Suite B230 Webster TX USA 77598
Phone 281 482-1714 Fax 281 482-9448 service@control3.com www.control3.com

Report Date: 01/03/2018

WORCESTER SCALE CO., INC.

228 Brooks St., Higgins Industrial Park
Worcester, Mass. 01606
P: (508) 853-2886
F: (508) 853-2902
www.worcscale.com

N.I.S.T. Traceability Numbers: 41867 & 822/255592-95 an ISO/IEC 17025 Registered Company -Cert.# ACT266

Certificate of Calibration

Customer: ClearStak
Address: 99 Canal Street
City, State, Zip: Putnam, CT, 06260-0109
Attention: Kelli O'Brien

Test Number: 44793
Test Date: 01/03/2018
Calibration Due: 07/2018
Measurement Uncertainty: mu= 0.026 lb

Equipment Tested : **Description :** Digital Floor Scale (Class III)
Manufacturer: Sartorius
Capacity: 1,000 lb
Condition as Found: Good
Keyboard Functions: Pass

Model: MI S2OR-V2
Division: .02 lb
Temperature: 66 ° F **Humidity:** 24 %
Repeatability: Pass **Decreasing Load:** Pass

ID: 33166427
Calibration: On Site:
W.S. Shop: <
Shift Test: Pass

Test Results:

Test Load	Readings as Found	Readings as Left	+/- Tolerance per HB-44
0.00 lb	0.00 lb	0.00 lb	.10 lb
100.00 lb	100.00 lb	100.00 lb	.20 lb
200.00 lb	200.02 lb	200.00 lb	.20 lb
300.00 lb	300.00 lb	300.00 lb	.30 lb
400.00 lb	400.02 lb	400.00 lb	.30 lb
500.00 lb	500.02 lb	500.00 lb	.50 lb
600.00 lb	600.02 lb	600.02 lb	.50 lb
700.00 lb	700.00 lb	700.02 lb	.50 lb
800.00 lb	800.02 lb	800.04 lb	.50 lb
900.00 lb	900.02 lb	900.04 lb	.50 lb
1,000.00 lb	1,000.02 lb	1,000.04 lb	.50 lb

* Denotes out of tolerance

Remarks: Tested, and certified final readings.
Standards Used: 11,27,29,33,45,52,70,83,88,96,305,308,318,320,330,726,753,768,770,828
Tested By: Mark Houseman
Technician (s)
Approved By:
Service Manager

This certificate attests that the above stated instrument has been calibrated with standards traceable to the National Institute of Standards and Technology (NIST). Certificates of traceability are on file at Worcester Scale Company, Inc. Calibration procedures reference WSC-009 and manufacturers service manuals. The calibration was performed in compliance of all applicable requirements of ISO/IEC 17025:2005. Computed uncertainties refer to WSC's Laboratory Accreditation Documents (reference Certificate AC-1266 for results). Test methods and tolerance requirements are found in the current edition of HB-44, section 2 (scale code manual). Any deviation from these should be noted in remarks section of this report. Due to numerous conditions that may affect calibration, this certificate attests only to the status of the tested equipment at the time of the test and/or calibration procedures. No sampling was performed during this calibration.
Measurement Uncertainty is expressed at a 95% confidence level with a coverage factor of k=2.

Tektronix®

ACCREDITED

CALIBRATION CERT #2357.08

Certificate of Calibration

13043549

Instrument Identification

Company ID: 1087
CLEARSTAK
KELLI OBRIEN
99 CONAL STREET
PUTMAN , CT 06260

PO Number: CS17120

Instrument ID: **50155**
Manufacturer: TROEMNER
Description: 2 KG WEIGHT

Class F

Model Number: 2 KG CLASS F
Serial Number: 50155

Certificate Information

Reason For Service: CALIBRATION
Type of Cal: ACCREDITED 17025 WITH UNCERTAINTIES
As Found Condition: IN TOLERANCE
As Left Condition: IN TOLERANCE
Procedure: 375A1053CSP REV G

Remarks: *DATA REPORT ATTACHED*

Technician: THOMAS HRYNUK
Cal Date 30Nov2017
Cal Due Date: 30Nov2018
Interval: 12 MONTHS
Temperature: 19.0 C
Humidity: 43.0 %

Tektronix certifies the performance of the above instrument has been verified using test equipment of known accuracy, which is traceable to a National Standards Laboratory (NIST, NPL, PTB). The policies and procedures used comply with ISO/IEC 17025:2005. This certificate shall not be reproduced, except in full, without the written approval of the calibration facility. Reported uncertainties are expanded uncertainties expressed at approximately the 95% confidence level using a coverage of k=2.

This certificate and associated attachments relate only to the metrological quantities presented in this report. No representation is made about the long-term stability of this unit. Any number of factors can influence the calibration that may cause the unit to drift out of specification before the calibration interval has expired.

Approved By: THOMAS HRYNUK
Service Representative

Issue Date: 11/30/2017

Calibration Standards

NIST Traceable#	Inst. ID#	Description	Manufacturer	Model	Cal Date	Date Due
11940192	1700415	WEIGHT SET	RICE LAKE WEIGHIN	45900	05Dec2016	05Dec2017
12060729R2	H046992	MASS COMPARATOR	METTLER TOLEDO	PR2004	25Jan2017	25Jan2018

Tektronix®

Certificate Number: 13043549

Manufacturer: Troemner
ID / Asset Number: 50155
Class: F

Model Number: 2 KG CLASS F
Calibration Date: 11/30/2017

Function / Range	Nominal Value	As Found	Result	As Left	Result	Min	Max	Units	Uncertainty
Mass Accuracy									
2000.0000	2000.0000	2000.0521	**Pass**	2000.0521	**Pass**	1999.8000	2000.2000	g	1.0 mg

Accredited Calibration Datasheets may contain measurements that are not covered by the Scope of Accreditation. These measurements are indicated by a pound sign (#).
Measurements with an (*) indicates an Indeterminate Guardband Pass or Fail - Guardbanding is determined by the Measurement Uncertainty Method

**********END OF MEASUREMENT REPORT**********

Starrett

ATTN: QUALITY ASSURANCE
MCMASTER-CARR SUP CO
200 NEW CANTON WAY
ROBBINSVILLE, NJ. 08691-2345

August 7, 2017

STANDARD LETTER of CERTIFICATION

THIS IS TO CERTIFY THAT THE ITEM LISTED BELOW MEETS THE REQUIREMENTS OF ACCURACY OF THE APPLICABLE SPECIFICATION ON DATE OF SHIPMENT.

STANDARDS AND EQUIPMENT USED FOR INSPECTION ARE CERTIFIED ACCURATE WITH REFERENCE TO 68 DEGREES F, TRACEABLE TO MASTER STANDARDS AT THE NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY, GAITHERSBURG, MD. CALIBRATION IS PERFORMED WITH TRANSFER STANDARDS WHICH ARE PROGRESSIVELY MORE ACCURATE IN THE ORDER OF 4: 1.

WE ATTEST THAT OUR MEASURING AND TEST EQUIPMENT, AND CALIBRATIONS PERFORMED ON THE ITEM (S) LISTED BELOW, ARE IN ACCORDANCE WITH ISO 17025, ISO GUIDE 25, ANSI/NCSL Z540-1, MIL-STD-45662A.

YOURS VERY TRULY,
THE L. S. STARRETT COMPANY

Susan Mader (for)

DEXTER J. CARLSON,
CHIEF INSPECTOR

YOUR ORDER NO.:	KA-86905640
STARRETT ORDER NO.:	2649825
CATALOG NO.:	KTX12-12-N ENGLISH MEASURING TAPE
SERIAL NO.:	17308312
N.I.S.T. TEST NO.	683/282436
SPECIFICATION:	GGG-T-106F
ACCURACY:	± 1/32" for the first 12 Feet, ± 1/16" for the remainder

The estimated uncertainties reflect a Confidence Probability of approximately 95%.

The L.S. Starrett Company
121 Crescent Street
Athol, MA 01331-1915 - USA
Tel.: 978 249-3551 / Fax: 978 249-8495
www.starrett.com

DELMHORST
INSTRUMENT CO.

LETTER OF CERTIFICATION

December 6, 2017

Clearstak, LLC
99 Canal Street
Putnam, CT 06260

Subject: Moisture Meter Model: J-2000, Serial No: 42318

This is to certify that the primary calibration - electrical resistance - of the Delmhorst Moisture Meter referenced above has been tested on equipment whose accuracy is certified by the following equipment:

General Radio Bridge, Model No. 1644-A, S/N 2526
Keithley Multimeter, Model No. 197, S/N 283483

The calibration of these instruments, certified by Industrial Process Measurement, Inc. with Report No. 66366-01, dated December 29, 2016 and Report No. 66366-02, dated December 28, 2016, is traceable to the NIST.

Sincerely,

John C. Laurenzi
V.P. Manufacturing

JCL: AA

51 INDIAN LANE EAST, TOWACO, NEW JERSEY 07082
PHONE: 973-334-2557, FAX: 973-334-2657
www.delmhorst.com

DELMHORST
INSTRUMENT CO.

CALIBRATION VERIFICATION FOR WOOD MOISTURE METERS

Customer Name: Clearstak, LLC

Model #: J-2000

Serial #: 42318

Date: 12/6/17

Nominal Settings At Factory	INCOMING	OUTGOING
7.0 +/- 0.5	7.1	7.1
10.0 +/- 0.5	10.0	10.0
15.0 +/- 0.5	15.1	15.1
20.0 +/- 0.5	19.9	19.9
25.0 +/- 0.5	24.7	24.6
30.0 +/- 0.5	30.1	30.1

Rev. 11/07

John C. Laurenzi
VP Manufacturing

51 INDIAN LANE EAST, TOWACO, NEW JERSEY 07082
PHONE: 973-334-2557, FAX: 973-334-2657
www.delmhorst.com

CSL-00010

Appendix C

Test ID	CSL-00010						
Technician	BV, KO'B						
Date	3/5/18						
Start Time	10:15						
End Time	10:30						
Barometric Pressure	29.7	in Hg					
Room Temperature	63	F					
Relative Humidity	40	%					
Saturation Pressure	0.285	psia					
Actual Fan Speed for Test (Hz)	16	Hz					
PreTest Pitot		in. water					
Leak Rate (15 seconds)	0	in. water	<--Must be 0				
Static Pressure in Appliance (no DT)	0	in. water	Static Pressure in Appliance must be taken within 1 ft of top of appliance				
Static Pressure in Appliance (DT)	0	in.					
Difference	0	in. water	"Difference" mustbe less than 0.005 in WC				
Diameter of Tunnel (in)	8	in.					
Static Pressure in Dilution Tunnel (beginning	0	in. water					
Point			**Port A**		**Port B**		
	% of Diameter	**Distance (inches)**	**Δp (in water)**	**Temperature (F)**	**Δp (in water)**	**Temperature (F)**	
1							
2	**6.7**	**0.536**	0.03	93	0.04	78	
3	**25**	**2.0**	0.045	93	0.045	87	
Center	**50**	**4.0**	0.055	94	0.055	96	
4	**77**	**6.0**	0.065	94	0.06	100	
5	**93.3**	**7.46**	0.065	95	0.065	103	
6							
PostTest Pitot							
Staic Pressure (after test)	0	in. water					
Leak Rate (15 seconds)	0	in. water					

ISS-1 ΔH@	
ISS-2 ΔH@	

Signature_____

Quality Review_____

PRELIMINARY VELOCITY DETERMINATION

Test ID	CSL-00010
Date	3/5/18

Static Pressure (Pg)	0.000	in W.C.
Pitot Coeffiecent	0.99	unitless
Gas Molecular Weight (MW) wet	29.0	lb/lb-mole
Diameter of Tunnel	8.000	inches
Dilution Tunnel Cross Sectional Area	0.349	FT^2

			Port A				Port B			
POINT	**% of Diameter**	**Distance (inches)**	**Δp (in W.C.)**	**√Δp (in W.C.)**	**Temp (F)**	**Temp(R)**	**Δp (in water)**	**√Δp (in W.C.)**	**Temp (F)**	**Temp(R)**
1			0.000	0.00	0.0	460	0.000	0.00	0.0	460
2	**6.7**	**0.54**	0.030	0.17	93.0	553	0.040	0.20	78.0	538
3	**25.0**	**2.00**	0.045	0.21	93.0	553	0.045	0.21	87.0	547
Center	**50.0**	**4.00**	0.055	0.23	94.0	554	0.055	0.23	96.0	556
4	**77.0**	**6.00**	0.065	0.25	94.0	554	0.060	0.24	100.0	560
5	**93.3**	**7.46**	0.065	0.25	95.0	555	0.065	0.25	103.0	563
6			0.000	0.00	0.0	460	0.000	0.00	0.0	460
			AVERAGE	**0.23**	**AVERAGE**	**553**				

DILUTION TUNNEL CALCULATIONS						
Absolute Gas Temperature; Tst = Ts + 459.67°		**Tst =**	**553**	**°R**		
Absolute Gas Pressure; Ps = Pb + Pg/13.6		**Ps =**	**29.7**	**inches Hg**		
Gas Velocity; Vs = (85.49) x Cp x (avg √ΔP) x √(Tst avg/(Ps*Mw))		**Vs =**	**15.44**	**FT/sec**	**926**	**FT/min**
Gas Flow Rate; Qa = Vs x 60 x cross sectional area		**Qa =**	**323**	**ACFM**		

V_{stray} CALCULATIONS		**AVERAGE √Δp**	**0.23**	**(in W.C.)**		
Absolute Gas Temperature; Tst = Ts + 459.67°		**Tst =**	**553**	**°R**		
Absolute Gas Pressure; Ps = Pb + Pg/13.6		**Ps =**	**29.7**	**inches Hg**		
Gas Velocity; Vs = (85.49) x Cp x (avg √ΔP) x √(Tst avg/(Ps*Mw))		**Vs =**	**15.31**	**FT/sec**	**919**	**FT/min**
Gas Flow Rate; Qa = Vs x 60 x cross sectional area		**Qa =**	**321**	**ACFM**		

1.0	**Fp**

V_{scent} CALCULATIONS		**AVERAGE √Δp**	**0.23**	**(in W.C.)**		
Absolute Gas Temperature; Tst = Ts + 459.67°		**Tst =**	**555**	**°R**		
Absolute Gas Pressure; Ps = Pb + Pg/13.6		**Ps =**	**29.7**	**inches Hg**		
Gas Velocity; Vs = (85.49) x Cp x (avg √ΔP) x √(Tst avg/(Ps*Mw))		**Vs =**	**15.93**	**FT/sec**	**956**	**FT/min**
Gas Flow Rate; Qa = Vs x 60 x cross sectional area		**Qa =**	**334**	**ACFM**		

METER BOX CALCULATIONS		
Proposed Porportional Sampling Rate; PR	1.00	
Sample Probe Inside Diameter	.175	inches
Sample Probe Cross Sectional Area	.00017	FT^2

296	SCFM
323	ACFM

Pstd	14.696	psia
Pact	14.4	psia
Psat	0.285	psia
Humidity	0.4	%/100
Tact	522.67	R
Tstd	491.67	R

Signature_____

Test ID:	CSL-00010
Date:	3.5.18

Fuel Type
Doug. Fir. Crib
Preburn or Test Fuel Charge
Preburn

Test Fuel Pieces Weight (lbs)	Total Spacer Weight (lbs)	Total Test Fuel Charge Weight
10.50	0.78	11.28

Average Test Fuel MC%	Test Fuel Density		Dry Basis Weight (lbs)	Charcoal Bed Loading Range (lbs)
21.09	25		8.29	2.26 to 2.82
*must be between 19-25%	**Test Fuel Loading Density must be between 25-36 lb/ft	*** Individual piece length shall closely aproximate 5/6 the dimension of the firebox length		*****Test Fuel Load Range 7lbs +/- 0.7 lbs per ft3

Piece Number	Piece Size (in):			Weight (lbs):	Moisture Content			Average MC (%)	Volume Cubic Inches	Avg. MC% x Dry Basis Weight
	Length	Width	Height		Moisture #1 (%)	Moisture #2 (%)	Moisture #3 (%)			
1	14.50	3.50	1.50	1.38	20.2	20.0	20.2	20.13	76.125	0.00000
2								#DIV/0!	0	0.00000
3								#DIV/0!	0	0.00000
4	14.50	3.50	3.50	3.10	20.4	20.9	22.7	21.33	177.625	0.00000
5	14.50	3.50	3.50	3.48	22.0	21.4	22.0	21.80	177.625	0.00000
6								#DIV/0!	0	0.00000
7	14.50	3.50	1.50	1.26	21.0	21.3	20.4	20.90	76.125	0.00000
8	14.50	3.50	1.50	1.28	21.4	21.0	21.4	21.27	76.125	0.00000
9								#DIV/0!	0	0.00000
10								#DIV/0!	0	0.00000
11								#DIV/0!	0	0.00000
12								#DIV/0!	0	0.00000
13								#DIV/0!	0	0.00000
14								#DIV/0!	0	0.00000
15								#DIV/0!	0	0.00000
16								#DIV/0!	0	0.00000
17								#DIV/0!	0	0.00000
18								#DIV/0!	0	0.00000
19								#DIV/0!	0	0.00000
20								#DIV/0!	0	0.00000
21								#DIV/0!	0	0.00000
22								#DIV/0!	0	0.00000
23								#DIV/0!	0	0.00000
24								#DIV/0!	0	0.00000
25								#DIV/0!	0	0.00000

Total Test Fuel Volume (in^3):
583.625
Total Test Fuel Volume (ft^3):
0.3377

Technician Signature _____

Quality Review Kelli O'Brien

Number of Spacers	***10***
Total Spacer Weight (lbs)	***0.78***
Average Spacer Moisture (%)	***14.16***

Spacer Number	*Piece Size (in)*			*Spacer Weight (lbs)*	*Moisture Content (%)*
	Length	*Width*	*Height*		
1	5.00	1.50	0.75	0.08	12.6
2	5.00	1.50	0.75	0.08	13.6
3	5.00	1.50	0.75	0.06	12.0
4	5.00	1.50	0.75	0.08	14.8
5	5.00	1.50	0.75	0.08	14.3
6	5.00	1.50	0.75	0.08	14.8
7	5.00	1.50	0.75	0.08	15.0
8	5.00	1.50	0.75	0.08	13.8
9	5.00	1.50	0.75	0.08	15.6
10	5.00	1.50	0.75	0.08	15.1
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					
21					
22					
23					
24					
25					

Kelli O'Brien

Test ID:	CSL-00010
Date:	3.5.18

Fuel Type
Doug. Fir Cribwood
Preburn or Test Fuel Charge
Test Fuel

Test Fuel Pieces Weight (lbs)	Total Spacer Weight (lbs)	Total Test Fuel Charge Weight
10.88	0.84	11.72

Average Test Fuel MC%	Test Fuel Density		Dry Basis Weight (lbs)	Charcoal Bed Loading Range (lbs)
22.53	25		8.43	2.34 to 2.93
*must be between 19-25%	**Test Fuel Loading Density must be between 25-36 lb/ft	*** Individual piece length shall closely aproximate 5/6 the dimension of the firebox length		*****Test Fuel Load Range 7lbs +/- 0.7 lbs per ft3

Piece Number	Piece Size (in):			Weight (lbs):	Moisture Content			Average MC (%)	Volume Cubic Inches	Avg. MC% x Dry Basis Weight
	Length	Width	Height		Moisture #1 (%)	Moisture #2 (%)	Moisture #3 (%)			
1	14.50	3.50	1.50	1.26	20.8	20.7	23.5	21.67	76.125	0.00000
2	14.50	3.50	1.50	1.32	22.5	23.1	23.5	23.03	76.125	0.00000
3	14.50	3.50	1.50	1.28	23.5	23.5	21.0	22.67	76.125	0.00000
4	14.50	3.50	3.50	3.52	22.6	22.3	23.6	22.83	177.625	0.00000
5	14.50	3.50	3.50	3.50	23.0	22.0	22.4	22.47	177.625	0.00000
6								#DIV/0!	0	0.00000
7								#DIV/0!	0	0.00000
8								#DIV/0!	0	0.00000
9								#DIV/0!	0	0.00000
10								#DIV/0!	0	0.00000
11								#DIV/0!	0	0.00000
12								#DIV/0!	0	0.00000
13								#DIV/0!	0	0.00000
14								#DIV/0!	0	0.00000
15								#DIV/0!	0	0.00000
16								#DIV/0!	0	0.00000
17								#DIV/0!	0	0.00000
18								#DIV/0!	0	0.00000
19								#DIV/0!	0	0.00000
20								#DIV/0!	0	0.00000
21								#DIV/0!	0	0.00000
22								#DIV/0!	0	0.00000
23								#DIV/0!	0	0.00000
24								#DIV/0!	0	0.00000
25								#DIV/0!	0	0.00000

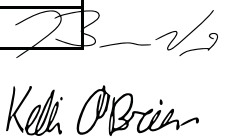
Total Test Fuel Volume (in^3):
583.625
Total Test Fuel Volume (ft^3):
0.3377

Technician Signature _____

Quality Review Kelli O'Brien

Number of Spacers	***10***
Total Spacer Weight (lbs)	***0.84***
Average Spacer Moisture (%)	***17.04***

Spacer Number	*Piece Size (in)*			*Spacer Weight (lbs)*	*Moisture Content (%)*
	Length	*Width*	*Height*		
1	5.00	1.50	0.75	0.08	20.9
2	5.00	1.50	0.75	0.08	13.2
3	5.00	1.50	0.75	0.08	17.6
4	5.00	1.50	0.75	0.08	14.2
5	5.00	1.50	0.75	0.08	20.9
6	5.00	1.50	0.75	0.10	17.0
7	5.00	1.50	0.75	0.08	17.8
8	5.00	1.50	0.75	0.10	16.0
9	5.00	1.50	0.75	0.08	13.7
10	5.00	1.50	0.75	0.08	19.1
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					
21					
22					
23					
24					
25					



ClearStak

Manufacturer:	MF Fire	**Technicians:**	Kelli O'Brien
Model:	Nova		
Date:	03/05/18		Brian Vinal
Run:	1		
Control #:	CSL-00010		
Test Duration:	158		
Output Category:	N/A		

Test Results in Accordance with CSA B415.1-10

	HHV Basis	LHV Basis
Overall Efficiency	67.9%	73.4%
Combustion Efficiency	99.5%	99.5%
Heat Transfer Efficiency	68%	73.7%

Output Rate (kJ/h)	21,040	19,959	**(Btu/h)**
Burn Rate (kg/h)	1.56	3.45	**(lb/h)**
Input (kJ/h)	30,990	29,398	**(Btu/h)**

Test Load Weight (dry kg)	4.12	9.08	**dry lb**
MC wet (%)	22.53		
MC dry (%)	29.08		
Particulate (g)	5.18		
CO (g)	25		
Test Duration (h)	2.63		

Emissions	Particulate	CO
g/MJ Output	0.09	0.45
g/kg Dry Fuel	1.26	6.06
g/h	1.97	9.49
lb/MM Btu Output	0.22	1.05

Air/Fuel Ratio (A/F)	18.06

VERSION: **2.4** **4/15/10**

Method 28 Data Collection	
Date	3/5/18
Operator	BV, KO'B
Test Type	Method 28R
Run #	1
Wood Heater Information	
Manufacturer/ Model	MF Fire/ Nova
Test ID	CSL-00010
Volume of water in Appliance (gal)	n/a
Weight of Appliance (empty) (lbs)	303.2
Volume of water in Storage (gal)	n/a
Weight of Storage Tank(s) (empty) (lbs)	n/a
Primary Air Setting (Hz)	single burn rate stove
Secondary Air Setting (Hz)	single burn rate stove
Thermostat Setting (F)	n/a
Fuel Type	doug fir crib wood

Velocity Traverse	
Static Pressure (in WC)	0
Vstrav (ACFM)	321
Vscent (ACFM)	334
Pre-Test Conditions	
Desired Flow Rate (load Side) (GPM)	n/a
Pre-test destratification volume pumped (need 2x) (gal)	n/a
Pre-test temperature difference (post destratification) (F)	n/a
Test facility temp at test start (F)	65
Room air velocity (FPM)	8,8,13
Ambient relative humidity (%)	40
Ambient barometric pressure (in Hg)	29.7
Adjustments to pre-test fuel	See Kelvin notes
Coal-bed weight prior to test start (lbs)	2.62

Post-Test Conditions	
Time of TFS_{avg} (hh:mm) (leave blank if Cat III or IV)	
room air velocity immediately following run (FPM)	8,12,9
test facility temperature after run (F)	73
ambient relative humidity after run (%)	30
ambient barometric pressure after run (in Hg)	29.7
Weight of unburnt fuel (lbs)	n/a

Note** When inputting data from the logger, the start time of the input must coincide with the start time of the test.

Signature_____

Quality Review_____

Ambient

Test ID	CSL-00010
Date	3/5/18
Start Time (hh:mm:ss)	11:41
End Time (hh:mm:ss)	14:19
Y (DGM calibration factor)	1.00243
Pre test leak (*A* cfm @ *B* in Hg)	0.00 @20 in. WC
Post test leak (*A* cfm @ *B* in Hg)	0.00 @ 20 in WC

Filter Assemblies		
A	FH #	FH-01,FF-15
	Front Filter #	G-18-0001
	Back Filter #	n/a
B	FH #	
	Front Filter #	
	Back Filter #	

*Pre and Post leak checkes should be 60 seconds in duration

Duration (hh:mm:ss)	DGM (m^3)	ΔH (in H_2O)	Flow (l/min)	ΔP (in H_2O)
0:00:00	90.8896	4.0	2.0	0.060
0:10:00	90.9022	4.0	2.0	0.060
0:20:00	90.9251	4.0	2.0	0.050
0:30:00	90.9473	3.5	2.0	0.050
0:40:00	90.9695	3.5	2.0	0.050
0:50:00	90.9916	3.5	2.0	0.060
1:00:00	91.0154	3.5	2.0	0.055
1:10:00	91.0300	3.5	2.0	0.060
1:20:00	91.0520	3.5	2.0	0.060
1:30:00	91.0739	3.5	2.0	0.055
1:40:00	91.0956	3.5	2.0	0.050
1:50:00	91.1177	3.5	2.0	0.050
2:00:00	91.1395	3.5	2.0	0.045
2:10:00	91.1616	3.5	2.0	0.055
2:20:00	91.1832	3.5	2.0	0.055
2:30:00	91.2055	3.5	2.0	0.050
2:38:39	91.2244	3.5	2.0	
2:50:00				
3:00:00				
3:10:00				
3:20:00				
3:30:00				
3:40:00				
3:50:00				
4:00:00				

Signature_____

Quality Review_____

ISS-1

Test ID	CSL-00010
Date	3/5/18
Start Time (hh:mm:ss)	11:41:00
End Time (hh:mm:ss)	14:19:00
Y (DGM calibration factor)	1.004
Pre test leak (*A* cfm @ *B* in Hg)	0.00 @10 in. Hg
Post test leak (*A* cfm @ *B* in Hg)	0.00 @ 5 in. Hg

Filter Assemblies		
A	FH #	FH-2, FH-4,FF-12
	Front Filter #	G-18-0008
	Back Filter #	G-18-0003
B	FH #	
	Front Filter #	
	Back Filter #	

*Pre and Post leak checkes should be 60 seconds in duration

PM Sampling Flow may be 0.15-.25 cfm

Duration (hh:mm:ss)	DGM (ft^3)	ΔH (in H_2O)	Module In Temp (°F)	Module Out Temp (°F)	Vacuum (in Hg)
0:00:00	370.395	0.15	64	64	1.0
0:10:00	373.110	0.15	64	64	1.0
0:20:00	375.400	0.15	66	64	1.0
0:30:00	377.842	0.15	67	65	1.0
0:40:00	380.318	0.15	69	66	1.0
0:50:00	382.788	0.15	71	67	1.0
1:00:00	385.218	0.15	72	69	1.0
1:10:00	387.240	0.15	73	70	1.0
1:20:00	389.545	0.15	73	70	1.0
1:30:00	391.985	0.15	73	71	1.0
1:40:00	394.460	0.15	74	71	1.0
1:50:00	396.928	0.15	74	72	1.0
2:00:00	399.362	0.15	75	72	1.0
2:10:00	401.875	0.15	75	72	1.0
2:20:00	404.345	0.15	75	73	1.0
2:30:00	406.777	0.15	74	73	1.0
2:38:39	408.877				
2:50:00					
3:00:00					
3:10:00					
3:20:00					
3:30:00					
3:40:00					
3:50:00					
4:00:00					

Signature_____

Quality Review_____

ISS-2

	Filter Change 1	Filter Change 2	Filter Change 3
Weight (lbs)			
Elapsed Time Paused (hh:mm:ss)	0:11:41		
Elapsed Time Resume (hh:mm:ss)	0.12:41		
Actual Time Pause (hh:mm:ss)	11:52:41	11:41:00	11:41:00
Actual Time Resume (hh:mm:ss)	#VALUE!	11:41:00	11:41:00

Test ID	CSL-00010
Date	3/5/18
Start Time (hh:mm:ss)	11:41
End Time (hh:mm:ss)	14:19
Y (DGM calibration factor)	1.0032
Pre test leak (*A* cfm @ *B* in Hg)	0.00 @ 15 in. Hg
Post test leak (*A* cfm @ *B* in Hg)	0.00 @ 5 in. Hg

*Pre and Post leak checkes should be 60 seconds in duration

PM Sampling Flow may be 0.15-.25 cfm

Filter Assemblies		
A	FH #	FH-07, FH-06, FF-07
	Front Filter #	G-18-0004
	Back Filter #	G-18-0005
B	FH #	FH-09, FH-08, FF-17
	Front Filter #	G-18-0006
	Back Filter #	G-18-0007
C	FH #	
	Front Filter #	
	Back Filter #	

Duration (hh:mm:ss)	DGM (ft^3)	ΔH (in H_2O)	Module In Temp (°F)	Module Out Temp (°F)	Vacuum (in Hg)
0:00:00	676.882	0.15	68	68	2.0
0:10:00	679.085	0.15	68	68	2.0
0:20:00	681.348	0.15	69	68	2.0
0:30:00	683.844	0.15	70	69	2.0
0:40:00	686.360	0.15	72	70	2.0
0:50:00	688.736	0.15	74	71	2.0
1:00:00	691.120	0.15	74	72	2.0
1:10:00	693.128	0.15	75	73	2.0
1:20:00	695.610	0.15	76	74	2.0
1:30:00	698.098	0.15	76	75	2.0
1:40:00	700.610	0.15	77	75	2.0
1:50:00	703.095	0.15	77	75	2.0
2:00:00	705.578	0.15	77	76	2.0
2:10:00	708.115	0.15	78	76	2.0
2:20:00	710.605	0.15	77	76	2.0
2:30:00	713.100	0.15	77	76	2.0
2:38:39	715.073				
2:50:00					
3:00:00					
3:10:00					

Signature

Quality Review Kelli O'Brien

Test ID:	CSL-00010	
Date:	3/5/18	

	ISS#/AS#	Filter/FH ID #	Pre-Weight Avg (g)	Post Weight Avg (g)	Total Catch (g)	Total Catch (mg)
Ambient	AS-1	G-18-0001	0.1120	0.1122	**0.0003**	0.250
	AS-1	FF-01	63.6541	63.6538	**-0.0003**	0.000
ISS 1	ISS-1	G-18-0008	0.1117	0.1166	**0.0049**	4.900
	ISS-1	G-18-0003	0.1119	0.1116	**-0.0003**	0.000
	ISS-1	FF-12	63.4965	63.4963	**-0.0002**	0.000
ISS 2A	ISS-2	G-18-0004	0.1166	0.1209	**0.0044**	4.350
	ISS-2	G-18-0005	0.1131	0.1131	**0.0000**	0.000
	ISS-2	FF-7	63.9316	63.9315	**-0.0002**	0.000
ISS 2B	ISS-2	G-18-0006	0.1119	0.1127	**0.0008**	0.850
	ISS-2	G-18-0007	0.1170	0.1170	**0.0000**	0.000
	ISS-2	FF-17	64.2726	64.2726	**-0.0001**	0.000
n/a	ISS-2				**0.0000**	0.000
	ISS-2				**0.0000**	0.000
	ISS-2				**0.0000**	0.000

Signature_____

Quality Review_____

Test ID:	CSL-00010
Date:	3/5/18

ISS-1

Test Duration (hh:mm:ss)	T_s	V_{sm}	v_s	T_m	T_d	V_m	v_d	T_t	T_{sm}	PR
0:00:00										
0:10:00	10	0.077	11.57977	290.9	312.4	0.077	11.98168	311.4732	290.9278	96.93319
0:20:00	20	0.065	11.2571	291.1	313.1778	0.142	11.45931	310.8061	291.2056	90.55099
0:30:00	30	0.069	11.09473	291.3	314.3722	0.211	10.93118	311.1	291.7611	100.7532
0:40:00	40	0.070	10.99917	291.7	313.65	0.281	10.94511	311.8939	292.4556	100.5883
0:50:00	50	0.070	11.10706	292.0	313.3722	0.351	11.48801	312.3656	293.2889	96.23176
1:00:00	60	0.069	11.11398	292.4	312.9833	0.420	11.74764	312.4423	294.1222	92.65656
1:10:00	70	0.057	11.18349	292.7	312.9556	0.477	11.74778	312.4497	294.8167	79.54
1:20:00	80	0.065	11.23735	293.0	312.4833	0.542	11.99948	312.399	295.0944	89.55
1:30:00	90	0.069	11.23083	293.2	312.2333	0.611	11.74503	312.3032	295.2333	96.57111
1:40:00	100	0.070	11.18024	293.4	312.15	0.681	11.22027	312.1644	295.5111	101.7524
1:50:00	110	0.070	11.13827	293.6	311.7611	0.751	10.94667	311.9828	295.7889	103.2776
2:00:00	120	0.069	11.06383	293.8	311.7611	0.820	10.66718	311.8472	296.0667	103.764
2:10:00	130	0.071	11.07263	294.0	311.5111	0.891	10.94096	311.6572	296.2056	104.1961
2:20:00	140	0.070	11.0806	294.2	311.2333	0.961	11.47246	311.5206	296.3444	97.56418
2:30:00	150	0.069	11.05534	294.3	310.9	1.030	11.20518	311.3255	296.3444	98.11033
2:38:39	159	0.059	#VALUE!	Error	313.7611	1.090	10.93283	311.194	Error	#VALUE!
2:50:00	170	Error	#VALUE!	Error	313.7611	Error	#DIV/0!	311.194	Error	#VALUE!
3:00:00	180	Error	#VALUE!	Error	313.7611	Error	#DIV/0!	311.194	Error	#VALUE!
3:10:00	190	Error	#VALUE!	Error	313.7611	Error	#DIV/0!	311.194	Error	#VALUE!
3:20:00	200	Error	#VALUE!	Error	313.7611	Error	#DIV/0!	311.194	Error	#VALUE!
3:30:00	210	Error	#VALUE!	Error	313.7611	Error	#DIV/0!	311.194	Error	#VALUE!
3:40:00	220	Error	#VALUE!	Error	313.7611	Error	#DIV/0!	311.194	Error	#VALUE!
3:50:00	230	Error	#VALUE!	Error	313.7611	Error	#DIV/0!	311.194	Error	#VALUE!
4:00:00	240	Error	#VALUE!	Error	313.7611	Error	#DIV/0!	311.194	Error	#VALUE!
4:10:00	250	Error	#VALUE!	Error	313.7611	Error	#DIV/0!	311.194	Error	#VALUE!
4:20:00	260	Error	#VALUE!	Error	313.7611	Error	#DIV/0!	311.194	Error	#VALUE!
4:30:00	270	Error	#VALUE!	Error	313.7611	Error	#DIV/0!	311.194	Error	#VALUE!
4:40:00	280	Error	#VALUE!	Error	313.7611	Error	#DIV/0!	311.194	Error	#VALUE!
4:50:00	290	Error	#VALUE!	Error	313.7611	Error	#DIV/0!	311.194	Error	#VALUE!
5:00:00	300	Error	#VALUE!	Error	313.7611	Error	#DIV/0!	311.194	Error	#VALUE!
5:10:00	310	Error	#VALUE!	Error	313.7611	Error	#DIV/0!	311.194	Error	#VALUE!
5:20:00	320	Error	#VALUE!	Error	313.7611	Error	#DIV/0!	311.194	Error	#VALUE!
5:30:00	330	Error	#VALUE!	Error	313.7611	Error	#DIV/0!	311.194	Error	#VALUE!
5:40:00	340	Error	#VALUE!	Error	313.7611	Error	#DIV/0!	311.194	Error	#VALUE!
5:50:00	350	Error	#VALUE!	Error	313.7611	Error	#DIV/0!	311.194	Error	#VALUE!
6:00:00	360	Error	#VALUE!	Error	313.7611	Error	#DIV/0!	311.194	Error	#VALUE!
6:10:00	370	Error	#VALUE!	Error	313.7611	Error	#DIV/0!	311.194	Error	#VALUE!
6:20:00	380	Error	#VALUE!	Error	313.7611	Error	#DIV/0!	311.194	Error	#VALUE!
6:30:00	390	Error	#VALUE!	Error	313.7611	Error	#DIV/0!	311.194	Error	#VALUE!
6:40:00	400	Error	#VALUE!	Error	313.7611	Error	#DIV/0!	311.194	Error	#VALUE!
6:50:00	410	Error	#VALUE!	Error	313.7611	Error	#DIV/0!	311.194	Error	#VALUE!
7:00:00	420	Error	#VALUE!	Error	313.7611	Error	#DIV/0!	311.194	Error	#VALUE!
7:10:00	430	Error	#VALUE!	Error	313.7611	Error	#DIV/0!	311.194	Error	#VALUE!
7:20:00	440	Error	#VALUE!	Error	313.7611	Error	#DIV/0!	311.194	Error	#VALUE!
7:30:00	450	Error	#VALUE!	Error	313.7611	Error	#DIV/0!	311.194	Error	#VALUE!
7:40:00	460	Error	#VALUE!	Error	313.7611	Error	#DIV/0!	311.194	Error	#VALUE!
7:50:00	470	Error	#VALUE!	Error	313.7611	Error	#DIV/0!	311.194	Error	#VALUE!
8:00:00	480	Error	#VALUE!	Error	313.7611	Error	#DIV/0!	311.194	Error	#VALUE!
8:10:00	490	Error	#VALUE!	Error	313.7611	Error	#DIV/0!	311.194	Error	#VALUE!
8:20:00	500	Error	#VALUE!	Error	313.7611	Error	#DIV/0!	311.194	Error	#VALUE!
8:30:00	510	Error	#VALUE!	Error	313.7611	Error	#DIV/0!	311.194	Error	#VALUE!
8:40:00	520	Error	#VALUE!	Error	313.7611	Error	#DIV/0!	311.194	Error	#VALUE!
8:50:00	530	Error	#VALUE!	Error	313.7611	Error	#DIV/0!	311.194	Error	#VALUE!
9:00:00	540	Error	#VALUE!	Error	313.7611	Error	#DIV/0!	311.194	Error	#VALUE!
9:10:00	550	Error	#VALUE!	Error	313.7611	Error	#DIV/0!	311.194	Error	#VALUE!
9:20:00	560	Error	#VALUE!	Error	313.7611	Error	#DIV/0!	311.194	Error	#VALUE!
9:30:00	570	Error	#VALUE!	Error	313.7611	Error	#DIV/0!	311.194	Error	#VALUE!
9:40:00	580	Error	#VALUE!	Error	313.7611	Error	#DIV/0!	311.194	Error	#VALUE!
9:50:00	590	Error	#VALUE!	Error	313.7611	Error	#DIV/0!	311.194	Error	#VALUE!
10:00:00	600	Error	#VALUE!	Error	313.7611	Error	#DIV/0!	311.194	Error	#VALUE!
10:10:00	610	Error	#VALUE!	Error	313.7611	Error	#DIV/0!	311.194	Error	#VALUE!
10:20:00	620	Error	#VALUE!	Error	313.7611	Error	#DIV/0!	311.194	Error	#VALUE!
10:30:00	630	Error	#VALUE!	Error	313.7611	Error	#DIV/0!	311.194	Error	#VALUE!
10:40:00	640	Error	#VALUE!	Error	313.7611	Error	#DIV/0!	311.194	Error	#VALUE!
10:50:00	650	Error	#VALUE!	Error	313.7611	Error	#DIV/0!	311.194	Error	#VALUE!
11:00:00	660	Error	#VALUE!	Error	313.7611	Error	#DIV/0!	311.194	Error	#VALUE!
11:10:00	670	Error	#VALUE!	Error	313.7611	Error	#DIV/0!	311.194	Error	#VALUE!
11:20:00	680	Error	#VALUE!	Error	313.7611	Error	#DIV/0!	311.194	Error	#VALUE!
11:30:00	690	Error	#VALUE!	Error	313.7611	Error	#DIV/0!	311.194	Error	#VALUE!
11:40:00	700	Error	#VALUE!	Error	313.7611	Error	#DIV/0!	311.194	Error	#VALUE!
11:50:00	710	Error	#VALUE!	Error	313.7611	Error	#DIV/0!	311.194	Error	#VALUE!
12:00:00	720	Error	#VALUE!	Error	0	Error	#DIV/0!	311.194	Error	#VALUE!

ISS-2

Test Duration (hh:mm:ss)	T_s	V_{sm}	v_s	T_m	T_d	V_m	v_d	T_t	T_{sm}	PR
0:00:00										
0:10:00	10	0.062382	11.57977	293.15	311.7056	0.062382	11.98168	311.4732	293.15	96.71772
0:20:00	20	0.064081	11.2571	293.2889	312.4	0.126463	11.45931	310.8061	293.2889	100.0658
0:30:00	30	0.070679	11.09473	293.7056	313.1778	0.197142	10.93118	311.1	293.7056	109.8936
0:40:00	40	0.071245	10.99917	294.4	314.3722	0.268387	10.94511	311.8939	294.4	107.555
0:50:00	50	0.067281	11.10706	295.2333	313.65	0.335668	11.48801	312.3656	295.2333	97.29444
1:00:00	60	0.067507	11.11398	295.7889	313.3722	0.403175	11.74764	312.4423	295.7889	95.3274
1:10:00	70	0.05686	11.18349	296.2056	312.9833	0.460035	11.74778	312.4497	296.2056	82.50453
1:20:00	80	0.070282	11.23735	296.7611	312.9556	0.530318	11.99948	312.399	296.7611	99.46612
1:30:00	90	0.070452	11.23083	297.1778	312.4833	0.60077	11.74503	312.3032	297.1778	100.9805
1:40:00	100	0.071132	11.18024	297.4556	312.2333	0.671902	11.22027	312.1644	297.4556	105.5121
1:50:00	110	0.070367	11.13827	297.5944	312.15	0.742269	10.94667	311.9828	297.5944	106.1624
2:00:00	120	0.070311	11.06383	297.7333	311.7611	0.81258	10.66718	311.8472	297.7333	107.6645
2:10:00	130	0.07184	11.07263	298.0111	311.7611	0.88442	10.94096	311.6572	298.0111	106.903
2:20:00	140	0.070509	11.0806	298.0111	311.5111	0.954929	11.47246	311.5206	298.0111	99.83767
2:30:00	150	0.070651	11.05534	297.8722	311.2333	1.02558	11.20518	311.3255	297.8722	101.9206
2:38:39	159	0.055869	#VALUE!	Error	310.9	1.081449	10.93283	311.194	Error	#VALUE!
2:50:00	170	Error	#VALUE!	Error	313.7611	Error	#DIV/0!	311.194	Error	#VALUE!
3:00:00	180	Error	#VALUE!	Error	313.7611	Error	#DIV/0!	311.194	Error	#VALUE!
3:10:00	190	Error	#VALUE!	Error	313.7611	Error	#DIV/0!	311.194	Error	#VALUE!
3:20:00	200	Error	#VALUE!	Error	313.7611	Error	#DIV/0!	311.194	Error	#VALUE!
3:30:00	210	Error	#VALUE!	Error	313.7611	Error	#DIV/0!	311.194	Error	#VALUE!
3:40:00	220	Error	#VALUE!	Error	313.7611	Error	#DIV/0!	311.194	Error	#VALUE!
3:50:00	230	Error	#VALUE!	Error	313.7611	Error	#DIV/0!	311.194	Error	#VALUE!
4:00:00	240	Error	#VALUE!	Error	313.7611	Error	#DIV/0!	311.194	Error	#VALUE!
4:10:00	250	Error	#VALUE!	Error	313.7611	Error	#DIV/0!	311.194	Error	#VALUE!
4:20:00	260	Error	#VALUE!	Error	313.7611	Error	#DIV/0!	311.194	Error	#VALUE!
4:30:00	270	Error	#VALUE!	Error	313.7611	Error	#DIV/0!	311.194	Error	#VALUE!
4:40:00	280	Error	#VALUE!	Error	313.7611	Error	#DIV/0!	311.194	Error	#VALUE!
4:50:00	290	Error	#VALUE!	Error	313.7611	Error	#DIV/0!	311.194	Error	#VALUE!
5:00:00	300	Error	#VALUE!	Error	313.7611	Error	#DIV/0!	311.194	Error	#VALUE!
5:10:00	310	Error	#VALUE!	Error	313.7611	Error	#DIV/0!	311.194	Error	#VALUE!
5:20:00	320	Error	#VALUE!	Error	313.7611	Error	#DIV/0!	311.194	Error	#VALUE!
5:30:00	330	Error	#VALUE!	Error	313.7611	Error	#DIV/0!	311.194	Error	#VALUE!
5:40:00	340	Error	#VALUE!	Error	313.7611	Error	#DIV/0!	311.194	Error	#VALUE!
5:50:00	350	Error	#VALUE!	Error	313.7611	Error	#DIV/0!	311.194	Error	#VALUE!
6:00:00	360	Error	#VALUE!	Error	313.7611	Error	#DIV/0!	311.194	Error	#VALUE!
6:10:00	370	Error	#VALUE!	Error	313.7611	Error	#DIV/0!	311.194	Error	#VALUE!
6:20:00	380	Error	#VALUE!	Error	313.7611	Error	#DIV/0!	311.194	Error	#VALUE!
6:30:00	390	Error	#VALUE!	Error	313.7611	Error	#DIV/0!	311.194	Error	#VALUE!
6:40:00	400	Error	#VALUE!	Error	313.7611	Error	#DIV/0!	311.194	Error	#VALUE!
6:50:00	410	Error	#VALUE!	Error	313.7611	Error	#DIV/0!	311.194	Error	#VALUE!
7:00:00	420	Error	#VALUE!	Error	313.7611	Error	#DIV/0!	311.194	Error	#VALUE!
7:10:00	430	Error	#VALUE!	Error	313.7611	Error	#DIV/0!	311.194	Error	#VALUE!
7:20:00	440	Error	#VALUE!	Error	313.7611	Error	#DIV/0!	311.194	Error	#VALUE!
7:30:00	450	Error	#VALUE!	Error	313.7611	Error	#DIV/0!	311.194	Error	#VALUE!
7:40:00	460	Error	#VALUE!	Error	313.7611	Error	#DIV/0!	311.194	Error	#VALUE!
7:50:00	470	Error	#VALUE!	Error	313.7611	Error	#DIV/0!	311.194	Error	#VALUE!
8:00:00	480	Error	#VALUE!	Error	313.7611	Error	#DIV/0!	311.194	Error	#VALUE!
8:10:00	490	Error	#VALUE!	Error	313.7611	Error	#DIV/0!	311.194	Error	#VALUE!
8:20:00	500	Error	#VALUE!	Error	313.7611	Error	#DIV/0!	311.194	Error	#VALUE!
8:30:00	510	Error	#VALUE!	Error	313.7611	Error	#DIV/0!	311.194	Error	#VALUE!
8:40:00	520	Error	#VALUE!	Error	313.7611	Error	#DIV/0!	311.194	Error	#VALUE!
8:50:00	530	Error	#VALUE!	Error	313.7611	Error	#DIV/0!	311.194	Error	#VALUE!
9:00:00	540	Error	#VALUE!	Error	313.7611	Error	#DIV/0!	311.194	Error	#VALUE!
9:10:00	550	Error	#VALUE!	Error	313.7611	Error	#DIV/0!	311.194	Error	#VALUE!
9:20:00	560	Error	#VALUE!	Error	313.7611	Error	#DIV/0!	311.194	Error	#VALUE!
9:30:00	570	Error	#VALUE!	Error	313.7611	Error	#DIV/0!	311.194	Error	#VALUE!
9:40:00	580	Error	#VALUE!	Error	313.7611	Error	#DIV/0!	311.194	Error	#VALUE!
9:50:00	590	Error	#VALUE!	Error	313.7611	Error	#DIV/0!	311.194	Error	#VALUE!
10:00:00	600	Error	#VALUE!	Error	313.7611	Error	#DIV/0!	311.194	Error	#VALUE!
10:10:00	610	Error	#VALUE!	Error	313.7611	Error	#DIV/0!	311.194	Error	#VALUE!
10:20:00	620	Error	#VALUE!	Error	313.7611	Error	#DIV/0!	311.194	Error	#VALUE!
10:30:00	630	Error	#VALUE!	Error	313.7611	Error	#DIV/0!	311.194	Error	#VALUE!
10:40:00	640	Error	#VALUE!	Error	313.7611	Error	#DIV/0!	311.194	Error	#VALUE!
10:50:00	650	Error	#VALUE!	Error	313.7611	Error	#DIV/0!	311.194	Error	#VALUE!
11:00:00	660	Error	#VALUE!	Error	313.7611	Error	#DIV/0!	311.194	Error	#VALUE!
11:10:00	670	Error	#VALUE!	Error	313.7611	Error	#DIV/0!	311.194	Error	#VALUE!
11:20:00	680	Error	#VALUE!	Error	313.7611	Error	#DIV/0!	311.194	Error	#VALUE!
11:30:00	690	Error	#VALUE!	Error	313.7611	Error	#DIV/0!	311.194	Error	#VALUE!
11:40:00	700	Error	#VALUE!	Error	313.7611	Error	#DIV/0!	311.194	Error	#VALUE!
11:50:00	710	Error	#VALUE!	Error	313.7611	Error	#DIV/0!	311.194	Error	#VALUE!
12:00:00	720	Error	#VALUE!	Error	313.7611	Error	#DIV/0!	311.194	Error	#VALUE!

T_t	total sampling time	min
V_{sm}	volume of dry gas sample as measured by dry gas meter during each 10 minute interval, *i* , of the test run	dry m^3
v_s	average gas velocity in the dilution tunnel (gas molecular weight may be assumed to be 29g/gmol	m/s
T_m	absolute average dry gas meter temperature	K
T_d	absolute average gas temperature in the dilution tunnel during each 10 min interval, *i* , of test run	K
V_m	volume of gas sample as measured by dry gas meter	dry m^3
v_d	average gas velocity in the dilution tunnel during each 10 min interval, *i*, of the test run	m/s
T_t	absolute average gas temperature in the dilution tunnel	K
T_{sm}	absolute average dry gas meter temperature during each 10 min interval, *i* , of the test run	K
PR	proportional rate variation for each 10 minute interval	%

Signature _____

Quality Review Kelli O'Brien

Test ID	CSL-00010
Date	3/5/18

Module 2				
Variable	**Description**	**Value**	**Units**	**Variable**
	final volume module 2	691.120	cubic feet	
	initial volume module 2	676.882	cubic feet	
V_{m2}	total gas volume collected (module 2)	14.238	cubic feet	V_{mR}
Average ΔH	average delta H over entirety of run	0.15	in water	Average ΔH
T_m	average gas meter temperature	68	°F	T_m
P_{bar}	barometric pressure	29.7	in Hg	P_{bar}
Y	DGM calibration factor	1.003	unitless	Y
K_1	volume corrected to standard conditions	17.64	°F/(in Hg)	K_1
V_{mstd}	volume gas sampled (corrected to standard conditions)	14.1869941	dscf	V_{mRstd}
Total Catch	total catch (raw data)	4.35	mg	Total Catch
C_s	concentration of PM in tunnel gas (dry basis, corrected to standard conditions	0.00030662	g/dscf	C_R

Total Particulate Matter (based on ISS-2 and AS-1 data)			
C_s	concentration of PM in tunnel gas (dry basis, corrected to standard conditions	0.00030662	g/dscf
C_R	concentration of PM in tunnel gas (dry basis, corrected to standard conditions	0.00021266	g/dscf
Q_{std}	average gas flow rate through dilution tunnel	308.475696	dscf/min
B_{ws}	water vapor in gas stream (assumed) (proportion by volume)	0.02	unitless
v_s	average velocity of gas through dilution tunnel	16.0703576	ft/s
A	cross-sectional area of dilution tunnel	0.349	square ft
T_s	average gas temperature in dilution tunnel	560.32	R
T_{std}	absolute average gas temperature in dilution tunnel	528	R
P_s	average gas static pressure in dilution tunnel	29.7	in Hg
P_{std}	standard absolute pressure	29.92	in Hg
F_p	adjustment factor for center of tunnel pitot tube placement	0.96	unitless
V_{strav}	average gas velocity after multi point pitot traverse	321	ACFM
V_{scent}	average gas velocity at center of dilution tunnel calculated after pitot tube traverse	334	ACFM
K_p	pitot tube constant	85.49	ft/sec((lb)/(lb-mole)(in Hg))/((R)(in

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Quality Review_____

C_p	pitot tube coefficient	0.99	unitless
ΔP_{avg}	average velocity pressure in dilution tunnel	0.06	in H_2O
M_s	dilution tunnel dry gas MW (assumed)	29	lb/(lb-mol)
Θ	total sampling time	60.00	min
E_T	total particulate emissions	5.08467369	g

Signature_____

Quality Review_____

Ambient		
Description	**Value**	**Units**
final volume ambient	90.9022	cubic meters
initial volume ambient	90.8896	cubic meters
total gas volume collected (ambient)	0.4450	cubic feet
average delta H over entirety of run	4.00	in water
average gas meter temperature	68.3	°F
barometric pressure	29.7	in Hg
DGM calibration factor	1.002	unitless
volume corrected to standard conditions	17.64	°F/(in Hg)
volume gas sampled (corrected to standard conditions)	0.44699797	dscf
total catch (raw data)	0.09505703	mg
concentration of PM in tunnel gas (dry basis, corrected to standard conditions	0.00021266	g/dscf

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Test ID	CSL-00010
Date	3/5/18

Module 1			
Variable	**Description**	**Value**	**Units**
	final volume module 1	408.877	cubic feet
	initial volume module 1	370.395	cubic feet
V_{m1}	total gas volume collected (module 1)	38.482	cubic feet
Average ΔH	average delta H over entirety of run	0.15	in water
T_m	average gas meter temperature	70	°F
P_{bar}	barometric pressure	29.7	in Hg
Y	DGM calibration factor	1.004	unitless
K_1	volume corrected to standard conditions	17.64	R/(in Hg)
V_{msstd}	volume gas sampled (corrected to standard conditions)	38.2199792	dscf
Total Catch	total catch (raw data)	4.9	mg
C_s	concentration of PM in tunnel gas (dry basis, corrected to standard conditions	0.00012821	g/dscf

Module 2			
Variable	**Description**	**Value**	**Units**
	final volume module 2	715.073	cubic feet
	initial volume module 2	676.882	cubic feet
V_{m2}	total gas volume collected (module 2)	38.191	cubic feet
Average ΔH	average delta H over entirety of run	0.15	in water
T_m	average gas meter temperature	73	°F
P_{bar}	barometric pressure	29.7	in Hg
Y	DGM calibration factor	1.003	unitless
K_1	volume corrected to standard conditions	17.64	°F/(in Hg)
V_{msstd}	volume gas sampled (corrected to standard conditions)	37.67267172	dscf
Total Catch	total catch (raw data)	5.2	mg
C_s	concentration of PM in tunnel gas (dry basis, corrected to standard conditions	0.000138031	g/dscf

Ambient			
Variable	**Description**	**Value**	**Units**
	final volume ambient	91.2244	cubic meters
	initial volume ambient	90.8896	cubic meters
V_{mA}	total gas volume collected (ambient)	11.8234	cubic feet
Average ΔH	average delta H over entirety of run	3.59	in water
T_m	average gas meter temperature	73.0	°F
P_{bar}	barometric pressure	29.7	in Hg
Y	DGM calibration factor	1.002	unitless
K_1	volume corrected to standard conditions	17.64	°F/(in Hg)
V_{mAstd}	volume gas sampled (corrected to standard conditions)	11.76069129	dscf
Total Catch	total catch (raw data)	0.25	mg
C_s	concentration of PM in tunnel gas (dry basis, corrected to standard conditions	2.12573E-05	g/dscf

Total Particulate Matter (based on ISS-2 and AS-1 data)			
C_s	concentration of PM in tunnel gas (dry basis, corrected to standard conditions	0.00013312	g/dscf
C_a	concentration of PM in tunnel gas (dry basis, corrected to standard conditions	2.1257E-05	g/dscf
Q_{std}	average gas flow rate through dilution tunnel	293.509938	dscf/min
B_{ws}	water vapor in gas stream (assumed) (proportion by volume)	0.02	unitless
v_s	average velocity of gas through dilution tunnel	15.2183847	ft/s
A	cross-sectional area of dilution tunnel	0.349	square ft
T_s	average gas temperature in dilution tunnel	557.67	R
T_{std}	absolute average gas temperature in dilution tunnel	528	R
P_s	average gas static pressure in dilution tunnel	29.7	in Hg
P_{std}	standard absolute pressure	29.92	in Hg
F_p	adjustment factor for center of tunnel pitot tube placement	0.96	unitless
V_{avav}	average gas velocity after multi point pitot traverse	321	ACFM
V_{avcent}	average gas velocity at center of dilution tunnel calculated after pitot tube traverse	334	ACFM
K_p	pitot tube constant	85.49	ft/sec)[(lb/lb-mole)/(in Hg)](460+ water)]^(1/2)
C_p	pitot tube coefficient	0.99	unitless
ΔP_{avg}	average velocity pressure in dilution tunnel	0.0540625	in H_2O
M_s	dilution tunnel dry gas MW (assumed)	29	lb/(lb-mol)
Θ	total sampling time	158.00	min
E_T	total particulate emissions	5.18750074	g

Signature

Quality Review

Test ID:	CSL-00010
Date:	3/5/18

Q_{in}	Btu	#DIV/0!	
$Q_{in\ LHV}$		#DIV/0!	
$Q_{In Corrected}$	Btu	#DIV/0!	
Q_{Out}	Btu	#VALUE!	(3 sig figs)
Heat Output Rate	Btu/hr	#VALUE!	(3 sig figs)
Load Draw	Btu/hr	0	
$E_{g/MJ}$	g/MJ	#VALUE!	
$E_{lb/MMBtu}$	lb/MMBtu	#VALUE!	
$E_{g/kg}$	g/kg	#REF!	
$E_{g/hr}$ (1)	g/hr	1.96993699	
Θ1	min	11.68	
Θ2	min	#VALUE!	
Θ_3	min	158.00	
Θ_4	hours	0	
Θ	hours	2.63	
η_{del}	%	#VALUE!	
$\eta_{del\ LHV}$	%	#VALUE!	

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E_1	g	5.08467
E_2	g	#N/A
E_3	g	-0.16683
$E_{1\_g/kg}$	g/kg	#REF!
$E_{2\_g/kg}$	g/kg	#N/A
$E_{3\_g/kg}$	g/kg	#N/A
ET	g	5.18750074

Run #		1
Wood Weight	lbs	0.00
Wood Moisture	%DB	#DIV/0!
Min H_2O Temp (T2)	°F	157.60

CO_1	Startup CO emission (g)
CO_2	Steady State CO emission (g)
CO_3	End CO emission (g)
COT	Total CO emission (g)

Signature_____

Quality Review_____

Fill in boxes in light red. Calculated values are yellow.

Measurement Uncertainty for Total Particulate Emissions

	Measured Value	Measurement Uncertainty (+/-)	Units
Sample Filter Catch Average ISS1 and ISS2 (Fc):	0.00505	0.000273205	g
Sample Flow Rate (Qsample):	0.24	0.0024	dscfm
Sampling Duration (theta):	158	0.1	minutes
Background Filter Catch (BGc):	0.00025	0.000273205	g
Background Filter Flow Rate (Qbg):	0.074	0.00074	dscfm
Tunnel Flow Rate (Qstd):	293.5	5.87	dscfm

Number of Total Weighings Required to Find Sample Filter Catch:	3
Number of Total Weighings Required to Find Background Filter Catch:	3

Et = (Cs-Cr)Qstd(Theta)
Cs= sample filter catch/(sample flow rate*test duration) g/dscf
Cr= room background filter catch / (sample flow*test duration) g/dscf
Qstd = average dilution tunnel flow rate, dscf/min
Theta = sampling time, minutes

Calculating MU of Cs		
Cs	0.000133175	
Delta Cs/Delta Fc	0.026371308	
Delta Cs/Delta Qsample	-0.000554896	
Delta Cs/Delta Theta	-8.4288E-07	
MU of Cs	7.32731E-06	g

Calculating MU of Cr		
Cr	2.13821E-05	
Delta Cr/DeltaBGc	0.085528567	
Delta Cr/Delta Qbg	-0.000288948	
Delta Cr/Delta Theta	-1.3533E-07	
MU of Cr	2.33678E-05	g

Calculating MU of Et		
Et	5.184175113	g
Delta Et/Delta Cs	46373	
Delta Et/Delta Cr	46373	
Delta Et/Delta Qstd	0.017663288	
Delta Et/Delta theta	0.032811235	
MU of Et	1.140387964	g

ET =	5.184175113	grams
with a 95% Confidence Interval of:	1.140387964	(+/-) grams

Signature: Kelli O'Brien

Plant Name: CLST Page: 1

General Average Report

Reporting Period: 03/05/2018 to 03/05/2018

Site Name: SAMPLE Time of Report: 03/06/18 14:22

Data Averaging Type: 1m Rolling Average Interval: 1

Date	Time	Z (none)	COND2OUT (Deg_F)	DIL_CO2 (%)	DILRATIO (RATIO)	FILT1OUT (Deg_F)	FILT2OUT (Deg_F)	ROOM_TMP (Deg_F)	TUNL_TMP (Deg_F)	UNIT_WT (lbs)	
3/5/18	9:55	1	60.9		-0.062	62.7	63.9	61.9	63	0.05	Pre burn
3/5/18	9:56	1	60.8		-0.46	62.7	63.8	61.8	62.5	0.04	
3/5/18	9:57	1	60.8		0.327	62.8	63.8	61.6	62.4	0.03	
3/5/18	9:58	1	60.8		-0.155	62.7	63.7	61.6	62.8	0.04	
3/5/18	9:59	1	60.7		-1.287	62.6	63.7	61.6	62.4	0.03	
3/5/18	10:00	1	60.8		0.594	62.6	63.7	61.6	62.5	0.04	
3/5/18	10:01	1	60.8		0.029	62.6	63.7	61.6	62.6	0.04	
3/5/18	10:02	1	61		0.024	62.6	63.7	61.7	63.3	0.05	
3/5/18	10:03	1	61.1		-0.133	62.6	63.7	61.7	63.2	0.04	
3/5/18	10:04	1	61.2		0.611	62.6	63.9	61.7	62.8	0.05	
3/5/18	10:05	1	61		0.687	62.6	63.7	61.7	62.7	0.06	
3/5/18	10:06	1	61		-0.481	62.6	63.7	61.5	64	0.07	
3/5/18	10:07	1	61.1		0.003	62.7	63.8	61.5	63	0.07	
3/5/18	10:08	1	61		0.131	62.7	63.7	61.6	62.1	0.5	
3/5/18	10:09	1	61.1		0.071	62.7	63.8	61.8	63	0.72	
3/5/18	10:10	1	61.1		0.227	62.7	63.7	62	62.8	1.11	
3/5/18	10:11	1	61.1		-0.111	62.7	63.7	62	63	1.49	
3/5/18	10:12	1	61.1		-0.229	62.7	63.8	62.1	62.7	1.42	
3/5/18	10:13	1	61.1		1.985	62.7	63.8	62.2	63	1.4	
3/5/18	10:14	1	60.9		0.036	62.6	63.7	62.2	66.8	1.37	
3/5/18	10:15	1	61.2		3.812	62.7	64	62	65.5	1.26	
3/5/18	10:16	1	61		2.577	62.7	64	62.5	75.2	1.12	
3/5/18	10:17	1	61.3		3.186	62.8	63.9	62.6	81.4	0.98	
3/5/18	10:18	1	61.2		3.281	62.9	64.1	62.8	87.5	3.31	
3/5/18	10:19	1	61.2		3.78	63	64.1	62.8	83.9	11.84	
3/5/18	10:20	1	61.1		4.39	63	64	62.7	79.2	11.88	
3/5/18	10:21	1	61		6.072	63.1	64.3	63	74.2	11.78	
3/5/18	10:22	1	61.3		6.18	63.1	64.2	62.8	75	11.52	
3/5/18	10:23	1	61.3		5.458	63.2	64.3	62.9	79.4	11.27	
3/5/18	10:24	1	61.1		3.918	63.1	64.2	63	90.7	11.08	
3/5/18	10:25	1	61.2		3.709	63.3	64.5	62.8	95.2	10.84	
3/5/18	10:26	1	61.4		6.447	63.3	64.5	63.1	82.9	10.65	
3/5/18	10:27	1	61.4		6.141	63.5	64.9	63.1	86.9	10.45	
3/5/18	10:28	1	61.5		3.551	63.6	64.8	63.4	102.6	10.23	
3/5/18	10:29	1	61.5		3.452	63.6	64.8	63.3	104.9	10.01	
3/5/18	10:30	1	61.5		3.559	63.7	64.8	63.3	105	9.8	
3/5/18	10:31	1	61.5		3.497	63.8	64.9	63.4	106.6	9.6	
3/5/18	10:32	1	61.6		3.608	63.8	64.9	63.6	105.5	9.44	
3/5/18	10:33	1	61.8		3.496	63.9	64.9	63.6	107.6	9.24	
3/5/18	10:34	1	61.8		3.537	64.1	65	63.9	107.6	9.05	
3/5/18	10:35	1	61.8		3.479	64.2	65.7	63.6	107.1	9.32	
3/5/18	10:36	1	62		3.379	64.3	66.1	63.7	107.7	8.61	
3/5/18	10:37	1	62.1		3.221	64.4	66.2	63.7	109.8	8.43	
3/5/18	10:38	1	62.1		3.274	64.4	66.2	64	109	8.26	
3/5/18	10:39	1	62.1		3.212	64.6	66.3	64.2	110	8.06	
3/5/18	10:40	1	62.3		3.292	64.6	66.3	64.2	110	7.86	
3/5/18	10:41	1	62.3		3.163	64.9	66.5	64.2	110.9	7.65	
3/5/18	10:42	1	62.4		3.027	65.1	66.5	64.6	112.9	7.49	
3/5/18	10:43	1	62.4		3.163	65.2	66.4	64.5	112	7.55	
3/5/18	10:44	1	62.6		3.205	65.3	66.6	64.6	109.8	7.1	
3/5/18	10:45	1	62.7		3.454	65.4	66.6	65	106.1	6.97	
3/5/18	10:46	1	62.7		3.402	65.4	66.6	65.3	107	6.95	
3/5/18	10:47	1	62.9		3.472	65.5	66.6	65.3	105.9	6.73	
3/5/18	10:48	1	62.9		3.426	65.7	66.6	65.5	106.1	6.57	
3/5/18	10:49	1	63		3.357	65.8	66.6	65.6	106.6	6.41	
3/5/18	10:50	1	63.1		3.298	65.8	66.7	65.7	107.1	6.29	
3/5/18	10:51	1	63.2		3.312	65.8	66.7	65.8	107.2	6.17	
3/5/18	10:52	1	63.3		3.452	66	66.7	65.8	105.3	6.06	
3/5/18	10:53	1	63.3		3.393	66.1	66.8	66	105.8	5.91	
3/5/18	10:54	1	63.4		3.184	66.1	66.8	66.1	110.5	6.1	
3/5/18	10:55	1	63.7		3.351	66.3	67	66.1	108.4	5.74	
3/5/18	10:56	1	63.8		3.39	66.5	67.1	65.9	105.6	5.5	
3/5/18	10:57	1	63.7		3.337	66.5	67.1	66.3	104.8	5.36	

3/5/18	10:58	1	63.9	3.372	66.5	67	66.7	103.8	5.23	
3/5/18	10:59	1	63.9	3.214	66.5	67	66.6	106.3	5.22	
3/5/18	11:00	1	64	3.113	66.6	67	66.3	111.7	5.17	
3/5/18	11:01	1	64	3.126	66.8	67.2	66.2	113	5.04	
3/5/18	11:02	1	64.1	3.016	66.9	67.2	66.3	116.1	4.92	
3/5/18	11:03	1	64.3	3.13	66.8	67.1	66.3	116.6	4.74	
3/5/18	11:04	1	64.3	3.09	66.9	67.1	66.4	117.5	5.18	
3/5/18	11:05	1	64.4	2.985	67.1	67.4	66.9	117.5	6.15	
3/5/18	11:06	1	64.4	2.972	67.1	67.3	66.9	118.1	6.24	
3/5/18	11:07	1	64.7	3.01	67.2	67.4	67	118.3	6.1	
3/5/18	11:08	1	64.5	3.1	67.2	67.5	66.8	116.7	5.8	
3/5/18	11:09	1	64.5	3.271	67.6	67.7	66.5	111.4	5.57	
3/5/18	11:10	1	64.6	3.133	67.5	67.5	67.1	114.9	5.07	
3/5/18	11:11	1	64.8	3.173	67.7	67.7	67.1	116.1	5.3	
3/5/18	11:12	1	64.7	3.048	67.7	67.7	66.9	117.9	5.11	
3/5/18	11:13	1	64.8	3.004	67.8	67.8	67.2	122.1	5.14	
3/5/18	11:14	1	64.9	3.036	67.8	67.9	67.1	121.4	3.1	
3/5/18	11:15	1	65.2	3.253	68	67.9	67.5	113.1	2.21	
3/5/18	11:16	1	65.3	3.231	68.1	68.1	67.9	111.4	2.94	
3/5/18	11:17	1	65.3	2.979	68.1	68	67.3	114	2.92	
3/5/18	11:18	1	65.3	2.94	68.3	68.1	67.3	116.1	3.22	
3/5/18	11:19	1	65.3	2.974	68.3	68.2	67.5	114.5	3.14	
3/5/18	11:20	1	65.4	2.948	68.2	68.3	66	111.6	2.32	
3/5/18	11:21	1	65.2	2.931	68	68.1	65.8	111.9	3.24	
3/5/18	11:22	1	65.3	3.108	67.8	67.9	65.5	106.5	3.77	
3/5/18	11:23	1	65.1	3.01	68.1	68.2	65.3	104.4	3.7	
3/5/18	11:24	1	65.4	2.944	67.7	67.9	65.4	106.4	4.54	
3/5/18	11:25	1	65.4	2.9	67.4	67.6	65.3	107.6	5.36	
3/5/18	11:26	1	65.3	2.931	67.2	67.4	65.1	110.3	5.2	
3/5/18	11:27	1	65.2	2.988	67.2	67.6	65.2	111.3	5	
3/5/18	11:28	1	65.2	3.013	67.1	67.6	65.4	112.6	4.77	
3/5/18	11:29	1	65	2.988	66.9	67.4	65.3	113.9	4.55	
3/5/18	11:30	1	64.9	2.902	66.9	67.2	65.2	118.4	4.72	
3/5/18	11:31	1	64.8	3.023	66.8	67.1	65.9	117.9	4	
3/5/18	11:32	1	64.6	3.054	67	67.5	66.4	117.1	3.95	
3/5/18	11:33	1	64.6	3.202	67	67.5	66	111.8	3.53	
3/5/18	11:34	1	64.5	3.141	67	67.5	65.2	108.8	3.44	
3/5/18	11:35	1	64.6	3.183	66.8	67.3	65.5	106	3.92	
3/5/18	11:36	1	64.9	3.139	66.9	67.5	65.2	105.2	3.36	
3/5/18	11:37	1	64.8	3.074	66.8	67.3	65.2	108.3	3.26	
3/5/18	11:38	1	64.8	3.117	66.6	67.2	65	108.2	3.2	
3/5/18	11:39	1	64.9	3.138	66.7	67.3	65.6	105.8	2.95	Test Start
3/5/18	11:40	1	63.5	3.22	66.9	68.1	65.1	103.6	2.86	Fuel Consumed, 2.6 lb coal bed
3/5/18	11:41	1	60.5	3.145	68	72.2	65.1	105.1	14.2	11.6
3/5/18	11:42	1	59.7	3.045	68.7	74.4	65.2	110.8	14.23	11.63
3/5/18	11:43	1	59.1	3.329	69.4	75.1	65.3	103.1	14.13	11.53
3/5/18	11:44	1	58.5	3.308	69.8	75.3	65.1	101.2	14.05	11.45
3/5/18	11:45	1	58	3.193	70.2	75.7	64.7	101.1	13.93	11.33
3/5/18	11:46	1	57.7	3.268	70.6	75.9	65.3	100.1	13.86	11.26
3/5/18	11:47	1	57.2	3.283	71.1	76.3	65.9	99.7	13.79	11.19
3/5/18	11:48	1	57.1	3.37	71.5	76.6	66.1	98.1	13.69	11.09
3/5/18	11:49	1	56.9	3.344	72	76.9	65.4	97.2	13.61	11.01
3/5/18	11:50	1	56.7	3.308	72.4	77.2	65.1	96.7	13.51	10.91
3/5/18	11:51	1	56.5	3.232	72.6	77.1	65.2	97.7	13.41	10.81
3/5/18	11:52	1	56.5	3.284	72.7	77.1	65.2	97	13.33	10.73
3/5/18	11:53	1	56.3	3.172	72.8	77.5	65.1	98.2	13.21	10.61
3/5/18	11:54	1	56.2	3.187	72.8	77.4	64.9	97.9	13.08	10.48
3/5/18	11:55	1	56	3.185	72.9	77.6	65.2	98.4	13.01	10.41
3/5/18	11:56	1	55.9	3.133	73.2	78	65.5	99.7	12.9	10.3
3/5/18	11:57	1	56	3.328	73.3	77.9	66.1	98	12.78	10.18
3/5/18	11:58	1	56	3.307	73.5	78.1	66	98	12.68	10.08
3/5/18	11:59	1	56	3.249	73.7	78.3	66.1	98.5	12.57	9.97
3/5/18	12:00	1	55.9	3.306	74.1	78.5	66.4	98.7	12.42	9.82
3/5/18	12:01	1	55.9	3.262	74.4	78.9	66.9	100.2	12.32	9.72
3/5/18	12:02	1	55.7	3.383	74.6	79.2	66.9	99.6	12.18	9.58
3/5/18	12:03	1	55.7	3.219	74.7	79.3	66.6	100.3	12.03	9.43
3/5/18	12:04	1	55.6	3.229	74.8	79.5	66.8	101	11.89	9.29
3/5/18	12:05	1	55.9	3.278	75.3	80	67.2	101.9	11.74	9.14
3/5/18	12:06	1	55.6	3.392	75.6	80.3	67.4	100.9	11.65	9.05
3/5/18	12:07	1	55.9	3.396	75.7	80.3	67.7	101.5	11.43	8.83
3/5/18	12:08	1	55.8	3.311	75.8	80.5	67.8	102.3	11.34	8.74

3/5/18	12:09	1	56.1	3.32	75.9	80.8	68	103.4	11.23	8.63
3/5/18	12:10	1	56.1	3.389	76.4	81.1	67.8	103	11.08	8.48
3/5/18	12:11	1	56.1	3.335	76.5	81.3	68.2	103.6	11.01	8.41
3/5/18	12:12	1	56.1	3.234	76.7	81.5	68.3	103.6	10.78	8.18
3/5/18	12:13	1	56.2	3.354	76.9	81.6	68.8	103.1	10.67	8.07
3/5/18	12:14	1	56	3.139	77.2	81.9	68.4	105.3	10.54	7.94
3/5/18	12:15	1	56.2	3.156	77.5	82.2	68.7	106.2	10.33	7.73
3/5/18	12:16	1	56.1	3.241	77.8	82.5	69	106.1	10.18	7.58
3/5/18	12:17	1	56	3.311	78	82.8	69.2	106.6	10	7.4
3/5/18	12:18	1	56.1	3.349	78	83.1	69.3	107.2	9.87	7.27
3/5/18	12:19	1	56.3	3.321	78.3	83.3	69.3	107.3	9.73	7.13
3/5/18	12:20	1	56.3	3.422	78.5	83.2	69.3	105.7	9.49	6.89
3/5/18	12:21	1	56.2	3.294	78.7	83.4	69.4	107.3	9.28	6.68
3/5/18	12:22	1	56.4	3.232	78.9	83.7	69.7	107.8	9.12	6.52
3/5/18	12:23	1	56.6	3.246	79	83.8	69.8	107.7	8.9	6.3
3/5/18	12:24	1	56.6	3.22	79.1	83.9	70	108.2	8.72	6.12
3/5/18	12:25	1	56.8	3.255	79.2	84	70.1	107.9	8.66	6.06
3/5/18	12:26	1	56.7	3.377	79.4	84	70.8	107	8.5	5.9
3/5/18	12:27	1	56.8	3.499	79.4	83.8	70.6	105.4	8.42	5.82
3/5/18	12:28	1	57	3.526	79.5	84	71.2	105	8.33	5.73
3/5/18	12:29	1	56.8	3.556	79.7	84	71.4	104.4	8.27	5.67
3/5/18	12:30	1	56.9	3.482	79.7	83.8	71.2	104.7	8.19	5.59
3/5/18	12:31	1	56.9	3.488	79.8	83.8	70.7	103.7	8.11	5.51
3/5/18	12:32	1	56.8	3.435	79.9	83.9	71.2	104.2	8.04	5.44
3/5/18	12:33	1	57	3.388	79.8	83.7	71.4	104.3	7.97	5.37
3/5/18	12:34	1	57.1	3.508	79.8	83.7	71.6	103.4	7.93	5.33
3/5/18	12:35	1	57.1	3.437	79.8	83.6	70.9	102.9	7.82	5.22
3/5/18	12:36	1	57.1	3.594	79.8	83.6	71.4	101.9	7.68	5.08
3/5/18	12:37	1	57.1	3.5	79.8	83.6	71.8	103.5	7.62	5.02
3/5/18	12:38	1	57.2	3.537	79.7	83.6	71.8	103.2	7.57	4.97
3/5/18	12:39	1	57.2	3.453	79.6	83.4	71.9	103.3	7.46	4.86
3/5/18	12:40	1	57.3	3.49	79.6	82.5	71.9	102.8	7.35	4.75
3/5/18	12:41	1	58.4	3.36	79	166.3	71.6	103.7	7.2	4.6
3/5/18	12:42	1	59.6	3.384	79	73.8	71.5	103.3	7.14	4.54
3/5/18	12:43	1	58.8	3.31	78.9	73.4	71	103.5	7.05	4.45
3/5/18	12:44	1	58.2	3.249	78.8	73.1	71	104.1	6.99	4.39
3/5/18	12:45	1	57.9	3.434	78.8	73.1	71.1	102.4	6.87	4.27
3/5/18	12:46	1	57.8	3.468	78.8	73.1	71.9	102.3	6.8	4.2
3/5/18	12:47	1	57.5	3.524	78.8	73.1	71.3	101.7	6.76	4.16
3/5/18	12:48	1	57.4	3.268	78.7	73.2	70.6	103.2	6.66	4.06
3/5/18	12:49	1	57.3	3.312	78.7	73.5	71	102.8	6.56	3.96
3/5/18	12:50	1	57.3	3.438	78.8	73.7	71.9	102.6	6.51	3.91
3/5/18	12:51	1	57.4	3.474	78.8	73.9	72.4	102.3	6.46	3.86
3/5/18	12:52	1	57.3	3.346	78.8	74.1	71.7	102.6	6.38	3.78
3/5/18	12:53	1	57.6	3.5	78.9	74.4	71.8	101.6	6.28	3.68
3/5/18	12:54	1	57.6	3.446	78.8	74.4	72	102.3	6.25	3.65
3/5/18	12:55	1	57.6	3.432	79	74.7	71.9	102.4	6.17	3.57
3/5/18	12:56	1	57.5	3.546	78.9	74.9	71.7	101.2	6.08	3.48
3/5/18	12:57	1	57.5	3.486	78.9	75.1	72.4	102.2	6.01	3.41
3/5/18	12:58	1	57.4	3.571	78.7	75.1	72.5	101.5	5.96	3.36
3/5/18	12:59	1	57.6	3.514	79	75.4	72.5	102	5.9	3.3
3/5/18	13:00	1	57.6	3.464	79	75.5	72.5	102	5.84	3.24
3/5/18	13:01	1	57.5	3.387	79.1	75.6	72.3	102.2	5.78	3.18
3/5/18	13:02	1	57.5	3.352	79	75.8	72	101.7	5.71	3.11
3/5/18	13:03	1	57.6	3.395	79	75.8	72.1	101.6	5.65	3.05
3/5/18	13:04	1	57.7	3.389	79.1	76	72.6	102.4	5.59	2.99
3/5/18	13:05	1	57.7	3.454	79.1	76.1	72.3	101.2	5.56	2.96
3/5/18	13:06	1	57.6	3.583	79.1	76	72.9	100.4	5.49	2.89
3/5/18	13:07	1	57.6	3.442	79.1	76.2	72.4	101.1	5.44	2.84
3/5/18	13:08	1	57.7	3.357	78.9	76	72.5	101.5	5.37	2.77
3/5/18	13:09	1	57.6	3.484	79.1	76.4	72.1	100.6	5.34	2.74
3/5/18	13:10	1	57.7	3.538	79.2	76.4	72	99.8	5.3	2.7
3/5/18	13:11	1	57.8	3.496	79.1	76.5	72.3	100.5	5.24	2.64
3/5/18	13:12	1	57.7	3.501	79	76.5	72.3	100.4	5.19	2.59
3/5/18	13:13	1	57.8	3.512	79	76.5	71.8	100.2	5.12	2.52
3/5/18	13:14	1	57.8	3.567	78.9	76.4	71.3	99.2	5.07	2.47
3/5/18	13:15	1	57.8	3.607	79	76.5	72	99.4	5.04	2.44
3/5/18	13:16	1	57.7	3.564	79	76.4	72.2	99.7	4.99	2.39
3/5/18	13:17	1	57.8	3.422	78.9	76.4	72.2	100.1	4.93	2.33
3/5/18	13:18	1	57.7	3.471	78.8	76.6	72.3	99.5	4.87	2.27
3/5/18	13:19	1	57.8	3.581	78.7	76.4	72.7	99.2	4.82	2.22

3/5/18	13:20	1	57.7	3.45	78.7	76.3	72.2	99.6	4.79	2.19
3/5/18	13:21	1	57.7	3.545	78.8	76.4	72.8	99.3	4.72	2.12
3/5/18	13:22	1	57.6	3.587	78.8	76.4	72.4	98.8	4.67	2.07
3/5/18	13:23	1	57.7	3.488	78.7	76.3	72	98.9	4.62	2.02
3/5/18	13:24	1	57.7	3.436	78.8	76.5	72.3	99.5	4.56	1.96
3/5/18	13:25	1	57.9	3.529	78.7	76.3	72.4	98.7	4.52	1.92
3/5/18	13:26	1	57.7	3.469	78.7	76.4	72.4	98.8	4.49	1.89
3/5/18	13:27	1	57.6	3.444	78.7	76.3	71.9	99.1	4.45	1.85
3/5/18	13:28	1	57.6	3.504	78.6	76.3	72.2	98.6	4.39	1.79
3/5/18	13:29	1	57.5	3.63	78.6	76.4	72.3	98	4.34	1.74
3/5/18	13:30	1	57.7	3.501	78.6	76.4	72.4	99.2	4.29	1.69
3/5/18	13:31	1	57.6	3.481	78.8	76.6	72.2	99.3	4.25	1.65
3/5/18	13:32	1	57.7	3.549	78.7	76.5	71.7	98.2	4.23	1.63
3/5/18	13:33	1	57.9	3.593	78.7	76.4	72.1	97.8	4.18	1.58
3/5/18	13:34	1	57.8	3.477	78.7	76.4	72	98.6	4.13	1.53
3/5/18	13:35	1	57.8	3.484	78.7	76.5	72.4	98.8	4.08	1.48
3/5/18	13:36	1	57.8	3.455	78.7	76.4	72.3	98.9	4.05	1.45
3/5/18	13:37	1	57.8	3.481	78.6	76.2	72.4	98.8	4.01	1.41
3/5/18	13:38	1	57.8	3.347	78.5	76.2	72.1	99.2	3.98	1.38
3/5/18	13:39	1	57.9	3.301	78.5	76.1	72.2	99.6	3.94	1.34
3/5/18	13:40	1	57.7	3.604	78.6	76.3	72.6	97.9	3.9	1.3
3/5/18	13:41	1	57.8	3.615	78.6	76.3	72.5	97.9	3.88	1.28
3/5/18	13:42	1	57.9	3.573	78.6	76.4	71.8	97.3	3.83	1.23
3/5/18	13:43	1	57.8	3.554	78.6	76.3	72.2	97.6	3.82	1.22
3/5/18	13:44	1	57.8	3.511	78.5	76.3	71.6	97.7	3.8	1.2
3/5/18	13:45	1	57.8	3.59	78.5	76.2	72.3	97.9	3.76	1.16
3/5/18	13:46	1	57.8	3.721	78.4	76.2	72.2	97	3.71	1.11
3/5/18	13:47	1	57.8	3.644	78.4	76.2	71.9	97.2	3.68	1.08
3/5/18	13:48	1	57.7	3.588	78.4	76.2	72.4	97.8	3.64	1.04
3/5/18	13:49	1	57.8	3.686	78.3	76.2	72.4	97	3.59	0.99
3/5/18	13:50	1	57.7	3.526	78.3	76.2	72.4	98.1	3.6	1
3/5/18	13:51	1	57.8	3.551	78.4	76.2	72.5	97.9	3.54	0.94
3/5/18	13:52	1	57.9	3.558	78.4	76.2	72.1	97.8	3.51	0.91
3/5/18	13:53	1	57.9	3.615	78.3	76.2	72.3	97.3	3.45	0.85
3/5/18	13:54	1	57.8	3.598	78.3	76.1	72.4	97.5	3.43	0.83
3/5/18	13:55	1	57.7	3.541	78.3	76.1	72.3	97.9	3.4	0.8
3/5/18	13:56	1	57.7	3.576	78.2	75.9	72.4	97.4	3.37	0.77
3/5/18	13:57	1	58	3.349	78.3	76.2	71.2	98.1	3.34	0.74
3/5/18	13:58	1	57.8	3.477	78.3	76.1	71	97.1	3.29	0.69
3/5/18	13:59	1	57.8	3.504	78.4	76.2	71.8	97.3	3.28	0.68
3/5/18	14:00	1	57.8	3.615	78.3	76.2	72.1	97	3.23	0.63
3/5/18	14:01	1	57.7	3.702	78.3	76.2	72.2	96.7	3.22	0.62
3/5/18	14:02	1	57.8	3.684	78.2	76.2	72.2	96.8	3.18	0.58
3/5/18	14:03	1	57.7	3.639	78.1	76.2	72.3	96.7	3.12	0.52
3/5/18	14:04	1	57.8	3.611	78.2	76.2	71.8	96.6	3.09	0.49
3/5/18	14:05	1	57.8	3.626	78.1	76.2	71.6	96.4	3.09	0.49
3/5/18	14:06	1	57.9	3.533	78.1	76.1	71	96.3	3.06	0.46
3/5/18	14:07	1	57.8	3.617	77.8	76	71.8	96	3.02	0.42
3/5/18	14:08	1	58	3.693	77.8	76.1	72	95.5	3.01	0.41
3/5/18	14:09	1	57.9	3.639	77.8	76.2	72	95.8	2.99	0.39
3/5/18	14:10	1	58	3.686	77.8	76	72.1	95.9	2.96	0.36
3/5/18	14:11	1	58	3.695	77.8	76	72.2	96	2.93	0.33
3/5/18	14:12	1	58	3.672	77.8	76.1	72	95.6	2.91	0.31
3/5/18	14:13	1	57.8	3.531	77.7	76	72.2	97.1	2.86	0.26
3/5/18	14:14	1	58	3.652	77.7	75.8	72	96.2	2.83	0.23
3/5/18	14:15	1	58	3.601	77.8	76	71.8	96	2.8	0.2
3/5/18	14:16	1	57.8	3.509	77.9	75.9	72.1	96.5	2.76	0.16
3/5/18	14:17	1	58	3.709	77.9	76	72.2	95.6	2.73	0.13
3/5/18	14:18	1	57.9	3.489	77.8	76	71.5	96.3	2.7	0.1
3/5/18	14:19	1	58.7	3.707	77.4	75.9	71.4	94.8	2.65	0

Plant Name: CLST Page: 1

General Average Report

Reporting Period: 03/05/2018 to 03/05/2018

Site Name: UNIT Time of Report: 03/06/18 14:22

Data Averaging Type: 1m Rolling Average Interval: 1

Date	Time	CAT_POST (Deg_F)	CO (%)	CO2 (%)	O2 (%)	STK_CSA (Deg_F)	STK_TMP (Deg_F)	
3/5/18	9:55	61.4	0.02	0	22	61.95	61.3	Preburn
3/5/18	9:56	61.5	0.02	0	22	62.2	61.2	
3/5/18	9:57	61.4	0.02	0	22	62.33	61.2	
3/5/18	9:58	61.2	0.02	0	22	62.06	61.2	
3/5/18	9:59	61.4	0.02	0	22	62.06	61.1	
3/5/18	10:00	61.4	0.02	0	22	62.29	61.1	
3/5/18	10:01	61.1	0.02	0	22	62.55	61	
3/5/18	10:02	60.8	0.06	0.7	22	62.34	61	
3/5/18	10:03	61	0.03	-0.1	21.3	62.04	61	
3/5/18	10:04	61.1	0.03	-0.1	14.8	62.14	60.9	
3/5/18	10:05	61.1	0.03	-0.1	8.8	62.35	61	
3/5/18	10:06	60.6	0.02	0	5.4	62.36	61	
3/5/18	10:07	61.2	0	-0.1	8.3	62.11	61.2	
3/5/18	10:08	61.5	0	-0.1	9	62.1	61.3	
3/5/18	10:09	61.1	0	-0.1	5.5	62.52	61.2	
3/5/18	10:10	61	0	0	3.3	62.74	61.2	
3/5/18	10:11	61	0	0	5.2	62.43	61.3	
3/5/18	10:12	61.4	0	0	11.5	62.36	61.4	
3/5/18	10:13	64.4	0	0	15.7	62.62	61.3	
3/5/18	10:14	85.9	0.05	1.9	18.2	67.2	62.3	
3/5/18	10:15	181.7	0.07	2.6	19.5	87.29	71.5	
3/5/18	10:16	459.1	0.08	4.7	19.6	141.07	95.2	
3/5/18	10:17	655	0.16	6.2	19	207.15	122.5	
3/5/18	10:18	682.9	0.06	5.7	17.8	261.14	143.6	
3/5/18	10:19	463.6	0.18	1.8	16.6	254.24	140.6	
3/5/18	10:20	340.6	0.24	2	16.8	225.91	134.3	
3/5/18	10:21	357.5	0.18	2.1	18	217.52	129.2	
3/5/18	10:22	519	0.43	5.3	18.7	232.96	133.5	
3/5/18	10:23	724.6	0.36	8.2	18.6	282.51	151.3	
3/5/18	10:24	813.1	0.24	7.4	16.9	325.84	170.7	
3/5/18	10:25	764.3	0.25	7.5	15.3	352.24	181.8	
3/5/18	10:26	797	0.16	7.4	14.6	372.31	188.2	
3/5/18	10:27	866.4	0.11	7.5	14.2	388.91	196.8	
3/5/18	10:28	874.6	0.08	7.6	14	402.38	202.6	
3/5/18	10:29	847	0.08	6.8	13.8	407.2	206.9	
3/5/18	10:30	814.4	0.08	6.3	13.8	407.63	211.7	
3/5/18	10:31	792.4	0.09	6	14.1	405.62	214.1	
3/5/18	10:32	780	0.08	6.5	14.5	405.92	214.6	
3/5/18	10:33	797.8	0.07	7.1	14.7	411.61	217	
3/5/18	10:34	818	0.06	7.4	14.6	419.31	218.2	

3/5/18	10:35	841.5	0.06	7.4	14.3	426.09	214.5
3/5/18	10:36	831.6	0.07	6.2	14	427.4	211.9
3/5/18	10:37	834.2	0.05	6.8	14.1	427.32	212
3/5/18	10:38	856.5	0.04	7.7	14.3	430.62	210.9
3/5/18	10:39	864.3	0.05	7.1	14.2	435.02	211.3
3/5/18	10:40	859.8	0.05	6.8	13.9	437.25	214.9
3/5/18	10:41	865.3	0.05	6.8	14	437.82	211.8
3/5/18	10:42	879.1	0.05	7	14.1	440.87	210.8
3/5/18	10:43	887	0.05	7.4	14.2	443.1	214.7
3/5/18	10:44	880.2	0.04	7.1	14.1	431.47	209.2
3/5/18	10:45	843.4	0.03	6	13.9	418.67	206.8
3/5/18	10:46	814.1	0.04	5.4	14.2	411	206.5
3/5/18	10:47	814.6	0.05	6	14.7	408.4	206
3/5/18	10:48	847.1	0.05	5.9	15.1	411.03	204.6
3/5/18	10:49	818.5	0.05	5.4	15.1	408.25	203.2
3/5/18	10:50	801.6	0.03	5.8	15.3	403.41	202.2
3/5/18	10:51	802.2	0.03	5.9	15.4	400.67	202.9
3/5/18	10:52	804.4	0.03	5.9	15.3	399.98	202
3/5/18	10:53	802.6	0.02	5.8	15.3	398.97	201
3/5/18	10:54	791.5	0.02	5.5	15.3	403.1	207.2
3/5/18	10:55	868.8	0.03	8.2	15.3	405.09	207.5
3/5/18	10:56	932.6	0.02	8.1	15.1	405.49	200.4
3/5/18	10:57	838.3	-0.01	6.2	14.1	397.9	194.8
3/5/18	10:58	786.8	0	5.6	13.9	388.19	191.7
3/5/18	10:59	767.3	0	5.1	14.4	386.02	193.7
3/5/18	11:00	735	0.02	4.6	15	397.71	207.3
3/5/18	11:01	741.6	0.01	5.2	15.5	407.02	212.3
3/5/18	11:02	752.8	0.01	6	15.8	414.2	216.2
3/5/18	11:03	729.1	0.01	5.3	15.7	417.95	223.5
3/5/18	11:04	700.7	0	4.6	15.5	415.92	224
3/5/18	11:05	651.2	0.05	3.8	15.7	408.4	217.9
3/5/18	11:06	695.1	0.03	4.7	16.2	410.24	218.8
3/5/18	11:07	757.3	0.01	5.3	16.6	416.99	221.3
3/5/18	11:08	832.5	0	6.5	16.6	423.64	221.4
3/5/18	11:09	854.1	0	6.7	16.1	418.28	213.2
3/5/18	11:10	838.4	0	5.5	15.5	420.68	216.5
3/5/18	11:11	854.9	0	6	15.2	431.04	222.3
3/5/18	11:12	825.4	0	6.6	15.5	431.64	222.1
3/5/18	11:13	774.9	0	4.8	15.1	433.85	232.2
3/5/18	11:14	766.2	0	4.9	15.2	433.62	231.6
3/5/18	11:15	693.9	0	4.3	15.7	408.58	215.6
3/5/18	11:16	592.9	0	1.8	16.1	382.58	207.8
3/5/18	11:17	606.8	0	1.9	16.8	377.16	206.4
3/5/18	11:18	678.8	0	2.7	18	385.37	210.7
3/5/18	11:19	850.9	0	5.2	18.7	401.59	207.2
3/5/18	11:20	890.7	0	8	18.4	410.88	200.3
3/5/18	11:21	840.8	0	4.6	17	435.48	200.9
3/5/18	11:22	799.8	0	0	15.6	420.71	192.8

3/5/18	11:23	779.8	0	0	17.1	404.46	182.9	
3/5/18	11:24	740.3	0	0	19.1	410.43	185.4	
3/5/18	11:25	720.3	0	0.1	20.3	413.6	187.8	
3/5/18	11:26	810.7	0	7	21	440.66	197.5	
3/5/18	11:27	954.7	0	10.2	20.5	477.6	202.7	
3/5/18	11:28	983.5	0	9.9	17.5	499.87	207.4	
3/5/18	11:29	1017.5	0	10.4	14.8	513.21	210.3	
3/5/18	11:30	1063.5	0	11.2	13.3	527.32	219.3	
3/5/18	11:31	1053.3	0	10.3	12.1	529.24	223.1	
3/5/18	11:32	957.3	0	7.8	11.2	517.23	221.1	
3/5/18	11:33	913.3	0	7.6	11.5	484.2	212.4	
3/5/18	11:34	879.2	0	6.2	12.4	458.34	202.1	
3/5/18	11:35	843.4	0	5.8	13.1	440.61	194.4	
3/5/18	11:36	830.9	0	5.2	13.9	429.91	190.7	
3/5/18	11:37	842.2	0	6.3	14.6	449.57	197.7	
3/5/18	11:38	882.2	0	7.3	15.1	451.65	199.6	
3/5/18	11:39	872.8	0	6.4	14.8	436.8	191.6	
3/5/18	11:40	838.8	0	5.8	14.6	426.87	189.1	
3/5/18	11:41	824	0	5.6	14.8	427.25	190.1	Test Start
3/5/18	11:42	824.9	0	6.1	15	449.41	203.5	
3/5/18	11:43	884.8	0	5.5	15.3	432.52	191.3	
3/5/18	11:44	871.2	0	4.6	15.2	422	184.5	
3/5/18	11:45	830.3	0	3.7	15.5	411.96	180.7	
3/5/18	11:46	815.4	0	3.7	16.1	405.69	179.1	
3/5/18	11:47	806.5	0	3.2	16.8	402.19	176.6	
3/5/18	11:48	778.5	0	3.4	17.2	394.12	173.6	
3/5/18	11:49	772.6	0	3.5	17.6	388.97	171.4	
3/5/18	11:50	776.6	0	4.2	17.7	387.52	169.5	
3/5/18	11:51	788.2	0	4.8	17.7	389.28	170.1	
3/5/18	11:52	797.9	0	5	17.3	391.85	169.7	
3/5/18	11:53	799.8	0	5.1	16.9	393.77	169.7	
3/5/18	11:54	781.3	0	4	16.6	390.29	170	
3/5/18	11:55	771.5	0	4.1	16.6	387.89	170.8	
3/5/18	11:56	774.6	0	4.2	16.9	387.21	172.4	
3/5/18	11:57	782	0	5	17	385.67	172.1	
3/5/18	11:58	797.6	0.02	5.5	16.9	385.25	171.5	
3/5/18	11:59	827.2	0.02	6.6	16.6	388.46	171.2	
3/5/18	12:00	868.8	0.03	7.2	16.1	394.34	172.9	
3/5/18	12:01	912.2	0.05	7.7	15.4	403.62	175.4	
3/5/18	12:02	928.5	0.01	7.4	14.7	411.1	177.3	
3/5/18	12:03	933.1	0	7.4	14.3	413.7	175.1	
3/5/18	12:04	926	0	7.3	14.1	412.91	177.1	
3/5/18	12:05	930.1	0.01	7.5	14	415.39	180.7	
3/5/18	12:06	937	0	7.4	13.9	418.2	181.1	
3/5/18	12:07	940.3	0	7.5	13.8	419.83	182.4	
3/5/18	12:08	949.8	0	7.9	13.8	420.8	182	
3/5/18	12:09	968.7	0.02	8.1	13.7	425.21	185.3	
3/5/18	12:10	981.9	0.03	8.2	13.6	429.65	187.1	

3/5/18	12:11	992.1	0.05	8.4	13.4	430.82	186.2
3/5/18	12:12	1005.6	0.09	8.6	13.2	432.22	182.6
3/5/18	12:13	1029.7	0.15	9	13	435.96	183.9
3/5/18	12:14	1061	0.23	9.6	12.8	443.45	184.1
3/5/18	12:15	1100.6	0.45	10.5	12.4	451.64	186.9
3/5/18	12:16	1137.3	0.88	11.5	11.9	461.44	189.2
3/5/18	12:17	1154.3	0.75	11.5	11.1	469.91	192.9
3/5/18	12:18	1152.8	0.5	11.2	10.4	473.33	196.3
3/5/18	12:19	1146.1	0.35	11	10	474.25	195.4
3/5/18	12:20	1139	0.22	10.9	9.9	474.86	193.8
3/5/18	12:21	1128.2	0.16	10.7	10	474.52	193.9
3/5/18	12:22	1124.9	0.11	10.6	10.1	475.14	192.9
3/5/18	12:23	1114.8	0.07	10.2	10.2	473.43	192.9
3/5/18	12:24	1057.3	0	8.7	10.4	465.25	193
3/5/18	12:25	998.1	0	7.6	10.8	455.49	193.2
3/5/18	12:26	946.9	0	7	11.6	444.99	192.8
3/5/18	12:27	919.1	0	6.8	12.5	434.39	192.3
3/5/18	12:28	907.6	0	6.8	13.2	426.04	190.4
3/5/18	12:29	904.5	0	7.1	13.6	419.98	188.9
3/5/18	12:30	904.4	0	7.2	13.9	417.08	187.9
3/5/18	12:31	901.2	0	7.3	13.9	416.15	185.6
3/5/18	12:32	898.6	0	7.3	13.8	413.64	184.3
3/5/18	12:33	900.7	0	7.2	13.8	411.99	182.9
3/5/18	12:34	902.7	0	7.3	13.8	410.24	182.9
3/5/18	12:35	902.8	0	7.4	13.8	409.87	180.6
3/5/18	12:36	902.3	0	7.4	13.8	410.63	180.8
3/5/18	12:37	902.8	0	7.5	13.8	410.7	182.6
3/5/18	12:38	909.9	0	7.7	13.7	409.95	182.5
3/5/18	12:39	916.2	0	7.7	13.7	410.82	180.2
3/5/18	12:40	917.7	0	7.6	13.5	411.53	179.7
3/5/18	12:41	911.1	0	7.4	13.5	411.29	179.2
3/5/18	12:42	905.3	0	7.4	13.5	410.59	178.9
3/5/18	12:43	896.2	0	7.2	13.6	409.64	178.4
3/5/18	12:44	888.5	0	7	13.7	410.12	178.4
3/5/18	12:45	878.9	0	6.9	13.8	408.62	178.2
3/5/18	12:46	869.5	0	6.7	13.9	405.79	177.2
3/5/18	12:47	859	0	6.6	14.1	403.3	178.4
3/5/18	12:48	850.5	0	6.5	14.2	401.9	177
3/5/18	12:49	843.2	0	6.4	14.4	399.49	176.2
3/5/18	12:50	838.4	0	6.3	14.5	397.63	177.3
3/5/18	12:51	832.4	0	6.4	14.6	396.09	176.3
3/5/18	12:52	831.2	0	6.4	14.7	395.95	174.8
3/5/18	12:53	830.1	0	6.4	14.7	395.19	176.2
3/5/18	12:54	829.9	0	6.4	14.7	393.72	176.1
3/5/18	12:55	829.2	0	6.3	14.7	393.19	176.4
3/5/18	12:56	827	0	5.9	14.7	392.51	176.2
3/5/18	12:57	824.9	0	5.7	14.8	391.78	176.1
3/5/18	12:58	820.3	0	5.7	15	391.31	175.7

3/5/18	12:59	809.9	0	5.6	15.2	389.34	176
3/5/18	13:00	803.6	0	5.6	15.3	387.6	174.5
3/5/18	13:01	802.5	0	5.6	15.4	387.17	173.2
3/5/18	13:02	801.8	0	5.6	15.5	386.23	171.4
3/5/18	13:03	797.4	0	5.6	15.5	383.9	172.2
3/5/18	13:04	796	0	5.5	15.5	382.81	173.5
3/5/18	13:05	791.9	0	5.3	15.5	383.28	171.8
3/5/18	13:06	781.5	0	5.1	15.6	382.82	170.9
3/5/18	13:07	773.5	0	5.1	15.8	380.98	170.8
3/5/18	13:08	766.9	0	5	15.9	378.69	169.7
3/5/18	13:09	765.7	0	5	16	377.58	171.2
3/5/18	13:10	762.1	0	5	16.1	375.95	170.3
3/5/18	13:11	759	0	5	16.2	374.73	170.9
3/5/18	13:12	757.8	0	5	16.2	372.89	170.6
3/5/18	13:13	754.6	0	5	16.2	372.26	171.4
3/5/18	13:14	747.3	0	5	16.2	370.21	170.7
3/5/18	13:15	743.5	0	5	16.2	368.63	170.5
3/5/18	13:16	741.2	0	5.1	16.2	366.91	170
3/5/18	13:17	741	0	5	16.2	365.12	167.7
3/5/18	13:18	741.9	0	5.1	16.2	364.21	166.6
3/5/18	13:19	742.7	0	5.1	16.2	363.69	166.9
3/5/18	13:20	741.6	0	5.1	16.1	363.01	166.6
3/5/18	13:21	734.8	0	5.2	16.1	361.35	166.6
3/5/18	13:22	734.2	0	5.2	16.1	361.28	167.2
3/5/18	13:23	738.6	0	5.2	16.1	361.61	165.7
3/5/18	13:24	738.6	0	5.1	16	362.08	165.7
3/5/18	13:25	738.4	0	5	16	362.6	165.4
3/5/18	13:26	741.2	0	5.1	16	362.79	163.8
3/5/18	13:27	745.2	0	4.9	16.1	364.01	165.2
3/5/18	13:28	748.9	0	4.9	16.1	364.98	164.4
3/5/18	13:29	745.3	0	4.8	16.2	364.69	165.3
3/5/18	13:30	733.7	0	4.8	16.2	362.81	166.1
3/5/18	13:31	729.3	0	4.7	16.2	361.97	166.3
3/5/18	13:32	728.2	0	4.7	16.3	361.72	165.3
3/5/18	13:33	729.3	0	4.7	16.3	361.04	164.2
3/5/18	13:34	728.2	0	4.7	16.3	360.22	164.2
3/5/18	13:35	726.1	0	4.7	16.3	359.8	164.2
3/5/18	13:36	723.1	0	4.7	16.4	359.25	164.1
3/5/18	13:37	720.4	0	4.7	16.4	357.72	164
3/5/18	13:38	715.1	0	4.8	16.4	355.63	162.4
3/5/18	13:39	713.7	0	4.7	16.4	354.41	162.5
3/5/18	13:40	715.5	0	4.7	16.4	353.8	163.4
3/5/18	13:41	714.5	0	4.7	16.4	353.57	164
3/5/18	13:42	708.8	0	4.6	16.4	352.87	162.8
3/5/18	13:43	708.4	0	4.7	16.4	352.21	162.5
3/5/18	13:44	719.6	0	4.7	16.5	354.13	163.1
3/5/18	13:45	726.1	0	4.7	16.5	355.27	164.2
3/5/18	13:46	720.2	0	4.7	16.4	354.17	164.1

3/5/18	13:47	725.3	0	4.7	16.5	356.05	163.9	
3/5/18	13:48	726.1	0	4.6	16.5	357.1	163.4	
3/5/18	13:49	726.5	0	4.6	16.5	356.68	162.8	
3/5/18	13:50	732.9	0	4.6	16.5	357.88	162.8	
3/5/18	13:51	733.4	0	4.6	16.5	358.71	162.6	
3/5/18	13:52	729.1	0	4.6	16.5	358.81	163.3	
3/5/18	13:53	708.2	0	4.6	16.6	355.16	162.3	
3/5/18	13:54	702.4	0	4.6	16.6	351.28	162.6	
3/5/18	13:55	717.7	0	4.5	16.6	352.59	162.5	
3/5/18	13:56	722.3	0	4.6	16.6	353.39	161.3	
3/5/18	13:57	724.6	0	4.5	16.6	354.83	160.9	
3/5/18	13:58	726.1	0	4.4	16.7	355.15	161.3	
3/5/18	13:59	722.1	0	4.3	16.7	354.73	160.6	
3/5/18	14:00	713.1	0	4.1	16.7	354.09	162.1	
3/5/18	14:01	709.3	0	4.1	16.9	354.11	162.7	
3/5/18	14:02	702.1	0	4.1	17	353.04	162.7	
3/5/18	14:03	690.7	0	4.2	17	349.8	160.7	
3/5/18	14:04	685.7	0	4.1	17.1	347.32	160.8	
3/5/18	14:05	682.5	0	4.1	17.1	346.2	161	
3/5/18	14:06	682.2	0	4.1	17.1	345.55	160.1	
3/5/18	14:07	682.9	0	4.1	17.1	344.26	159	
3/5/18	14:08	683.4	0	4.1	17.1	343.42	158.6	
3/5/18	14:09	686.4	0	4.1	17.1	344.57	158.4	
3/5/18	14:10	690.3	0	4.2	17.1	345.92	159.4	
3/5/18	14:11	693.2	0	4.2	17.1	346.7	159.9	
3/5/18	14:12	695.4	0	4.2	17.1	347.05	158.5	
3/5/18	14:13	696.6	0	4.2	17.1	348.05	159.8	
3/5/18	14:14	698.2	0	4.2	17.1	348.81	160.5	
3/5/18	14:15	701	0	4.3	17	349.07	158.7	
3/5/18	14:16	701	0	4.2	17	348.53	157.6	
3/5/18	14:17	697.3	0	4.3	17	347.85	158.6	
3/5/18	14:18	690.7	0	4.2	17	348.04	157.9	
3/5/18	14:19	685.1	0	4.1	17	346.7	158	Test End

Plant Name: CLST Page: 1

General Average Report

Reporting Period: 03/05/2018 to 03/05/2018

Site Name: UNIT Time of Report: 03/06/18 14:21

Data Averaging Type: 1m Rolling Average Interval: 1

Date	Time	Stove Side front left CAT_PRE (Deg_F)	Stove Bottom TEMP_10 (Deg_F)	Stove Back TEMP_11 (Deg_F)	Stove Side TEMP_12 (Deg_F)	Stove Top TEMP_13 (Deg_F)	
3/5/18	9:55	61.7	62.34	61.96	63.04	61.66	Preburn
3/5/18	9:56	61.5	62.48	62.22	62.86	61.55	
3/5/18	9:57	61.3	62.88	62.42	62.97	61.78	
3/5/18	9:58	61.3	62.7	62.07	63.3	61.88	
3/5/18	9:59	61.5	62.6	61.94	63.11	61.51	
3/5/18	10:00	61.5	62.62	62.11	62.87	61.47	
3/5/18	10:01	61.5	62.94	62.42	62.91	61.75	
3/5/18	10:02	61.3	63.13	62.17	63.27	61.71	
3/5/18	10:03	61.4	62.74	61.93	63.19	61.32	
3/5/18	10:04	61.4	62.67	62.08	62.92	61.68	
3/5/18	10:05	61.4	62.72	62.42	62.91	62.23	
3/5/18	10:06	61.6	63.1	62.28	63.24	62.12	
3/5/18	10:07	61.7	62.81	61.99	63.3	61.81	
3/5/18	10:08	61.6	62.56	62.01	62.98	61.82	
3/5/18	10:09	61.6	62.76	62.39	62.89	62.19	
3/5/18	10:10	61.5	63.07	62.34	63.12	62.17	
3/5/18	10:11	61.5	62.98	62.01	63.33	61.8	
3/5/18	10:12	61.7	62.72	62.01	63.03	61.79	
3/5/18	10:13	61.7	62.69	62.35	62.88	62.06	
3/5/18	10:14	61.2	62.64	63.14	63.19	62.34	
3/5/18	10:15	61.6	63.4	63.32	63.7	62.86	
3/5/18	10:16	61.8	63.06	64.36	63.71	66.83	
3/5/18	10:17	61.8	62.8	66.44	63.85	77.37	
3/5/18	10:18	62.3	62.87	69.55	64.75	93.19	
3/5/18	10:19	63	63.34	73.38	66.01	110.11	
3/5/18	10:20	64.1	63.74	77.78	67.51	123.27	
3/5/18	10:21	65.4	63.78	82.57	69.26	132.32	
3/5/18	10:22	66.5	63.82	86.48	71.51	138.43	
3/5/18	10:23	68	64.5	89.51	74.18	146.23	
3/5/18	10:24	69.9	65.73	92.63	76.23	160.07	
3/5/18	10:25	71.8	66.13	96.18	78.41	178.48	
3/5/18	10:26	73.5	66.47	100.98	81.39	197.5	
3/5/18	10:27	75.4	67.7	105.24	84.79	216.81	
3/5/18	10:28	77.1	69.01	109.6	88.35	236.82	
3/5/18	10:29	79.6	69.94	114.83	91.32	257.59	
3/5/18	10:30	82.5	71.08	120.11	94.76	276.58	
3/5/18	10:31	84.9	72.27	125.12	98.64	290.61	
3/5/18	10:32	87.4	73.95	130.21	102.42	303.85	
3/5/18	10:33	89.8	75.49	135.93	105.43	312.2	
3/5/18	10:34	92.5	76.44	142.14	109.06	322.14	
3/5/18	10:35	94.8	77.85	146.7	112.95	331.8	
3/5/18	10:36	98	79.68	149.55	117.12	338.13	
3/5/18	10:37	101.3	81.73	155.78	120.65	346.54	
3/5/18	10:38	104.1	83.48	161.14	123.97	354.05	
3/5/18	10:39	106.6	85.04	166.45	127.81	358.68	
3/5/18	10:40	108.8	86.81	171.28	132.1	369.65	
3/5/18	10:41	111.2	89.26	173.38	134.17	372.74	
3/5/18	10:42	114.2	91.16	176.99	136.84	378.81	
3/5/18	10:43	117.8	92.75	180.42	139.79	387.72	

3/5/18	10:44	120.4	94.46	179.33	143.6	396.88
3/5/18	10:45	122.9	96.81	181.42	146.21	402.31
3/5/18	10:46	125.6	99.65	185.06	148.47	403.37
3/5/18	10:47	128.9	101.43	188.36	150.84	405.24
3/5/18	10:48	131.6	103.81	188.24	154.21	407.76
3/5/18	10:49	134.1	106.77	187.82	157.16	406.9
3/5/18	10:50	137	109.87	189.26	160.3	406.28
3/5/18	10:51	139.7	112.28	191.19	162.7	404.39
3/5/18	10:52	142.7	114.82	191.81	165.39	398.05
3/5/18	10:53	145	117.62	192.42	167.61	397.21
3/5/18	10:54	147.6	120.72	196.46	168.93	397.44
3/5/18	10:55	151.3	123.93	197.15	171.65	398.02
3/5/18	10:56	153.7	126.48	194.92	174.06	398.84
3/5/18	10:57	180	129.5	193.7	184.99	404.27
3/5/18	10:58	196.7	132.58	194.79	193.11	402.65
3/5/18	10:59	201.4	136.1	197.47	195.18	401.28
3/5/18	11:00	205.2	140.79	205.39	197.45	402.3
3/5/18	11:01	208.8	144.76	208.02	199.61	396.49
3/5/18	11:02	211.9	148.81	210.59	201.28	395.07
3/5/18	11:03	215	152.09	214.87	203.37	401.19
3/5/18	11:04	218.6	155.04	218.26	205.6	400.75
3/5/18	11:05	222.1	158.32	222.93	208.73	402.69
3/5/18	11:06	225.6	162.56	225.86	210.58	401.91
3/5/18	11:07	228.2	167.54	228	212.83	399.56
3/5/18	11:08	231.2	170.3	228.62	215.87	398.61
3/5/18	11:09	234	172.39	224.37	218.39	401.39
3/5/18	11:10	236.1	175.57	229.34	220.79	402.9
3/5/18	11:11	239	179.54	232.14	223.42	409.1
3/5/18	11:12	241.7	183.73	231.83	226.2	408.82
3/5/18	11:13	244.1	188.08	236.39	229.64	417.65
3/5/18	11:14	246.7	190.42	239.11	232.26	418.47
3/5/18	11:15	248.8	192.55	234.66	234.81	420.92
3/5/18	11:16	251.1	195.72	237.52	237.15	421.22
3/5/18	11:17	253.3	199.59	243.14	240.31	414.81
3/5/18	11:18	255.3	202.64	246.65	243.82	410.09
3/5/18	11:19	256.6	205.31	243.94	245.28	404.52
3/5/18	11:20	255	199.92	231.62	242.92	396.82
3/5/18	11:21	253.4	199.11	228.27	243.27	401.79
3/5/18	11:22	255	202.5	227.33	245.28	405.67
3/5/18	11:23	256	203.36	227.02	245.93	404.83
3/5/18	11:24	257.4	206.36	231.94	246.93	403.23
3/5/18	11:25	258.9	208.1	232.64	248.39	401.82
3/5/18	11:26	260.4	209.29	234.17	249.99	392.17
3/5/18	11:27	260.7	213.17	235.55	252.71	391.87
3/5/18	11:28	260.3	213.93	233.54	254.11	398.31
3/5/18	11:29	261.6	214.05	234.02	255.57	410.72
3/5/18	11:30	264.8	219.62	241.53	259.19	424.55
3/5/18	11:31	270.1	226.53	248.87	263.96	448.98
3/5/18	11:32	274.1	230.75	252.94	266.51	462.93
3/5/18	11:33	274.1	228.11	247.34	266.74	463.87
3/5/18	11:34	272.8	227.37	242.49	267.13	467.3
3/5/18	11:35	273.8	227.61	242.47	269	467.78
3/5/18	11:36	276.1	229.68	246.38	269.43	461.13
3/5/18	11:37	278.7	230.83	250.15	271.84	456.66
3/5/18	11:38	280.7	232.82	252.93	275.06	454.69
3/5/18	11:39	282.5	232.09	251.57	277.63	453.03
3/5/18	11:40	284.4	234.24	249.74	279.26	445.66

3/5/18	11:41	286.4	237.58	253.61	280.47	443.55
3/5/18	11:42	288.2	239.94	260.63	283.74	446.28
3/5/18	11:43	289.9	235.22	254.77	284.92	441.61
3/5/18	11:44	290.8	234.94	252.79	285.7	439.19
3/5/18	11:45	293.1	238.04	254.04	287.03	435.8
3/5/18	11:46	297.9	245.55	263.49	294.14	445.67
3/5/18	11:47	302.1	249.86	262.51	298.44	449.52
3/5/18	11:48	303.5	249.13	256.89	298.45	444.64
3/5/18	11:49	299.4	244.49	246.22	294.4	427.33
3/5/18	11:50	299.6	245.67	243.36	295.77	422
3/5/18	11:51	298.7	242.97	239.25	295.33	413.87
3/5/18	11:52	298.7	241.44	236.14	293.02	405.1
3/5/18	11:53	297.6	242.22	233.58	291.71	403.98
3/5/18	11:54	296.3	245.51	231.9	292.62	403.7
3/5/18	11:55	298.1	253.53	232.73	294.87	414.9
3/5/18	11:56	299.5	256.61	232.01	295.13	416.51
3/5/18	11:57	299.6	257.98	231.6	295.03	411.79
3/5/18	11:58	298.7	259.84	230.42	294.49	409.04
3/5/18	11:59	298	261.33	228.15	294.85	411.23
3/5/18	12:00	298.1	261.72	226.7	294.9	413.72
3/5/18	12:01	297.5	262.7	226.31	293.94	412.78
3/5/18	12:02	296.9	263.93	225.23	292.89	412.31
3/5/18	12:03	295.7	265.28	222.04	292.36	417.31
3/5/18	12:04	296.2	267.01	222.82	292.38	428.73
3/5/18	12:05	295.9	267.49	221.74	291.68	431.22
3/5/18	12:06	295.6	268.75	221.59	291.5	437.01
3/5/18	12:07	295.2	269.66	220.62	291.37	439.39
3/5/18	12:08	295.6	270.28	219.97	291.26	443.53
3/5/18	12:09	296.2	271.07	220.61	290.34	449.77
3/5/18	12:10	296	272.36	220.64	289.82	455.01
3/5/18	12:11	296.5	273.52	220.42	289.83	456.97
3/5/18	12:12	297.3	273.4	220.52	289.94	456.14
3/5/18	12:13	297.6	273.78	222.21	289.68	465.16
3/5/18	12:14	297.6	274.32	221.88	288.96	467.44
3/5/18	12:15	298.3	275.56	222.29	289.01	479.04
3/5/18	12:16	298.6	276.42	222.47	289.86	491.04
3/5/18	12:17	300	277.45	223.9	289.54	503.51
3/5/18	12:18	301.5	277.42	225.83	289.12	513.94
3/5/18	12:19	302.2	278.14	227.72	289.75	527.13
3/5/18	12:20	302.7	279.46	228.16	290.18	537.62
3/5/18	12:21	304.2	279.95	228.65	290.25	545.18
3/5/18	12:22	305.7	280.62	229.72	290.69	550.63
3/5/18	12:23	307.9	281.77	231.48	291.82	552.86
3/5/18	12:24	309.8	283.28	231.18	292.97	557.93
3/5/18	12:25	311	283.34	233.46	294.11	554.84
3/5/18	12:26	312.5	283.59	234.96	294.71	556.44
3/5/18	12:27	313.9	284.03	235.8	296.24	552.65
3/5/18	12:28	314.3	285.55	236.65	297.83	541.94
3/5/18	12:29	316.3	286.35	237.46	299.12	534.12
3/5/18	12:30	318.1	287.04	238.06	300.02	525.03
3/5/18	12:31	319.4	287.55	237.57	301.35	513.42
3/5/18	12:32	320.3	288.2	239.05	302.56	507.25
3/5/18	12:33	321.4	289.15	239.22	303.75	501.31
3/5/18	12:34	322.5	289.1	240.66	304.67	500.18
3/5/18	12:35	323.4	289.62	240.98	305.07	492.38
3/5/18	12:36	324.5	290.24	242.31	306.97	490.3
3/5/18	12:37	326.2	291.34	242.7	308.17	490.2

3/5/18	12:38	327.2	291.8	242.83	308.28	485.27		
3/5/18	12:39	328.6	292.31	243.65	309.49	482.05		
3/5/18	12:40	329.5	292.78	245.11	310.77	483.68	Test Start	
3/5/18	12:41	330.6	293.11	245.22	312.79	486.88	333.72	Average Surface temp
3/5/18	12:42	331.5	293.98	244.57	313.26	486.94		
3/5/18	12:43	332.9	294.04	247.43	313.95	486.05		
3/5/18	12:44	334.4	295.14	247.36	314.04	482.41		
3/5/18	12:45	336	296.58	247.54	314.63	483.04		
3/5/18	12:46	337.5	297.65	249.19	315.84	485.5		
3/5/18	12:47	338.6	297.12	249.09	316.04	481.84		
3/5/18	12:48	339	297.7	250.53	316.85	474.41		
3/5/18	12:49	340.6	298.19	250.24	318.47	474.59		
3/5/18	12:50	340.9	298.78	249.05	318.34	471.75		
3/5/18	12:51	342.2	298.9	250.42	318.35	465.82		
3/5/18	12:52	343.2	298.69	251.52	318.9	462.28		
3/5/18	12:53	344	299.6	252	320.08	466.38		
3/5/18	12:54	345	300.58	251.92	320.69	464.32		
3/5/18	12:55	346.1	301.06	252.55	321.18	463.17		
3/5/18	12:56	346.3	301.59	251.11	321.63	462.1		
3/5/18	12:57	347.4	301.8	252.62	322.76	460.69		
3/5/18	12:58	348.3	302.07	251.96	324.01	456.63		
3/5/18	12:59	349.1	302.77	252.92	324.42	455.35		
3/5/18	13:00	349.6	302.99	253.51	325.03	450.61		
3/5/18	13:01	349.7	303.47	251.92	325.86	446.79		
3/5/18	13:02	349.9	303.99	250.66	326.95	446.61		
3/5/18	13:03	350	304.3	248.85	327.14	445.62		
3/5/18	13:04	350.3	304.63	249.78	327.47	440.38		
3/5/18	13:05	350.4	304.71	250.83	328	438.68		
3/5/18	13:06	350.4	305.33	250.67	328.73	436.49		
3/5/18	13:07	350.6	306.12	250.84	329.16	435.02		
3/5/18	13:08	350.2	306.1	249.63	329.72	433.08		
3/5/18	13:09	350.1	305.87	250.32	329.92	429.38		
3/5/18	13:10	350.4	305.57	250	330.61	426.2		
3/5/18	13:11	350.6	305.92	248.88	330.67	425.02		
3/5/18	13:12	350.2	306.14	249.17	330.71	423.09		
3/5/18	13:13	350.1	306.17	249.64	330.95	420.23		
3/5/18	13:14	349.8	306.69	247.86	331.34	419.52		
3/5/18	13:15	350.7	307.59	247.92	331.26	417.41		
3/5/18	13:16	351	307.79	248.7	330.76	415		
3/5/18	13:17	351.2	307.31	248.49	330.78	414.52		
3/5/18	13:18	350.5	307.59	248.45	331.11	412.8		
3/5/18	13:19	350.4	308.29	248.38	330.55	410.88		
3/5/18	13:20	350.3	309.18	247.52	329.64	406.83		
3/5/18	13:21	350.2	309.4	248.63	329.24	405.52		
3/5/18	13:22	349.6	309.18	249.15	329.12	403.03		
3/5/18	13:23	349.4	309.05	249.32	329.45	401.54		
3/5/18	13:24	350.6	310.24	248.12	329.08	401.5		
3/5/18	13:25	350.1	310.34	248.97	328.94	399.03		
3/5/18	13:26	349.9	310.34	249.36	329.04	399.4		
3/5/18	13:27	349.7	310.94	248.54	329.01	396.78		
3/5/18	13:28	350	311.48	248.65	328.45	397.34		
3/5/18	13:29	349.9	311.88	248.15	327.91	398.24		
3/5/18	13:30	349.4	311.75	249.61	327.98	399.27		
3/5/18	13:31	349.3	312.2	250.05	328.4	396.74		
3/5/18	13:32	349.1	312.93	249.84	327.72	394.06		
3/5/18	13:33	349.1	313.4	248.85	327.56	395.6		
3/5/18	13:34	348.7	313.47	250.28	327.57	395.33		

3/5/18	13:35	349	313.97	250.29	327.28	392.4		
3/5/18	13:36	348.3	314.4	250.1	326.64	390.46		
3/5/18	13:37	348.6	315.12	251.02	326.52	389.65		
3/5/18	13:38	348.4	315.21	252.3	327.09	388.66		
3/5/18	13:39	347.9	316.37	252	326.68	386.82		
3/5/18	13:40	346.8	316.72	251.61	325.75	384.8		
3/5/18	13:41	347.1	317.54	251.41	325.09	383.28		
3/5/18	13:42	347.1	318.03	252.16	325.27	379.22		
3/5/18	13:43	347	318.09	252.92	326.16	381.94		
3/5/18	13:44	346.9	319.39	252.97	325.67	380.82		
3/5/18	13:45	346.8	320.41	253.36	324.93	381.16		
3/5/18	13:46	347	320.95	252.26	324.46	379.52		
3/5/18	13:47	346.9	321.09	253.42	324.76	375.07		
3/5/18	13:48	346.2	321.7	252.12	324.74	376.04		
3/5/18	13:49	346.1	322.74	252.9	324.64	376.78		
3/5/18	13:50	346	323.91	254.08	323.92	373.8		
3/5/18	13:51	346.1	323.99	254.41	324.38	372.54		
3/5/18	13:52	346.2	324.39	254.58	324.7	373.03		
3/5/18	13:53	345.5	325.45	254.3	323.91	374.72		
3/5/18	13:54	345.2	326.68	255.5	323.75	373.27		
3/5/18	13:55	345.2	326.95	254.53	324.02	372.18		
3/5/18	13:56	345.1	327.15	254.69	323.96	370.21		
3/5/18	13:57	344.4	327.24	255.75	323.64	368.41		
3/5/18	13:58	343.3	328.53	255.61	323.71	369.87		
3/5/18	13:59	343.1	328.83	256.02	324.32	372.07		
3/5/18	14:00	342.9	329.06	255.27	324.19	369.6		
3/5/18	14:01	342.6	330	255.79	323.32	368.49		
3/5/18	14:02	342.3	330.69	256.71	323.08	364.95		
3/5/18	14:03	342.1	331.58	257.07	323.64	366.73		
3/5/18	14:04	342.5	331.51	257.87	324.06	365.67		
3/5/18	14:05	342.2	331.84	255.39	323.68	363.4		
3/5/18	14:06	340.8	332.89	255.8	323.88	360.66		
3/5/18	14:07	340.9	333.43	256.19	324.4	360.34		
3/5/18	14:08	339.9	333.49	254.99	323.94	359.11		
3/5/18	14:09	339.6	333.94	256.27	323.29	356.97		
3/5/18	14:10	339.2	334.57	256.31	322.67	355.64		
3/5/18	14:11	338.9	335.01	256.88	323.25	354.57		
3/5/18	14:12	338.2	335.37	256.58	323.65	352.91		
3/5/18	14:13	337.7	335.57	256.06	323.27	352.71		
3/5/18	14:14	337.2	335.88	256.86	322.61	352.86		
3/5/18	14:15	336.8	336.02	259.03	322.56	351.67		
3/5/18	14:16	335.7	337.03	258.37	322.97	350.22		
3/5/18	14:17	335.1	337.1	258.05	322.94	350.6		
3/5/18	14:18	333.5	336.67	259.28	322.67	350.01	Test End	
3/5/18	14:19	333.4	337.83	258.82	322.8	351.08	320.786	Average Surface temp

3/5/18	10:35	1	61.8	3.479	64.2	65.7	63.6
3/5/18	10:36	1	62	3.379	64.3	66.1	63.7
3/5/18	10:37	1	62.1	3.221	64.4	66.2	63.7
3/5/18	10:38	1	62.1	3.274	64.4	66.2	64
3/5/18	10:39	1	62.1	3.212	64.6	66.3	64.2
3/5/18	10:40	1	62.3	3.292	64.6	66.3	64.2
3/5/18	10:41	1	62.3	3.163	64.9	66.5	64.2
3/5/18	10:42	1	62.4	3.027	65.1	66.5	64.6
3/5/18	10:43	1	62.4	3.163	65.2	66.4	64.5
3/5/18	10:44	1	62.6	3.205	65.3	66.6	64.6
3/5/18	10:45	1	62.7	3.454	65.4	66.6	65
3/5/18	10:46	1	62.7	3.402	65.4	66.6	65.3
3/5/18	10:47	1	62.9	3.472	65.5	66.6	65.3
3/5/18	10:48	1	62.9	3.426	65.7	66.6	65.5
3/5/18	10:49	1	63	3.357	65.8	66.6	65.6
3/5/18	10:50	1	63.1	3.298	65.8	66.7	65.7
3/5/18	10:51	1	63.2	3.312	65.8	66.7	65.8
3/5/18	10:52	1	63.3	3.452	66	66.7	65.8
3/5/18	10:53	1	63.3	3.393	66.1	66.8	66
3/5/18	10:54	1	63.4	3.184	66.1	66.8	66.1
3/5/18	10:55	1	63.7	3.351	66.3	67	66.1
3/5/18	10:56	1	63.8	3.39	66.5	67.1	65.9
3/5/18	10:57	1	63.7	3.337	66.5	67.1	66.3
3/5/18	10:58	1	63.9	3.372	66.5	67	66.7
3/5/18	10:59	1	63.9	3.214	66.5	67	66.6
3/5/18	11:00	1	64	3.113	66.6	67	66.3
3/5/18	11:01	1	64	3.126	66.8	67.2	66.2
3/5/18	11:02	1	64.1	3.016	66.9	67.2	66.3
3/5/18	11:03	1	64.3	3.13	66.8	67.1	66.3
3/5/18	11:04	1	64.3	3.09	66.9	67.1	66.4
3/5/18	11:05	1	64.4	2.985	67.1	67.4	66.9
3/5/18	11:06	1	64.4	2.972	67.1	67.3	66.9
3/5/18	11:07	1	64.7	3.01	67.2	67.4	67
3/5/18	11:08	1	64.5	3.1	67.2	67.5	66.8
3/5/18	11:09	1	64.5	3.271	67.6	67.7	66.5
3/5/18	11:10	1	64.6	3.133	67.5	67.5	67.1
3/5/18	11:11	1	64.8	3.173	67.7	67.7	67.1
3/5/18	11:12	1	64.7	3.048	67.7	67.7	66.9
3/5/18	11:13	1	64.8	3.004	67.8	67.8	67.2
3/5/18	11:14	1	64.9	3.036	67.8	67.9	67.1
3/5/18	11:15	1	65.2	3.253	68	67.9	67.5
3/5/18	11:16	1	65.3	3.231	68.1	68.1	67.9
3/5/18	11:17	1	65.3	2.979	68.1	68	67.3
3/5/18	11:18	1	65.3	2.94	68.3	68.1	67.3
3/5/18	11:19	1	65.3	2.974	68.3	68.2	67.5
3/5/18	11:20	1	65.4	2.948	68.2	68.3	66
3/5/18	11:21	1	65.2	2.931	68	68.1	65.8
3/5/18	11:22	1	65.3	3.108	67.8	67.9	65.5

3/5/18	11:23	1	65.1	3.01	68.1	68.2	65.3
3/5/18	11:24	1	65.4	2.944	67.7	67.9	65.4
3/5/18	11:25	1	65.4	2.9	67.4	67.6	65.3
3/5/18	11:26	1	65.3	2.931	67.2	67.4	65.1
3/5/18	11:27	1	65.2	2.988	67.2	67.6	65.2
3/5/18	11:28	1	65.2	3.013	67.1	67.6	65.4
3/5/18	11:29	1	65	2.988	66.9	67.4	65.3
3/5/18	11:30	1	64.9	2.902	66.9	67.2	65.2
3/5/18	11:31	1	64.8	3.023	66.8	67.1	65.9
3/5/18	11:32	1	64.6	3.054	67	67.5	66.4
3/5/18	11:33	1	64.6	3.202	67	67.5	66
3/5/18	11:34	1	64.5	3.141	67	67.5	65.2
3/5/18	11:35	1	64.6	3.183	66.8	67.3	65.5
3/5/18	11:36	1	64.9	3.139	66.9	67.5	65.2
3/5/18	11:37	1	64.8	3.074	66.8	67.3	65.2
3/5/18	11:38	1	64.8	3.117	66.6	67.2	65
3/5/18	11:39	1	64.9	3.138	66.7	67.3	65.6
3/5/18	11:40	1	63.5	3.22	66.9	68.1	65.1
3/5/18	11:41	1	60.5	3.145	68	72.2	65.1
3/5/18	11:42	1	59.7	3.045	68.7	74.4	65.2
3/5/18	11:43	1	59.1	3.329	69.4	75.1	65.3
3/5/18	11:44	1	58.5	3.308	69.8	75.3	65.1
3/5/18	11:45	1	58	3.193	70.2	75.7	64.7
3/5/18	11:46	1	57.7	3.268	70.6	75.9	65.3
3/5/18	11:47	1	57.2	3.283	71.1	76.3	65.9
3/5/18	11:48	1	57.1	3.37	71.5	76.6	66.1
3/5/18	11:49	1	56.9	3.344	72	76.9	65.4
3/5/18	11:50	1	56.7	3.308	72.4	77.2	65.1
3/5/18	11:51	1	56.5	3.232	72.6	77.1	65.2
3/5/18	11:52	1	56.5	3.284	72.7	77.1	65.2
3/5/18	11:53	1	56.3	3.172	72.8	77.5	65.1
3/5/18	11:54	1	56.2	3.187	72.8	77.4	64.9
3/5/18	11:55	1	56	3.185	72.9	77.6	65.2
3/5/18	11:56	1	55.9	3.133	73.2	78	65.5
3/5/18	11:57	1	56	3.328	73.3	77.9	66.1
3/5/18	11:58	1	56	3.307	73.5	78.1	66
3/5/18	11:59	1	56	3.249	73.7	78.3	66.1
3/5/18	12:00	1	55.9	3.306	74.1	78.5	66.4
3/5/18	12:01	1	55.9	3.262	74.4	78.9	66.9
3/5/18	12:02	1	55.7	3.383	74.6	79.2	66.9
3/5/18	12:03	1	55.7	3.219	74.7	79.3	66.6
3/5/18	12:04	1	55.6	3.229	74.8	79.5	66.8
3/5/18	12:05	1	55.9	3.278	75.3	80	67.2
3/5/18	12:06	1	55.6	3.392	75.6	80.3	67.4
3/5/18	12:07	1	55.9	3.396	75.7	80.3	67.7
3/5/18	12:08	1	55.8	3.311	75.8	80.5	67.8
3/5/18	12:09	1	56.1	3.32	75.9	80.8	68
3/5/18	12:10	1	56.1	3.389	76.4	81.1	67.8

3/5/18	12:11	1	56.1	3.335	76.5	81.3	68.2
3/5/18	12:12	1	56.1	3.234	76.7	81.5	68.3
3/5/18	12:13	1	56.2	3.354	76.9	81.6	68.8
3/5/18	12:14	1	56	3.139	77.2	81.9	68.4
3/5/18	12:15	1	56.2	3.156	77.5	82.2	68.7
3/5/18	12:16	1	56.1	3.241	77.8	82.5	69
3/5/18	12:17	1	56	3.311	78	82.8	69.2
3/5/18	12:18	1	56.1	3.349	78	83.1	69.3
3/5/18	12:19	1	56.3	3.321	78.3	83.3	69.3
3/5/18	12:20	1	56.3	3.422	78.5	83.2	69.3
3/5/18	12:21	1	56.2	3.294	78.7	83.4	69.4
3/5/18	12:22	1	56.4	3.232	78.9	83.7	69.7
3/5/18	12:23	1	56.6	3.246	79	83.8	69.8
3/5/18	12:24	1	56.6	3.22	79.1	83.9	70
3/5/18	12:25	1	56.8	3.255	79.2	84	70.1
3/5/18	12:26	1	56.7	3.377	79.4	84	70.8
3/5/18	12:27	1	56.8	3.499	79.4	83.8	70.6
3/5/18	12:28	1	57	3.526	79.5	84	71.2
3/5/18	12:29	1	56.8	3.556	79.7	84	71.4
3/5/18	12:30	1	56.9	3.482	79.7	83.8	71.2
3/5/18	12:31	1	56.9	3.488	79.8	83.8	70.7
3/5/18	12:32	1	56.8	3.435	79.9	83.9	71.2
3/5/18	12:33	1	57	3.388	79.8	83.7	71.4
3/5/18	12:34	1	57.1	3.508	79.8	83.7	71.6
3/5/18	12:35	1	57.1	3.437	79.8	83.6	70.9
3/5/18	12:36	1	57.1	3.594	79.8	83.6	71.4
3/5/18	12:37	1	57.1	3.5	79.8	83.6	71.8
3/5/18	12:38	1	57.2	3.537	79.7	83.6	71.8
3/5/18	12:39	1	57.2	3.453	79.6	83.4	71.9
3/5/18	12:40	1	57.3	3.49	79.6	82.5	71.9
3/5/18	12:41	1	58.4	3.36	79	166.3	71.6
3/5/18	12:42	1	59.6	3.384	79	73.8	71.5
3/5/18	12:43	1	58.8	3.31	78.9	73.4	71
3/5/18	12:44	1	58.2	3.249	78.8	73.1	71
3/5/18	12:45	1	57.9	3.434	78.8	73.1	71.1
3/5/18	12:46	1	57.8	3.468	78.8	73.1	71.9
3/5/18	12:47	1	57.5	3.524	78.8	73.1	71.3
3/5/18	12:48	1	57.4	3.268	78.7	73.2	70.6
3/5/18	12:49	1	57.3	3.312	78.7	73.5	71
3/5/18	12:50	1	57.3	3.438	78.8	73.7	71.9
3/5/18	12:51	1	57.4	3.474	78.8	73.9	72.4
3/5/18	12:52	1	57.3	3.346	78.8	74.1	71.7
3/5/18	12:53	1	57.6	3.5	78.9	74.4	71.8
3/5/18	12:54	1	57.6	3.446	78.8	74.4	72
3/5/18	12:55	1	57.6	3.432	79	74.7	71.9
3/5/18	12:56	1	57.5	3.546	78.9	74.9	71.7
3/5/18	12:57	1	57.5	3.486	78.9	75.1	72.4
3/5/18	12:58	1	57.4	3.571	78.7	75.1	72.5

3/5/18	12:59	1	57.6	3.514	79	75.4	72.5
3/5/18	13:00	1	57.6	3.464	79	75.5	72.5
3/5/18	13:01	1	57.5	3.387	79.1	75.6	72.3
3/5/18	13:02	1	57.5	3.352	79	75.8	72
3/5/18	13:03	1	57.6	3.395	79	75.8	72.1
3/5/18	13:04	1	57.7	3.389	79.1	76	72.6
3/5/18	13:05	1	57.7	3.454	79.1	76.1	72.3
3/5/18	13:06	1	57.6	3.583	79.1	76	72.9
3/5/18	13:07	1	57.6	3.442	79.1	76.2	72.4
3/5/18	13:08	1	57.7	3.357	78.9	76	72.5
3/5/18	13:09	1	57.6	3.484	79.1	76.4	72.1
3/5/18	13:10	1	57.7	3.538	79.2	76.4	72
3/5/18	13:11	1	57.8	3.496	79.1	76.5	72.3
3/5/18	13:12	1	57.7	3.501	79	76.5	72.3
3/5/18	13:13	1	57.8	3.512	79	76.5	71.8
3/5/18	13:14	1	57.8	3.567	78.9	76.4	71.3
3/5/18	13:15	1	57.8	3.607	79	76.5	72
3/5/18	13:16	1	57.7	3.564	79	76.4	72.2
3/5/18	13:17	1	57.8	3.422	78.9	76.4	72.2
3/5/18	13:18	1	57.7	3.471	78.8	76.6	72.3
3/5/18	13:19	1	57.8	3.581	78.7	76.4	72.7
3/5/18	13:20	1	57.7	3.45	78.7	76.3	72.2
3/5/18	13:21	1	57.7	3.545	78.8	76.4	72.8
3/5/18	13:22	1	57.6	3.587	78.8	76.4	72.4
3/5/18	13:23	1	57.7	3.488	78.7	76.3	72
3/5/18	13:24	1	57.7	3.436	78.8	76.5	72.3
3/5/18	13:25	1	57.9	3.529	78.7	76.3	72.4
3/5/18	13:26	1	57.7	3.469	78.7	76.4	72.4
3/5/18	13:27	1	57.6	3.444	78.7	76.3	71.9
3/5/18	13:28	1	57.6	3.504	78.6	76.3	72.2
3/5/18	13:29	1	57.5	3.63	78.6	76.4	72.3
3/5/18	13:30	1	57.7	3.501	78.6	76.4	72.4
3/5/18	13:31	1	57.6	3.481	78.8	76.6	72.2
3/5/18	13:32	1	57.7	3.549	78.7	76.5	71.7
3/5/18	13:33	1	57.9	3.593	78.7	76.4	72.1
3/5/18	13:34	1	57.8	3.477	78.7	76.4	72
3/5/18	13:35	1	57.8	3.484	78.7	76.5	72.4
3/5/18	13:36	1	57.8	3.455	78.7	76.4	72.3
3/5/18	13:37	1	57.8	3.481	78.6	76.2	72.4
3/5/18	13:38	1	57.8	3.347	78.5	76.2	72.1
3/5/18	13:39	1	57.9	3.301	78.5	76.1	72.2
3/5/18	13:40	1	57.7	3.604	78.6	76.3	72.6
3/5/18	13:41	1	57.8	3.615	78.6	76.3	72.5
3/5/18	13:42	1	57.9	3.573	78.6	76.4	71.8
3/5/18	13:43	1	57.8	3.554	78.6	76.3	72.2
3/5/18	13:44	1	57.8	3.511	78.5	76.3	71.6
3/5/18	13:45	1	57.8	3.59	78.5	76.2	72.3
3/5/18	13:46	1	57.8	3.721	78.4	76.2	72.2

3/5/18	13:47	1	57.8	3.644	78.4	76.2	71.9
3/5/18	13:48	1	57.7	3.588	78.4	76.2	72.4
3/5/18	13:49	1	57.8	3.686	78.3	76.2	72.4
3/5/18	13:50	1	57.7	3.526	78.3	76.2	72.4
3/5/18	13:51	1	57.8	3.551	78.4	76.2	72.5
3/5/18	13:52	1	57.9	3.558	78.4	76.2	72.1
3/5/18	13:53	1	57.9	3.615	78.3	76.2	72.3
3/5/18	13:54	1	57.8	3.598	78.3	76.1	72.4
3/5/18	13:55	1	57.7	3.541	78.3	76.1	72.3
3/5/18	13:56	1	57.7	3.576	78.2	75.9	72.4
3/5/18	13:57	1	58	3.349	78.3	76.2	71.2
3/5/18	13:58	1	57.8	3.477	78.3	76.1	71
3/5/18	13:59	1	57.8	3.504	78.4	76.2	71.8
3/5/18	14:00	1	57.8	3.615	78.3	76.2	72.1
3/5/18	14:01	1	57.7	3.702	78.3	76.2	72.2
3/5/18	14:02	1	57.8	3.684	78.2	76.2	72.2
3/5/18	14:03	1	57.7	3.639	78.1	76.2	72.3
3/5/18	14:04	1	57.8	3.611	78.2	76.2	71.8
3/5/18	14:05	1	57.8	3.626	78.1	76.2	71.6
3/5/18	14:06	1	57.9	3.533	78.1	76.1	71
3/5/18	14:07	1	57.8	3.617	77.8	76	71.8
3/5/18	14:08	1	58	3.693	77.8	76.1	72
3/5/18	14:09	1	57.9	3.639	77.8	76.2	72
3/5/18	14:10	1	58	3.686	77.8	76	72.1
3/5/18	14:11	1	58	3.695	77.8	76	72.2
3/5/18	14:12	1	58	3.672	77.8	76.1	72
3/5/18	14:13	1	57.8	3.531	77.7	76	72.2
3/5/18	14:14	1	58	3.652	77.7	75.8	72
3/5/18	14:15	1	58	3.601	77.8	76	71.8
3/5/18	14:16	1	57.8	3.509	77.9	75.9	72.1
3/5/18	14:17	1	58	3.709	77.9	76	72.2
3/5/18	14:18	1	57.9	3.489	77.8	76	71.5
3/5/18	14:19	1	58.7	3.707	77.4	75.9	71.4

TUNL_TMP (Deg_F)	UNIT_WT (lbs)
63	0.05
62.5	0.04
62.4	0.03
62.8	0.04
62.4	0.03
62.5	0.04
62.6	0.04
63.3	0.05
63.2	0.04
62.8	0.05
62.7	0.06
64	0.07
63	0.07
62.1	0.5
63	0.72
62.8	1.11
63	1.49
62.7	1.42
63	1.4
66.8	1.37
65.5	1.26
75.2	1.12
81.4	0.98
87.5	3.31
83.9	11.84
79.2	11.88
74.2	11.78
75	11.52
79.4	11.27
90.7	11.08
95.2	10.84
82.9	10.65
86.9	10.45
102.6	10.23
104.9	10.01
105	9.8
106.6	9.6
105.5	9.44
107.6	9.24
107.6	9.05

107.1	9.32
107.7	8.61
109.8	8.43
109	8.26
110	8.06
110	7.86
110.9	7.65
112.9	7.49
112	7.55
109.8	7.1
106.1	6.97
107	6.95
105.9	6.73
106.1	6.57
106.6	6.41
107.1	6.29
107.2	6.17
105.3	6.06
105.8	5.91
110.5	6.1
108.4	5.74
105.6	5.5
104.8	5.36
103.8	5.23
106.3	5.22
111.7	5.17
113	5.04
116.1	4.92
116.6	4.74
117.5	5.18
117.5	6.15
118.1	6.24
118.3	6.1
116.7	5.8
111.4	5.57
114.9	5.07
116.1	5.3
117.9	5.11
122.1	5.14
121.4	3.1
113.1	2.21
111.4	2.94
114	2.92
116.1	3.22
114.5	3.14
111.6	2.32
111.9	3.24
106.5	3.77

104.4	3.7	
106.4	4.54	
107.6	5.36	
110.3	5.2	
111.3	5	
112.6	4.77	
113.9	4.55	
118.4	4.72	
117.9	4	
117.1	3.95	
111.8	3.53	
108.8	3.44	
106	3.92	
105.2	3.36	
108.3	3.26	
108.2	3.2	
105.8	2.95	
103.6	2.86	Fuel Consumed, 2.6 lb coal bed
105.1	14.2	11.6
110.8	14.23	11.63
103.1	14.13	11.53
101.2	14.05	11.45
101.1	13.93	11.33
100.1	13.86	11.26
99.7	13.79	11.19
98.1	13.69	11.09
97.2	13.61	11.01
96.7	13.51	10.91
97.7	13.41	10.81
97	13.33	10.73
98.2	13.21	10.61
97.9	13.08	10.48
98.4	13.01	10.41
99.7	12.9	10.3
98	12.78	10.18
98	12.68	10.08
98.5	12.57	9.97
98.7	12.42	9.82
100.2	12.32	9.72
99.6	12.18	9.58
100.3	12.03	9.43
101	11.89	9.29
101.9	11.74	9.14
100.9	11.65	9.05
101.5	11.43	8.83
102.3	11.34	8.74
103.4	11.23	8.63
103	11.08	8.48

103.6	11.01	8.41
103.6	10.78	8.18
103.1	10.67	8.07
105.3	10.54	7.94
106.2	10.33	7.73
106.1	10.18	7.58
106.6	10	7.4
107.2	9.87	7.27
107.3	9.73	7.13
105.7	9.49	6.89
107.3	9.28	6.68
107.8	9.12	6.52
107.7	8.9	6.3
108.2	8.72	6.12
107.9	8.66	6.06
107	8.5	5.9
105.4	8.42	5.82
105	8.33	5.73
104.4	8.27	5.67
104.7	8.19	5.59
103.7	8.11	5.51
104.2	8.04	5.44
104.3	7.97	5.37
103.4	7.93	5.33
102.9	7.82	5.22
101.9	7.68	5.08
103.5	7.62	5.02
103.2	7.57	4.97
103.3	7.46	4.86
102.8	7.35	4.75
103.7	7.2	4.6
103.3	7.14	4.54
103.5	7.05	4.45
104.1	6.99	4.39
102.4	6.87	4.27
102.3	6.8	4.2
101.7	6.76	4.16
103.2	6.66	4.06
102.8	6.56	3.96
102.6	6.51	3.91
102.3	6.46	3.86
102.6	6.38	3.78
101.6	6.28	3.68
102.3	6.25	3.65
102.4	6.17	3.57
101.2	6.08	3.48
102.2	6.01	3.41
101.5	5.96	3.36

102	5.9	3.3
102	5.84	3.24
102.2	5.78	3.18
101.7	5.71	3.11
101.6	5.65	3.05
102.4	5.59	2.99
101.2	5.56	2.96
100.4	5.49	2.89
101.1	5.44	2.84
101.5	5.37	2.77
100.6	5.34	2.74
99.8	5.3	2.7
100.5	5.24	2.64
100.4	5.19	2.59
100.2	5.12	2.52
99.2	5.07	2.47
99.4	5.04	2.44
99.7	4.99	2.39
100.1	4.93	2.33
99.5	4.87	2.27
99.2	4.82	2.22
99.6	4.79	2.19
99.3	4.72	2.12
98.8	4.67	2.07
98.9	4.62	2.02
99.5	4.56	1.96
98.7	4.52	1.92
98.8	4.49	1.89
99.1	4.45	1.85
98.6	4.39	1.79
98	4.34	1.74
99.2	4.29	1.69
99.3	4.25	1.65
98.2	4.23	1.63
97.8	4.18	1.58
98.6	4.13	1.53
98.8	4.08	1.48
98.9	4.05	1.45
98.8	4.01	1.41
99.2	3.98	1.38
99.6	3.94	1.34
97.9	3.9	1.3
97.9	3.88	1.28
97.3	3.83	1.23
97.6	3.82	1.22
97.7	3.8	1.2
97.9	3.76	1.16
97	3.71	1.11

97.2	3.68	1.08
97.8	3.64	1.04
97	3.59	0.99
98.1	3.6	1
97.9	3.54	0.94
97.8	3.51	0.91
97.3	3.45	0.85
97.5	3.43	0.83
97.9	3.4	0.8
97.4	3.37	0.77
98.1	3.34	0.74
97.1	3.29	0.69
97.3	3.28	0.68
97	3.23	0.63
96.7	3.22	0.62
96.8	3.18	0.58
96.7	3.12	0.52
96.6	3.09	0.49
96.4	3.09	0.49
96.3	3.06	0.46
96	3.02	0.42
95.5	3.01	0.41
95.8	2.99	0.39
95.9	2.96	0.36
96	2.93	0.33
95.6	2.91	0.31
97.1	2.86	0.26
96.2	2.83	0.23
96	2.8	0.2
96.5	2.76	0.16
95.6	2.73	0.13
96.3	2.7	0.1
94.8	2.65	0

Plant Name: CLST

General Average Report

Reporting Period: 03/05/2018 to 03/05/2018

Site Name: UNIT Time of Report: 03/06/18 14:22

Data Averaging Type: 1m Rolling Average Interval: 1

Date	Time	CAT_POST (Deg_F)	CO (%)	CO2 (%)	O2 (%)	STK_CSA (Deg_F)	STK_TMP (Deg_F)
3/5/18	9:55	61.4	0.02	0	22	61.95	61.3
3/5/18	9:56	61.5	0.02	0	22	62.2	61.2
3/5/18	9:57	61.4	0.02	0	22	62.33	61.2
3/5/18	9:58	61.2	0.02	0	22	62.06	61.2
3/5/18	9:59	61.4	0.02	0	22	62.06	61.1
3/5/18	10:00	61.4	0.02	0	22	62.29	61.1
3/5/18	10:01	61.1	0.02	0	22	62.55	61
3/5/18	10:02	60.8	0.06	0.7	22	62.34	61
3/5/18	10:03	61	0.03	-0.1	21.3	62.04	61
3/5/18	10:04	61.1	0.03	-0.1	14.8	62.14	60.9
3/5/18	10:05	61.1	0.03	-0.1	8.8	62.35	61
3/5/18	10:06	60.6	0.02	0	5.4	62.36	61
3/5/18	10:07	61.2	0	-0.1	8.3	62.11	61.2
3/5/18	10:08	61.5	0	-0.1	9	62.1	61.3
3/5/18	10:09	61.1	0	-0.1	5.5	62.52	61.2
3/5/18	10:10	61	0	0	3.3	62.74	61.2
3/5/18	10:11	61	0	0	5.2	62.43	61.3
3/5/18	10:12	61.4	0	0	11.5	62.36	61.4
3/5/18	10:13	64.4	0	0	15.7	62.62	61.3
3/5/18	10:14	85.9	0.05	1.9	18.2	67.2	62.3
3/5/18	10:15	181.7	0.07	2.6	19.5	87.29	71.5
3/5/18	10:16	459.1	0.08	4.7	19.6	141.07	95.2
3/5/18	10:17	655	0.16	6.2	19	207.15	122.5
3/5/18	10:18	682.9	0.06	5.7	17.8	261.14	143.6
3/5/18	10:19	463.6	0.18	1.8	16.6	254.24	140.6
3/5/18	10:20	340.6	0.24	2	16.8	225.91	134.3
3/5/18	10:21	357.5	0.18	2.1	18	217.52	129.2
3/5/18	10:22	519	0.43	5.3	18.7	232.96	133.5
3/5/18	10:23	724.6	0.36	8.2	18.6	282.51	151.3
3/5/18	10:24	813.1	0.24	7.4	16.9	325.84	170.7
3/5/18	10:25	764.3	0.25	7.5	15.3	352.24	181.8
3/5/18	10:26	797	0.16	7.4	14.6	372.31	188.2
3/5/18	10:27	866.4	0.11	7.5	14.2	388.91	196.8
3/5/18	10:28	874.6	0.08	7.6	14	402.38	202.6
3/5/18	10:29	847	0.08	6.8	13.8	407.2	206.9
3/5/18	10:30	814.4	0.08	6.3	13.8	407.63	211.7
3/5/18	10:31	792.4	0.09	6	14.1	405.62	214.1
3/5/18	10:32	780	0.08	6.5	14.5	405.92	214.6
3/5/18	10:33	797.8	0.07	7.1	14.7	411.61	217
3/5/18	10:34	818	0.06	7.4	14.6	419.31	218.2

3/5/18	10:35	841.5	0.06	7.4	14.3	426.09	214.5
3/5/18	10:36	831.6	0.07	6.2	14	427.4	211.9
3/5/18	10:37	834.2	0.05	6.8	14.1	427.32	212
3/5/18	10:38	856.5	0.04	7.7	14.3	430.62	210.9
3/5/18	10:39	864.3	0.05	7.1	14.2	435.02	211.3
3/5/18	10:40	859.8	0.05	6.8	13.9	437.25	214.9
3/5/18	10:41	865.3	0.05	6.8	14	437.82	211.8
3/5/18	10:42	879.1	0.05	7	14.1	440.87	210.8
3/5/18	10:43	887	0.05	7.4	14.2	443.1	214.7
3/5/18	10:44	880.2	0.04	7.1	14.1	431.47	209.2
3/5/18	10:45	843.4	0.03	6	13.9	418.67	206.8
3/5/18	10:46	814.1	0.04	5.4	14.2	411	206.5
3/5/18	10:47	814.6	0.05	6	14.7	408.4	206
3/5/18	10:48	847.1	0.05	5.9	15.1	411.03	204.6
3/5/18	10:49	818.5	0.05	5.4	15.1	408.25	203.2
3/5/18	10:50	801.6	0.03	5.8	15.3	403.41	202.2
3/5/18	10:51	802.2	0.03	5.9	15.4	400.67	202.9
3/5/18	10:52	804.4	0.03	5.9	15.3	399.98	202
3/5/18	10:53	802.6	0.02	5.8	15.3	398.97	201
3/5/18	10:54	791.5	0.02	5.5	15.3	403.1	207.2
3/5/18	10:55	868.8	0.03	8.2	15.3	405.09	207.5
3/5/18	10:56	932.6	0.02	8.1	15.1	405.49	200.4
3/5/18	10:57	838.3	-0.01	6.2	14.1	397.9	194.8
3/5/18	10:58	786.8	0	5.6	13.9	388.19	191.7
3/5/18	10:59	767.3	0	5.1	14.4	386.02	193.7
3/5/18	11:00	735	0.02	4.6	15	397.71	207.3
3/5/18	11:01	741.6	0.01	5.2	15.5	407.02	212.3
3/5/18	11:02	752.8	0.01	6	15.8	414.2	216.2
3/5/18	11:03	729.1	0.01	5.3	15.7	417.95	223.5
3/5/18	11:04	700.7	0	4.6	15.5	415.92	224
3/5/18	11:05	651.2	0.05	3.8	15.7	408.4	217.9
3/5/18	11:06	695.1	0.03	4.7	16.2	410.24	218.8
3/5/18	11:07	757.3	0.01	5.3	16.6	416.99	221.3
3/5/18	11:08	832.5	0	6.5	16.6	423.64	221.4
3/5/18	11:09	854.1	0	6.7	16.1	418.28	213.2
3/5/18	11:10	838.4	0	5.5	15.5	420.68	216.5
3/5/18	11:11	854.9	0	6	15.2	431.04	222.3
3/5/18	11:12	825.4	0	6.6	15.5	431.64	222.1
3/5/18	11:13	774.9	0	4.8	15.1	433.85	232.2
3/5/18	11:14	766.2	0	4.9	15.2	433.62	231.6
3/5/18	11:15	693.9	0	4.3	15.7	408.58	215.6
3/5/18	11:16	592.9	0	1.8	16.1	382.58	207.8
3/5/18	11:17	606.8	0	1.9	16.8	377.16	206.4
3/5/18	11:18	678.8	0	2.7	18	385.37	210.7
3/5/18	11:19	850.9	0	5.2	18.7	401.59	207.2
3/5/18	11:20	890.7	0	8	18.4	410.88	200.3
3/5/18	11:21	840.8	0	4.6	17	435.48	200.9
3/5/18	11:22	799.8	0	0	15.6	420.71	192.8

3/5/18	11:23	779.8	0	0	17.1	404.46	182.9	
3/5/18	11:24	740.3	0	0	19.1	410.43	185.4	
3/5/18	11:25	720.3	0	0.1	20.3	413.6	187.8	
3/5/18	11:26	810.7	0	7	21	440.66	197.5	
3/5/18	11:27	954.7	0	10.2	20.5	477.6	202.7	
3/5/18	11:28	983.5	0	9.9	17.5	499.87	207.4	
3/5/18	11:29	1017.5	0	10.4	14.8	513.21	210.3	
3/5/18	11:30	1063.5	0	11.2	13.3	527.32	219.3	
3/5/18	11:31	1053.3	0	10.3	12.1	529.24	223.1	
3/5/18	11:32	957.3	0	7.8	11.2	517.23	221.1	
3/5/18	11:33	913.3	0	7.6	11.5	484.2	212.4	
3/5/18	11:34	879.2	0	6.2	12.4	458.34	202.1	
3/5/18	11:35	843.4	0	5.8	13.1	440.61	194.4	
3/5/18	11:36	830.9	0	5.2	13.9	429.91	190.7	
3/5/18	11:37	842.2	0	6.3	14.6	449.57	197.7	
3/5/18	11:38	882.2	0	7.3	15.1	451.65	199.6	
3/5/18	11:39	872.8	0	6.4	14.8	436.8	191.6	
3/5/18	11:40	838.8	0	5.8	14.6	426.87	189.1	
3/5/18	11:41	824	0	5.6	14.8	427.25	190.1	Test Start
3/5/18	11:42	824.9	0	6.1	15	449.41	203.5	
3/5/18	11:43	884.8	0	5.5	15.3	432.52	191.3	
3/5/18	11:44	871.2	0	4.6	15.2	422	184.5	
3/5/18	11:45	830.3	0	3.7	15.5	411.96	180.7	
3/5/18	11:46	815.4	0	3.7	16.1	405.69	179.1	
3/5/18	11:47	806.5	0	3.2	16.8	402.19	176.6	
3/5/18	11:48	778.5	0	3.4	17.2	394.12	173.6	
3/5/18	11:49	772.6	0	3.5	17.6	388.97	171.4	
3/5/18	11:50	776.6	0	4.2	17.7	387.52	169.5	
3/5/18	11:51	788.2	0	4.8	17.7	389.28	170.1	
3/5/18	11:52	797.9	0	5	17.3	391.85	169.7	
3/5/18	11:53	799.8	0	5.1	16.9	393.77	169.7	
3/5/18	11:54	781.3	0	4	16.6	390.29	170	
3/5/18	11:55	771.5	0	4.1	16.6	387.89	170.8	
3/5/18	11:56	774.6	0	4.2	16.9	387.21	172.4	
3/5/18	11:57	782	0	5	17	385.67	172.1	
3/5/18	11:58	797.6	0.02	5.5	16.9	385.25	171.5	
3/5/18	11:59	827.2	0.02	6.6	16.6	388.46	171.2	
3/5/18	12:00	868.8	0.03	7.2	16.1	394.34	172.9	
3/5/18	12:01	912.2	0.05	7.7	15.4	403.62	175.4	
3/5/18	12:02	928.5	0.01	7.4	14.7	411.1	177.3	
3/5/18	12:03	933.1	0	7.4	14.3	413.7	175.1	
3/5/18	12:04	926	0	7.3	14.1	412.91	177.1	
3/5/18	12:05	930.1	0.01	7.5	14	415.39	180.7	
3/5/18	12:06	937	0	7.4	13.9	418.2	181.1	
3/5/18	12:07	940.3	0	7.5	13.8	419.83	182.4	
3/5/18	12:08	949.8	0	7.9	13.8	420.8	182	
3/5/18	12:09	968.7	0.02	8.1	13.7	425.21	185.3	
3/5/18	12:10	981.9	0.03	8.2	13.6	429.65	187.1	

3/5/18	12:11	992.1	0.05	8.4	13.4	430.82	186.2
3/5/18	12:12	1005.6	0.09	8.6	13.2	432.22	182.6
3/5/18	12:13	1029.7	0.15	9	13	435.96	183.9
3/5/18	12:14	1061	0.23	9.6	12.8	443.45	184.1
3/5/18	12:15	1100.6	0.45	10.5	12.4	451.64	186.9
3/5/18	12:16	1137.3	0.88	11.5	11.9	461.44	189.2
3/5/18	12:17	1154.3	0.75	11.5	11.1	469.91	192.9
3/5/18	12:18	1152.8	0.5	11.2	10.4	473.33	196.3
3/5/18	12:19	1146.1	0.35	11	10	474.25	195.4
3/5/18	12:20	1139	0.22	10.9	9.9	474.86	193.8
3/5/18	12:21	1128.2	0.16	10.7	10	474.52	193.9
3/5/18	12:22	1124.9	0.11	10.6	10.1	475.14	192.9
3/5/18	12:23	1114.8	0.07	10.2	10.2	473.43	192.9
3/5/18	12:24	1057.3	0	8.7	10.4	465.25	193
3/5/18	12:25	998.1	0	7.6	10.8	455.49	193.2
3/5/18	12:26	946.9	0	7	11.6	444.99	192.8
3/5/18	12:27	919.1	0	6.8	12.5	434.39	192.3
3/5/18	12:28	907.6	0	6.8	13.2	426.04	190.4
3/5/18	12:29	904.5	0	7.1	13.6	419.98	188.9
3/5/18	12:30	904.4	0	7.2	13.9	417.08	187.9
3/5/18	12:31	901.2	0	7.3	13.9	416.15	185.6
3/5/18	12:32	898.6	0	7.3	13.8	413.64	184.3
3/5/18	12:33	900.7	0	7.2	13.8	411.99	182.9
3/5/18	12:34	902.7	0	7.3	13.8	410.24	182.9
3/5/18	12:35	902.8	0	7.4	13.8	409.87	180.6
3/5/18	12:36	902.3	0	7.4	13.8	410.63	180.8
3/5/18	12:37	902.8	0	7.5	13.8	410.7	182.6
3/5/18	12:38	909.9	0	7.7	13.7	409.95	182.5
3/5/18	12:39	916.2	0	7.7	13.7	410.82	180.2
3/5/18	12:40	917.7	0	7.6	13.5	411.53	179.7
3/5/18	12:41	911.1	0	7.4	13.5	411.29	179.2
3/5/18	12:42	905.3	0	7.4	13.5	410.59	178.9
3/5/18	12:43	896.2	0	7.2	13.6	409.64	178.4
3/5/18	12:44	888.5	0	7	13.7	410.12	178.4
3/5/18	12:45	878.9	0	6.9	13.8	408.62	178.2
3/5/18	12:46	869.5	0	6.7	13.9	405.79	177.2
3/5/18	12:47	859	0	6.6	14.1	403.3	178.4
3/5/18	12:48	850.5	0	6.5	14.2	401.9	177
3/5/18	12:49	843.2	0	6.4	14.4	399.49	176.2
3/5/18	12:50	838.4	0	6.3	14.5	397.63	177.3
3/5/18	12:51	832.4	0	6.4	14.6	396.09	176.3
3/5/18	12:52	831.2	0	6.4	14.7	395.95	174.8
3/5/18	12:53	830.1	0	6.4	14.7	395.19	176.2
3/5/18	12:54	829.9	0	6.4	14.7	393.72	176.1
3/5/18	12:55	829.2	0	6.3	14.7	393.19	176.4
3/5/18	12:56	827	0	5.9	14.7	392.51	176.2
3/5/18	12:57	824.9	0	5.7	14.8	391.78	176.1
3/5/18	12:58	820.3	0	5.7	15	391.31	175.7

3/5/18	12:59	809.9	0	5.6	15.2	389.34	176
3/5/18	13:00	803.6	0	5.6	15.3	387.6	174.5
3/5/18	13:01	802.5	0	5.6	15.4	387.17	173.2
3/5/18	13:02	801.8	0	5.6	15.5	386.23	171.4
3/5/18	13:03	797.4	0	5.6	15.5	383.9	172.2
3/5/18	13:04	796	0	5.5	15.5	382.81	173.5
3/5/18	13:05	791.9	0	5.3	15.5	383.28	171.8
3/5/18	13:06	781.5	0	5.1	15.6	382.82	170.9
3/5/18	13:07	773.5	0	5.1	15.8	380.98	170.8
3/5/18	13:08	766.9	0	5	15.9	378.69	169.7
3/5/18	13:09	765.7	0	5	16	377.58	171.2
3/5/18	13:10	762.1	0	5	16.1	375.95	170.3
3/5/18	13:11	759	0	5	16.2	374.73	170.9
3/5/18	13:12	757.8	0	5	16.2	372.89	170.6
3/5/18	13:13	754.6	0	5	16.2	372.26	171.4
3/5/18	13:14	747.3	0	5	16.2	370.21	170.7
3/5/18	13:15	743.5	0	5	16.2	368.63	170.5
3/5/18	13:16	741.2	0	5.1	16.2	366.91	170
3/5/18	13:17	741	0	5	16.2	365.12	167.7
3/5/18	13:18	741.9	0	5.1	16.2	364.21	166.6
3/5/18	13:19	742.7	0	5.1	16.2	363.69	166.9
3/5/18	13:20	741.6	0	5.1	16.1	363.01	166.6
3/5/18	13:21	734.8	0	5.2	16.1	361.35	166.6
3/5/18	13:22	734.2	0	5.2	16.1	361.28	167.2
3/5/18	13:23	738.6	0	5.2	16.1	361.61	165.7
3/5/18	13:24	738.6	0	5.1	16	362.08	165.7
3/5/18	13:25	738.4	0	5	16	362.6	165.4
3/5/18	13:26	741.2	0	5.1	16	362.79	163.8
3/5/18	13:27	745.2	0	4.9	16.1	364.01	165.2
3/5/18	13:28	748.9	0	4.9	16.1	364.98	164.4
3/5/18	13:29	745.3	0	4.8	16.2	364.69	165.3
3/5/18	13:30	733.7	0	4.8	16.2	362.81	166.1
3/5/18	13:31	729.3	0	4.7	16.2	361.97	166.3
3/5/18	13:32	728.2	0	4.7	16.3	361.72	165.3
3/5/18	13:33	729.3	0	4.7	16.3	361.04	164.2
3/5/18	13:34	728.2	0	4.7	16.3	360.22	164.2
3/5/18	13:35	726.1	0	4.7	16.3	359.8	164.2
3/5/18	13:36	723.1	0	4.7	16.4	359.25	164.1
3/5/18	13:37	720.4	0	4.7	16.4	357.72	164
3/5/18	13:38	715.1	0	4.8	16.4	355.63	162.4
3/5/18	13:39	713.7	0	4.7	16.4	354.41	162.5
3/5/18	13:40	715.5	0	4.7	16.4	353.8	163.4
3/5/18	13:41	714.5	0	4.7	16.4	353.57	164
3/5/18	13:42	708.8	0	4.6	16.4	352.87	162.8
3/5/18	13:43	708.4	0	4.7	16.4	352.21	162.5
3/5/18	13:44	719.6	0	4.7	16.5	354.13	163.1
3/5/18	13:45	726.1	0	4.7	16.5	355.27	164.2
3/5/18	13:46	720.2	0	4.7	16.4	354.17	164.1

3/5/18	13:47	725.3	0	4.7	16.5	356.05	163.9	
3/5/18	13:48	726.1	0	4.6	16.5	357.1	163.4	
3/5/18	13:49	726.5	0	4.6	16.5	356.68	162.8	
3/5/18	13:50	732.9	0	4.6	16.5	357.88	162.8	
3/5/18	13:51	733.4	0	4.6	16.5	358.71	162.6	
3/5/18	13:52	729.1	0	4.6	16.5	358.81	163.3	
3/5/18	13:53	708.2	0	4.6	16.6	355.16	162.3	
3/5/18	13:54	702.4	0	4.6	16.6	351.28	162.6	
3/5/18	13:55	717.7	0	4.5	16.6	352.59	162.5	
3/5/18	13:56	722.3	0	4.6	16.6	353.39	161.3	
3/5/18	13:57	724.6	0	4.5	16.6	354.83	160.9	
3/5/18	13:58	726.1	0	4.4	16.7	355.15	161.3	
3/5/18	13:59	722.1	0	4.3	16.7	354.73	160.6	
3/5/18	14:00	713.1	0	4.1	16.7	354.09	162.1	
3/5/18	14:01	709.3	0	4.1	16.9	354.11	162.7	
3/5/18	14:02	702.1	0	4.1	17	353.04	162.7	
3/5/18	14:03	690.7	0	4.2	17	349.8	160.7	
3/5/18	14:04	685.7	0	4.1	17.1	347.32	160.8	
3/5/18	14:05	682.5	0	4.1	17.1	346.2	161	
3/5/18	14:06	682.2	0	4.1	17.1	345.55	160.1	
3/5/18	14:07	682.9	0	4.1	17.1	344.26	159	
3/5/18	14:08	683.4	0	4.1	17.1	343.42	158.6	
3/5/18	14:09	686.4	0	4.1	17.1	344.57	158.4	
3/5/18	14:10	690.3	0	4.2	17.1	345.92	159.4	
3/5/18	14:11	693.2	0	4.2	17.1	346.7	159.9	
3/5/18	14:12	695.4	0	4.2	17.1	347.05	158.5	
3/5/18	14:13	696.6	0	4.2	17.1	348.05	159.8	
3/5/18	14:14	698.2	0	4.2	17.1	348.81	160.5	
3/5/18	14:15	701	0	4.3	17	349.07	158.7	
3/5/18	14:16	701	0	4.2	17	348.53	157.6	
3/5/18	14:17	697.3	0	4.3	17	347.85	158.6	
3/5/18	14:18	690.7	0	4.2	17	348.04	157.9	
3/5/18	14:19	685.1	0	4.1	17	346.7	158	Test End

General Average Report

Reporting Period: 03/05/2018 to 03/05/2018

Site Name: UNIT Time of Report: 03/06/18 14:21

Data Averaging Type: 1m Rolling Average Interval: 1

Date	Time	Stove Side fr CAT_PRE (Deg_F)	Stove Botto TEMP_10 (Deg_F)	Stove Back TEMP_11 (Deg_F)	Stove Side TEMP_12 (Deg_F)	Stove Top TEMP_13 (Deg_F)
3/5/18	9:55	61.7	62.34	61.96	63.04	61.66
3/5/18	9:56	61.5	62.48	62.22	62.86	61.55
3/5/18	9:57	61.3	62.88	62.42	62.97	61.78
3/5/18	9:58	61.3	62.7	62.07	63.3	61.88
3/5/18	9:59	61.5	62.6	61.94	63.11	61.51
3/5/18	10:00	61.5	62.62	62.11	62.87	61.47
3/5/18	10:01	61.5	62.94	62.42	62.91	61.75
3/5/18	10:02	61.3	63.13	62.17	63.27	61.71
3/5/18	10:03	61.4	62.74	61.93	63.19	61.32
3/5/18	10:04	61.4	62.67	62.08	62.92	61.68
3/5/18	10:05	61.4	62.72	62.42	62.91	62.23
3/5/18	10:06	61.6	63.1	62.28	63.24	62.12
3/5/18	10:07	61.7	62.81	61.99	63.3	61.81
3/5/18	10:08	61.6	62.56	62.01	62.98	61.82
3/5/18	10:09	61.6	62.76	62.39	62.89	62.19
3/5/18	10:10	61.5	63.07	62.34	63.12	62.17
3/5/18	10:11	61.5	62.98	62.01	63.33	61.8
3/5/18	10:12	61.7	62.72	62.01	63.03	61.79
3/5/18	10:13	61.7	62.69	62.35	62.88	62.06
3/5/18	10:14	61.2	62.64	63.14	63.19	62.34
3/5/18	10:15	61.6	63.4	63.32	63.7	62.86
3/5/18	10:16	61.8	63.06	64.36	63.71	66.83
3/5/18	10:17	61.8	62.8	66.44	63.85	77.37
3/5/18	10:18	62.3	62.87	69.55	64.75	93.19
3/5/18	10:19	63	63.34	73.38	66.01	110.11
3/5/18	10:20	64.1	63.74	77.78	67.51	123.27
3/5/18	10:21	65.4	63.78	82.57	69.26	132.32
3/5/18	10:22	66.5	63.82	86.48	71.51	138.43
3/5/18	10:23	68	64.5	89.51	74.18	146.23
3/5/18	10:24	69.9	65.73	92.63	76.23	160.07
3/5/18	10:25	71.8	66.13	96.18	78.41	178.48
3/5/18	10:26	73.5	66.47	100.98	81.39	197.5
3/5/18	10:27	75.4	67.7	105.24	84.79	216.81
3/5/18	10:28	77.1	69.01	109.6	88.35	236.82
3/5/18	10:29	79.6	69.94	114.83	91.32	257.59
3/5/18	10:30	82.5	71.08	120.11	94.76	276.58
3/5/18	10:31	84.9	72.27	125.12	98.64	290.61
3/5/18	10:32	87.4	73.95	130.21	102.42	303.85
3/5/18	10:33	89.8	75.49	135.93	105.43	312.2
3/5/18	10:34	92.5	76.44	142.14	109.06	322.14

3/5/18	10:35	94.8	77.85	146.7	112.95	331.8
3/5/18	10:36	98	79.68	149.55	117.12	338.13
3/5/18	10:37	101.3	81.73	155.78	120.65	346.54
3/5/18	10:38	104.1	83.48	161.14	123.97	354.05
3/5/18	10:39	106.6	85.04	166.45	127.81	358.68
3/5/18	10:40	108.8	86.81	171.28	132.1	369.65
3/5/18	10:41	111.2	89.26	173.38	134.17	372.74
3/5/18	10:42	114.2	91.16	176.99	136.84	378.81
3/5/18	10:43	117.8	92.75	180.42	139.79	387.72
3/5/18	10:44	120.4	94.46	179.33	143.6	396.88
3/5/18	10:45	122.9	96.81	181.42	146.21	402.31
3/5/18	10:46	125.6	99.65	185.06	148.47	403.37
3/5/18	10:47	128.9	101.43	188.36	150.84	405.24
3/5/18	10:48	131.6	103.81	188.24	154.21	407.76
3/5/18	10:49	134.1	106.77	187.82	157.16	406.9
3/5/18	10:50	137	109.87	189.26	160.3	406.28
3/5/18	10:51	139.7	112.28	191.19	162.7	404.39
3/5/18	10:52	142.7	114.82	191.81	165.39	398.05
3/5/18	10:53	145	117.62	192.42	167.61	397.21
3/5/18	10:54	147.6	120.72	196.46	168.93	397.44
3/5/18	10:55	151.3	123.93	197.15	171.65	398.02
3/5/18	10:56	153.7	126.48	194.92	174.06	398.84
3/5/18	10:57	180	129.5	193.7	184.99	404.27
3/5/18	10:58	196.7	132.58	194.79	193.11	402.65
3/5/18	10:59	201.4	136.1	197.47	195.18	401.28
3/5/18	11:00	205.2	140.79	205.39	197.45	402.3
3/5/18	11:01	208.8	144.76	208.02	199.61	396.49
3/5/18	11:02	211.9	148.81	210.59	201.28	395.07
3/5/18	11:03	215	152.09	214.87	203.37	401.19
3/5/18	11:04	218.6	155.04	218.26	205.6	400.75
3/5/18	11:05	222.1	158.32	222.93	208.73	402.69
3/5/18	11:06	225.6	162.56	225.86	210.58	401.91
3/5/18	11:07	228.2	167.54	228	212.83	399.56
3/5/18	11:08	231.2	170.3	228.62	215.87	398.61
3/5/18	11:09	234	172.39	224.37	218.39	401.39
3/5/18	11:10	236.1	175.57	229.34	220.79	402.9
3/5/18	11:11	239	179.54	232.14	223.42	409.1
3/5/18	11:12	241.7	183.73	231.83	226.2	408.82
3/5/18	11:13	244.1	188.08	236.39	229.64	417.65
3/5/18	11:14	246.7	190.42	239.11	232.26	418.47
3/5/18	11:15	248.8	192.55	234.66	234.81	420.92
3/5/18	11:16	251.1	195.72	237.52	237.15	421.22
3/5/18	11:17	253.3	199.59	243.14	240.31	414.81
3/5/18	11:18	255.3	202.64	246.65	243.82	410.09
3/5/18	11:19	256.6	205.31	243.94	245.28	404.52
3/5/18	11:20	255	199.92	231.62	242.92	396.82
3/5/18	11:21	253.4	199.11	228.27	243.27	401.79
3/5/18	11:22	255	202.5	227.33	245.28	405.67

3/5/18	11:23	256	203.36	227.02	245.93	404.83
3/5/18	11:24	257.4	206.36	231.94	246.93	403.23
3/5/18	11:25	258.9	208.1	232.64	248.39	401.82
3/5/18	11:26	260.4	209.29	234.17	249.99	392.17
3/5/18	11:27	260.7	213.17	235.55	252.71	391.87
3/5/18	11:28	260.3	213.93	233.54	254.11	398.31
3/5/18	11:29	261.6	214.05	234.02	255.57	410.72
3/5/18	11:30	264.8	219.62	241.53	259.19	424.55
3/5/18	11:31	270.1	226.53	248.87	263.96	448.98
3/5/18	11:32	274.1	230.75	252.94	266.51	462.93
3/5/18	11:33	274.1	228.11	247.34	266.74	463.87
3/5/18	11:34	272.8	227.37	242.49	267.13	467.3
3/5/18	11:35	273.8	227.61	242.47	269	467.78
3/5/18	11:36	276.1	229.68	246.38	269.43	461.13
3/5/18	11:37	278.7	230.83	250.15	271.84	456.66
3/5/18	11:38	280.7	232.82	252.93	275.06	454.69
3/5/18	11:39	282.5	232.09	251.57	277.63	453.03
3/5/18	11:40	284.4	234.24	249.74	279.26	445.66
3/5/18	11:41	286.4	237.58	253.61	280.47	443.55
3/5/18	11:42	288.2	239.94	260.63	283.74	446.28
3/5/18	11:43	289.9	235.22	254.77	284.92	441.61
3/5/18	11:44	290.8	234.94	252.79	285.7	439.19
3/5/18	11:45	293.1	238.04	254.04	287.03	435.8
3/5/18	11:46	297.9	245.55	263.49	294.14	445.67
3/5/18	11:47	302.1	249.86	262.51	298.44	449.52
3/5/18	11:48	303.5	249.13	256.89	298.45	444.64
3/5/18	11:49	299.4	244.49	246.22	294.4	427.33
3/5/18	11:50	299.6	245.67	243.36	295.77	422
3/5/18	11:51	298.7	242.97	239.25	295.33	413.87
3/5/18	11:52	298.7	241.44	236.14	293.02	405.1
3/5/18	11:53	297.6	242.22	233.58	291.71	403.98
3/5/18	11:54	296.3	245.51	231.9	292.62	403.7
3/5/18	11:55	298.1	253.53	232.73	294.87	414.9
3/5/18	11:56	299.5	256.61	232.01	295.13	416.51
3/5/18	11:57	299.6	257.98	231.6	295.03	411.79
3/5/18	11:58	298.7	259.84	230.42	294.49	409.04
3/5/18	11:59	298	261.33	228.15	294.85	411.23
3/5/18	12:00	298.1	261.72	226.7	294.9	413.72
3/5/18	12:01	297.5	262.7	226.31	293.94	412.78
3/5/18	12:02	296.9	263.93	225.23	292.89	412.31
3/5/18	12:03	295.7	265.28	222.04	292.36	417.31
3/5/18	12:04	296.2	267.01	222.82	292.38	428.73
3/5/18	12:05	295.9	267.49	221.74	291.68	431.22
3/5/18	12:06	295.6	268.75	221.59	291.5	437.01
3/5/18	12:07	295.2	269.66	220.62	291.37	439.39
3/5/18	12:08	295.6	270.28	219.97	291.26	443.53
3/5/18	12:09	296.2	271.07	220.61	290.34	449.77
3/5/18	12:10	296	272.36	220.64	289.82	455.01

3/5/18	12:11	296.5	273.52	220.42	289.83	456.97	
3/5/18	12:12	297.3	273.4	220.52	289.94	456.14	
3/5/18	12:13	297.6	273.78	222.21	289.68	465.16	
3/5/18	12:14	297.6	274.32	221.88	288.96	467.44	
3/5/18	12:15	298.3	275.56	222.29	289.01	479.04	
3/5/18	12:16	298.6	276.42	222.47	289.86	491.04	
3/5/18	12:17	300	277.45	223.9	289.54	503.51	
3/5/18	12:18	301.5	277.42	225.83	289.12	513.94	
3/5/18	12:19	302.2	278.14	227.72	289.75	527.13	
3/5/18	12:20	302.7	279.46	228.16	290.18	537.62	
3/5/18	12:21	304.2	279.95	228.65	290.25	545.18	
3/5/18	12:22	305.7	280.62	229.72	290.69	550.63	
3/5/18	12:23	307.9	281.77	231.48	291.82	552.86	
3/5/18	12:24	309.8	283.28	231.18	292.97	557.93	
3/5/18	12:25	311	283.34	233.46	294.11	554.84	
3/5/18	12:26	312.5	283.59	234.96	294.71	556.44	
3/5/18	12:27	313.9	284.03	235.8	296.24	552.65	
3/5/18	12:28	314.3	285.55	236.65	297.83	541.94	
3/5/18	12:29	316.3	286.35	237.46	299.12	534.12	
3/5/18	12:30	318.1	287.04	238.06	300.02	525.03	
3/5/18	12:31	319.4	287.55	237.57	301.35	513.42	
3/5/18	12:32	320.3	288.2	239.05	302.56	507.25	
3/5/18	12:33	321.4	289.15	239.22	303.75	501.31	
3/5/18	12:34	322.5	289.1	240.66	304.67	500.18	
3/5/18	12:35	323.4	289.62	240.98	305.07	492.38	
3/5/18	12:36	324.5	290.24	242.31	306.97	490.3	
3/5/18	12:37	326.2	291.34	242.7	308.17	490.2	
3/5/18	12:38	327.2	291.8	242.83	308.28	485.27	
3/5/18	12:39	328.6	292.31	243.65	309.49	482.05	
3/5/18	12:40	329.5	292.78	245.11	310.77	483.68	
3/5/18	12:41	330.6	293.11	245.22	312.79	486.88	333.72 Average Sur
3/5/18	12:42	331.5	293.98	244.57	313.26	486.94	
3/5/18	12:43	332.9	294.04	247.43	313.95	486.05	
3/5/18	12:44	334.4	295.14	247.36	314.04	482.41	
3/5/18	12:45	336	296.58	247.54	314.63	483.04	
3/5/18	12:46	337.5	297.65	249.19	315.84	485.5	
3/5/18	12:47	338.6	297.12	249.09	316.04	481.84	
3/5/18	12:48	339	297.7	250.53	316.85	474.41	
3/5/18	12:49	340.6	298.19	250.24	318.47	474.59	
3/5/18	12:50	340.9	298.78	249.05	318.34	471.75	
3/5/18	12:51	342.2	298.9	250.42	318.35	465.82	
3/5/18	12:52	343.2	298.69	251.52	318.9	462.28	
3/5/18	12:53	344	299.6	252	320.08	466.38	
3/5/18	12:54	345	300.58	251.92	320.69	464.32	
3/5/18	12:55	346.1	301.06	252.55	321.18	463.17	
3/5/18	12:56	346.3	301.59	251.11	321.63	462.1	
3/5/18	12:57	347.4	301.8	252.62	322.76	460.69	
3/5/18	12:58	348.3	302.07	251.96	324.01	456.63	

3/5/18	12:59	349.1	302.77	252.92	324.42	455.35
3/5/18	13:00	349.6	302.99	253.51	325.03	450.61
3/5/18	13:01	349.7	303.47	251.92	325.86	446.79
3/5/18	13:02	349.9	303.99	250.66	326.95	446.61
3/5/18	13:03	350	304.3	248.85	327.14	445.62
3/5/18	13:04	350.3	304.63	249.78	327.47	440.38
3/5/18	13:05	350.4	304.71	250.83	328	438.68
3/5/18	13:06	350.4	305.33	250.67	328.73	436.49
3/5/18	13:07	350.6	306.12	250.84	329.16	435.02
3/5/18	13:08	350.2	306.1	249.63	329.72	433.08
3/5/18	13:09	350.1	305.87	250.32	329.92	429.38
3/5/18	13:10	350.4	305.57	250	330.61	426.2
3/5/18	13:11	350.6	305.92	248.88	330.67	425.02
3/5/18	13:12	350.2	306.14	249.17	330.71	423.09
3/5/18	13:13	350.1	306.17	249.64	330.95	420.23
3/5/18	13:14	349.8	306.69	247.86	331.34	419.52
3/5/18	13:15	350.7	307.59	247.92	331.26	417.41
3/5/18	13:16	351	307.79	248.7	330.76	415
3/5/18	13:17	351.2	307.31	248.49	330.78	414.52
3/5/18	13:18	350.5	307.59	248.45	331.11	412.8
3/5/18	13:19	350.4	308.29	248.38	330.55	410.88
3/5/18	13:20	350.3	309.18	247.52	329.64	406.83
3/5/18	13:21	350.2	309.4	248.63	329.24	405.52
3/5/18	13:22	349.6	309.18	249.15	329.12	403.03
3/5/18	13:23	349.4	309.05	249.32	329.45	401.54
3/5/18	13:24	350.6	310.24	248.12	329.08	401.5
3/5/18	13:25	350.1	310.34	248.97	328.94	399.03
3/5/18	13:26	349.9	310.34	249.36	329.04	399.4
3/5/18	13:27	349.7	310.94	248.54	329.01	396.78
3/5/18	13:28	350	311.48	248.65	328.45	397.34
3/5/18	13:29	349.9	311.88	248.15	327.91	398.24
3/5/18	13:30	349.4	311.75	249.61	327.98	399.27
3/5/18	13:31	349.3	312.2	250.05	328.4	396.74
3/5/18	13:32	349.1	312.93	249.84	327.72	394.06
3/5/18	13:33	349.1	313.4	248.85	327.56	395.6
3/5/18	13:34	348.7	313.47	250.28	327.57	395.33
3/5/18	13:35	349	313.97	250.29	327.28	392.4
3/5/18	13:36	348.3	314.4	250.1	326.64	390.46
3/5/18	13:37	348.6	315.12	251.02	326.52	389.65
3/5/18	13:38	348.4	315.21	252.3	327.09	388.66
3/5/18	13:39	347.9	316.37	252	326.68	386.82
3/5/18	13:40	346.8	316.72	251.61	325.75	384.8
3/5/18	13:41	347.1	317.54	251.41	325.09	383.28
3/5/18	13:42	347.1	318.03	252.16	325.27	379.22
3/5/18	13:43	347	318.09	252.92	326.16	381.94
3/5/18	13:44	346.9	319.39	252.97	325.67	380.82
3/5/18	13:45	346.8	320.41	253.36	324.93	381.16
3/5/18	13:46	347	320.95	252.26	324.46	379.52

3/5/18	13:47	346.9	321.09	253.42	324.76	375.07		
3/5/18	13:48	346.2	321.7	252.12	324.74	376.04		
3/5/18	13:49	346.1	322.74	252.9	324.64	376.78		
3/5/18	13:50	346	323.91	254.08	323.92	373.8		
3/5/18	13:51	346.1	323.99	254.41	324.38	372.54		
3/5/18	13:52	346.2	324.39	254.58	324.7	373.03		
3/5/18	13:53	345.5	325.45	254.3	323.91	374.72		
3/5/18	13:54	345.2	326.68	255.5	323.75	373.27		
3/5/18	13:55	345.2	326.95	254.53	324.02	372.18		
3/5/18	13:56	345.1	327.15	254.69	323.96	370.21		
3/5/18	13:57	344.4	327.24	255.75	323.64	368.41		
3/5/18	13:58	343.3	328.53	255.61	323.71	369.87		
3/5/18	13:59	343.1	328.83	256.02	324.32	372.07		
3/5/18	14:00	342.9	329.06	255.27	324.19	369.6		
3/5/18	14:01	342.6	330	255.79	323.32	368.49		
3/5/18	14:02	342.3	330.69	256.71	323.08	364.95		
3/5/18	14:03	342.1	331.58	257.07	323.64	366.73		
3/5/18	14:04	342.5	331.51	257.87	324.06	365.67		
3/5/18	14:05	342.2	331.84	255.39	323.68	363.4		
3/5/18	14:06	340.8	332.89	255.8	323.88	360.66		
3/5/18	14:07	340.9	333.43	256.19	324.4	360.34		
3/5/18	14:08	339.9	333.49	254.99	323.94	359.11		
3/5/18	14:09	339.6	333.94	256.27	323.29	356.97		
3/5/18	14:10	339.2	334.57	256.31	322.67	355.64		
3/5/18	14:11	338.9	335.01	256.88	323.25	354.57		
3/5/18	14:12	338.2	335.37	256.58	323.65	352.91		
3/5/18	14:13	337.7	335.57	256.06	323.27	352.71		
3/5/18	14:14	337.2	335.88	256.86	322.61	352.86		
3/5/18	14:15	336.8	336.02	259.03	322.56	351.67		
3/5/18	14:16	335.7	337.03	258.37	322.97	350.22		
3/5/18	14:17	335.1	337.1	258.05	322.94	350.6		
3/5/18	14:18	333.5	336.67	259.28	322.67	350.01		
3/5/18	14:19	333.4	337.83	258.82	322.8	351.08	320.786	Average Sur

Test ID	CSL-00010						
Technician	BV, KO'B						
Date	3/6/18			**ISS-1 ΔH@**			
Start Time	10:15			**ISS-2 ΔH@**			
End Time	10:30						
Barometric Pressure	29.8	in Hg					
Room Temperature	64	F					
Relative Humidity	36	%					
Saturation Pressure	0.395	psia					
Actual Fan Speed for Test (Hz)	16	Hz					
PreTest Pitot		in. water					
Leak Rate (15 seconds)	0	in. water	<--Must be 0				
Static Pressure in Appliance (no DT)	0	in. water	Static Pressure in Appliance must be taken within 1 ft of top of appliance				
Static Pressure in Appliance (DT)	0	in.					
Difference	0	in. water	"Difference" mustbe less than 0.005 in WC				
Diameter of Tunnel (in)	8	in.					
Static Pressure in Dilution Tunnel (beginning	0	in. water					
Point			**Port A**		**Port B**		
	% of Diameter	**Distance (inches)**	**Δp (in water)**	**Temperature (F)**	**Δp (in water)**	**Temperature (F)**	
1	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	
2	**6.7**	**0.536**	0.03	65	0.04	65	
3	**25**	**2.0**	0.035	65	0.045	65	
Center	**50**	**4.0**	0.05	65	0.055	65	
4	**77**	**6.0**	0.055	65	0.06	65	
5	**93.3**	**7.46**	0.06	65	0.06	65	
6	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	
PostTest Pitot							
Staic Pressure (after test)	0	in. water					
Leak Rate (15 seconds)	0	in. water					

Signature_____

Quality Review_____

PRELIMINARY VELOCITY DETERMINATION

Test ID	CSL-00010
Date	3/6/18

Static Pressure (Pg)	0.000	in W.C.
Pitot Coeffiecent	0.99	unitless
Gas Molecular Weight (MW) wet	29.0	lb/lb-mole
Diameter of Tunnel	8.000	inches
Dilution Tunnel Cross Sectional Area	0.349	FT^2

			Port A				Port B			
POINT	**% of Diameter**	**Distance (inches)**	**Δp (in W.C.)**	**√Δp (in W.C.)**	**Temp (F)**	**Temp(R)**	**Δp (in water)**	**√Δp (in W.C.)**	**Temp (F)**	**Temp(R)**
1	**n/a**	**n/a**	n/a	#VALUE!	n/a	#VALUE!	n/a	#VALUE!	n/a	#VALUE!
2	**6.7**	**0.54**	0.030	0.17	65.0	525	0.040	0.20	65.0	525
3	**25.0**	**2.00**	0.035	0.19	65.0	525	0.045	0.21	65.0	525
Center	**50.0**	**4.00**	0.050	0.22	65.0	525	0.055	0.23	65.0	525
4	**77.0**	**6.00**	0.055	0.23	65.0	525	0.060	0.24	65.0	525
5	**93.3**	**7.46**	0.060	0.24	65.0	525	0.060	0.24	65.0	525
6	**n/a**	**n/a**	n/a	#VALUE!	n/a	#VALUE!	n/a	#VALUE!	n/a	#VALUE!
			AVERAGE	**0.22**	**AVERAGE**	**525**				

DILUTION TUNNEL CALCULATIONS						
Absolute Gas Temperature; Tst = Ts + 459.67°		**Tst =**	**525**	**°R**		
Absolute Gas Pressure; Ps = Pb + Pg/13.6		**Ps =**	**29.8**	**inches Hg**		
Gas Velocity; Vs = (85.49) x Cp x (avg √ΔP) x √(Tst avg/(Ps*Mw))		**Vs =**	**14.51**	**FT/sec**	**870**	**FT/min**
Gas Flow Rate; Qa = Vs x 60 x cross sectional area		**Qa =**	**304**	**ACFM**		

V_{strav} CALCULATIONS		**AVERAGE √Δp**	**0.22**	**(in W.C.)**		
Absolute Gas Temperature; Tst = Ts + 459.67°		**Tst =**	**525**	**°R**		
Absolute Gas Pressure; Ps = Pb + Pg/13.6		**Ps =**	**29.8**	**inches Hg**		
Gas Velocity; Vs = (85.49) x Cp x (avg √ΔP) x √(Tst avg/(Ps*Mw))		**Vs =**	**14.36**	**FT/sec**	**861**	**FT/min**
Gas Flow Rate; Qa = Vs x 60 x cross sectional area		**Qa =**	**301**	**ACFM**		

0.950	**Fp**

V_{scent} CALCULATIONS		**AVERAGE √Δp**	**0.23**	**(in W.C.)**		
Absolute Gas Temperature; Tst = Ts + 459.67°		**Tst =**	**525**	**°R**		
Absolute Gas Pressure; Ps = Pb + Pg/13.6		**Ps =**	**29.8**	**inches Hg**		
Gas Velocity; Vs = (85.49) x Cp x (avg √ΔP) x √(Tst avg/(Ps*Mw))		**Vs =**	**15.11**	**FT/sec**	**906**	**FT/min**
Gas Flow Rate; Qa = Vs x 60 x cross sectional area		**Qa =**	**316**	**ACFM**		

METER BOX CALCULATIONS			
Proposed Porportional Sampling Rate; PR	1.00		
Sample Probe Inside Diameter	.175	inches	
Sample Probe Cross Sectional Area	.00017	FT^2	

277	SCFM	
304	ACFM	
Pstd	14.696	psia
Pact	14.4	psia
Psat	0.395	psia
Humidity	0.36	%/100
Tact	523.67	R
Tstd	491.67	R

Signature_____

Test ID:	CSL-00010
Date:	3.6.18

Fuel Type
Preburn or Test Fuel Charge

Test Fuel Pieces Weight (lbs)	Total Spacer Weight (lbs)	Total Test Fuel Charge Weight
10.74	0.78	11.52

Average Test Fuel MC%	Test Fuel Density		Dry Basis Weight (lbs)	Charcoal Bed Loading Range (lbs)
22.61	25		8.31	2.30 to 2.88
*must be between 19-25%	**Test Fuel Loading Density must be between 25-36 lb/ft	*** Individual piece length shall closely aproximate 5/6 the dimension of the firebox length		*****Test Fuel Load Range 7lbs +/- 0.7 lbs per ft3

Piece Number	Piece Size (in):			Weight (lbs):	Moisture Content			Average MC (%)	Volume Cubic Inches	Avg. MC% x Dry Basis Weight
	Length	Width	Height		Moisture #1 (%)	Moisture #2 (%)	Moisture #3 (%)			
1								#DIV/0!	0	0.00000
2								#DIV/0!	0	0.00000
3	14.50	3.50	1.50	1.26	22.8	23.8	21.8	22.80	76.125	0.00000
4	14.50	3.50	3.50	3.38	23.7	22.9	24.7	23.77	177.625	0.00000
5	14.50	3.50	3.50	3.42	23.4	22.7	24.6	23.57	177.625	0.00000
6	14.50	3.50	1.50	1.42	21.4	23.0	20.5	21.63	76.125	0.00000
7	14.50	3.50	1.50	1.26	21.0	20.2	22.6	21.27	76.125	0.00000
8								#DIV/0!	0	0.00000
9								#DIV/0!	0	0.00000
10								#DIV/0!	0	0.00000
11								#DIV/0!	0	0.00000
12								#DIV/0!	0	0.00000
13								#DIV/0!	0	0.00000
14								#DIV/0!	0	0.00000
15								#DIV/0!	0	0.00000
16								#DIV/0!	0	0.00000
17								#DIV/0!	0	0.00000
18								#DIV/0!	0	0.00000
19								#DIV/0!	0	0.00000
20								#DIV/0!	0	0.00000
21								#DIV/0!	0	0.00000
22								#DIV/0!	0	0.00000
23								#DIV/0!	0	0.00000
24								#DIV/0!	0	0.00000
25								#DIV/0!	0	0.00000

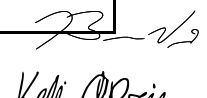
Total Test Fuel Volume (in^3):
583.625
Total Test Fuel Volume (ft^3):
0.3377

Technician Signature _____

Quality Review Kelli O'Brien

Number of Spacers	***10***
Total Spacer Weight (lbs)	***0.78***
Average Spacer Moisture (%)	***16.88***

Spacer Number	*Piece Size (in)*			*Spacer Weight (lbs)*	*Moisture Content (%)*
	Length	*Width*	*Height*		
1	5.00	1.50	0.75	0.08	16.8
2	5.00	1.50	0.75	0.08	16.4
3	5.00	1.50	0.75	0.08	16.2
4	5.00	1.50	0.75	0.08	19.6
5	5.00	1.50	0.75	0.06	12.6
6	5.00	1.50	0.75	0.06	14.7
7	5.00	1.50	0.75	0.08	20.1
8	5.00	1.50	0.75	0.08	17.4
9	5.00	1.50	0.75	0.10	23.0
10	5.00	1.50	0.75	0.08	12.0
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					
21					
22					
23					
24					
25					



Test ID:	CSL-00010
Date:	3.6.18

Fuel Type
Doug. Fir Crib
Preburn or Test Fuel Charge
Test Fuel

Test Fuel Pieces Weight (lbs)	Total Spacer Weight (lbs)	Total Test Fuel Charge Weight
11.06	0.92	11.98

Average Test Fuel MC%	Test Fuel Density		Dry Basis Weight (lbs)	Charcoal Bed Loading Range (lbs)
22.33	25		8.59	2.40 to 3.00
*must be between 19-25%	**Test Fuel Loading Density must be between 25-36 lb/ft	*** Individual piece length shall closely aproximate 5/6 the dimension of the firebox length		*****Test Fuel Load Range 7lbs +/- 0.7 lbs per ft3

Piece Number	Piece Size (in):			Weight (lbs):	Moisture Content			Average MC (%)	Volume Cubic Inches	Avg. MC% x Dry Basis Weight
	Length	Width	Height		Moisture #1 (%)	Moisture #2 (%)	Moisture #3 (%)			
1								#DIV/0!	0	0.00000
2	14.50	3.50	1.50	1.28	20.9	20.7	22.0	21.20	76.125	0.00000
3	14.50	3.50	1.50	1.32	22.9	23.9	21.3	22.70	76.125	0.00000
4	14.50	3.50	3.50	3.58	22.0	22.5	23.2	22.57	177.625	0.00000
5	14.50	3.50	3.50	3.66	23.4	23.5	22.6	23.17	177.625	0.00000
6	14.50	3.50	1.50	1.22	22.0	22.0	22.0	22.00	76.125	0.00000
7								#DIV/0!	0	0.00000
8								#DIV/0!	0	0.00000
9								#DIV/0!	0	0.00000
10								#DIV/0!	0	0.00000
11								#DIV/0!	0	0.00000
12								#DIV/0!	0	0.00000
13								#DIV/0!	0	0.00000
14								#DIV/0!	0	0.00000
15								#DIV/0!	0	0.00000
16								#DIV/0!	0	0.00000
17								#DIV/0!	0	0.00000
18								#DIV/0!	0	0.00000
19								#DIV/0!	0	0.00000
20								#DIV/0!	0	0.00000
21								#DIV/0!	0	0.00000
22								#DIV/0!	0	0.00000
23								#DIV/0!	0	0.00000
24								#DIV/0!	0	0.00000
25								#DIV/0!	0	0.00000

Total Test Fuel Volume (in^3):
583.625
Total Test Fuel Volume (ft^3):
0.3377

Technician Signature _____

Quality Review Kelli O'Brien

Number of Spacers	***10***
Total Spacer Weight (lbs)	***0.92***
Average Spacer Moisture (%)	***15.90***

Spacer Number	*Piece Size (in)*			*Spacer Weight (lbs)*	*Moisture Content (%)*
	Length	*Width*	*Height*		
1	5.00	1.50	0.75	0.10	20.2
2	5.00	1.50	0.75	0.10	11.5
3	5.00	1.50	0.75	0.10	17.9
4	5.00	1.50	0.75	0.10	14.3
5	5.00	1.50	0.75	0.08	17.0
6	5.00	1.50	0.75	0.10	13.2
7	5.00	1.50	0.75	0.08	15.1
8	5.00	1.50	0.75	0.10	16.6
9	5.00	1.50	0.75	0.08	14.2
10	5.00	1.50	0.75	0.08	19.0
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					
21					
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Kelli O'Brien

ClearStak

Manufacturer:	MF Fire	**Technicians:**	Kelli O'Brien
Model:	Nova		
Date:	03/06/18		Brian Vinal
Run:	2		
Control #:	CSL-000110		
Test Duration:	163		
Output Category:	N/A		

Test Results in Accordance with CSA B415.1-10

	HHV Basis	LHV Basis
Overall Efficiency	67.2%	72.6%
Combustion Efficiency	99.5%	99.5%
Heat Transfer Efficiency	68%	73.0%

Output Rate (kJ/h)	20,725	19,660	**(Btu/h)**
Burn Rate (kg/h)	1.56	3.43	**(lb/h)**
Input (kJ/h)	30,837	29,252	**(Btu/h)**

Test Load Weight (dry kg)	4.23	9.32	**dry lb**
MC wet (%)	22.33		
MC dry (%)	28.75		
Particulate (g)	11.52		
CO (g)	4		
Test Duration (h)	2.72		

Emissions	Particulate	CO
g/MJ Output	0.20	0.07
g/kg Dry Fuel	2.72	0.87
g/h	4.24	1.35
lb/MM Btu Output	0.48	0.15

Air/Fuel Ratio (A/F)	19.55

VERSION: **2.4** **4/15/10**

Method 28 Data Collection	
Date	3/6/18
Operator	BV, KO'B
Test Type	Method 28R
Run #	2
Wood Heater Information	
Manufacturer/ Model	MF Fire, Nova
Test ID	CSL-00010
Volume of water in Appliance (gal)	n/a
Weight of Appliance (empty) (lbs)	303.2
Volume of water in Storage (gal)	n/a
Weight of Storage Tank(s) (empty) (lbs)	n/a
Primary Air Setting (Hz)	n/a single burnrate stove
Secondary Air Setting (Hz)	n/a single burnrate stove
Thermostat Setting (F)	n/a
Fuel Type	Doug Fir crib wood

Velocity Traverse	
Static Pressure (in WC)	0
Vstrav (ACFM)	301
Vscent (ACFM)	316
Pre-Test Conditions	
Desired Flow Rate (load Side) (GPM)	n/a
Pre-test destratification volume pumped (need 2x) (gal)	n/a
Pre-test temperature difference (post destratification) (F)	n/a
Test facility temp at test start (F)	70
Room air velocity (FPM)	5,9,12
Ambient relative humidity (%)	34
Ambient barometric pressure (in Hg)	29.8
Adjustments to pre-test fuel	See Kelvin
Coal-bed weight prior to test start (lbs)	2.5

Post-Test Conditions	
Time of TFS_{avg} (hh:mm) (leave blank if Cat III or IV)	n/a
room air velocity immediately following run (FPM)	8,12,8
test facility temperature after run (F)	73
ambient relative humidity after run (%)	30
ambient barometric pressure after run (in Hg)	29.75
Weight of unburnt fuel (lbs)	n/a

Note** When inputting data from the logger, the start time of the input must coincide with the start time of the test.

Signature_____

Ambient

Test ID	CSL-00010
Date	3/6/18
Start Time (hh:mm:ss)	11:49
End Time (hh:mm:ss)	14:32
Y (DGM calibration factor)	1.00243
Pre test leak (*A* cfm @ *B* in Hg)	0.00 @20 in. WC
Post test leak (*A* cfm @ *B* in Hg)	0.00 @ 20 in. WC

Filter Assemblies		
A	FH #	FH-01, FF-18
	Front Filter #	G-18-0009
	Back Filter #	n/a
B	FH #	
	Front Filter #	
	Back Filter #	

*Pre and Post leak checkes should be 60 seconds in duration

Duration (hh:mm:ss)	DGM (m^3)	ΔH (in H_2O)	Flow (l/min)	ΔP (in H_2O)
0:00:00	91.2246	4.0	2.0	0.060
0:10:00	91.2452	3.5	2.0	0.060
0:20:00	91.2676	3.5	2.0	0.060
0:30:00	91.2892	3.5	2.0	0.060
0:40:00	91.3109	3.5	2.0	0.060
0:50:00	91.3324	3.5	2.0	0.060
1:00:00	91.3538	3.5	2.0	0.060
1:10:00	91.3686	3.5	2.0	0.060
1:20:00	91.3900	3.5	2.0	0.065
1:30:00	91.4114	3.5	2.0	0.060
1:40:00	91.4328	3.5	2.0	0.060
1:50:00	91.4544	3.5	2.0	0.060
2:00:00	91.4758	3.5	2.0	0.055
2:10:00	91.4978	3.5	2.0	0.050
2:20:00	91.5196	3.5	2.0	0.050
2:30:00	91.5408	3.5	2.0	0.055
2:40:00	91.5624	3.5	2.0	0.060
2:44:54	91.5730			
3:00:00				
3:10:00				
3:20:00				
3:30:00				
3:40:00				
3:50:00				
4:00:00				

Signature_____

Quality Review_____

ISS-1

Test ID	CSL-00010
Date	3/6/18
Start Time (hh:mm:ss)	11:49:00
End Time (hh:mm:ss)	14:32:00
Y (DGM calibration factor)	1.004
Pre test leak (*A* cfm @ *B* in Hg)	0.00 @ 15 in. Hg
Post test leak (*A* cfm @ *B* in Hg)	0.00 @ 5 in Hg

Filter Assemblies		
A	FH #	FH-02, FH-04, FF-20
	Front Filter #	G-18-0010
	Back Filter #	G-18-0011
B	FH #	
	Front Filter #	
	Back Filter #	

*Pre and Post leak checkes should be 60 seconds in duration

PM Sampling Flow may be 0.15-.25 cfm

Duration (hh:mm:ss)	DGM (ft^3)	ΔH (in H_2O)	Module In Temp (°F)	Module Out Temp (°F)	Vacuum (in Hg)
0:00:00	408.940	0.15	66	67	0.0
0:10:00	411.352	0.15	66	66	1.0
0:20:00	413.838	0.15	67	66	1.0
0:30:00	416.350	0.15	68	67	1.0
0:40:00	418.885	0.15	70	68	1.0
0:50:00	421.372	0.15	71	68	1.0
1:00:00	423.855	0.15	72	69	1.0
1:10:00	425.845	0.15	72	70	1.0
1:20:00	428.178	0.15	72	70	1.0
1:30:00	430.700	0.15	72	71	1.0
1:40:00	433.210	0.15	73	71	1.0
1:50:00	435.735	0.15	73	71	1.0
2:00:00	438.248	0.15	73	72	1.0
2:10:00	440.850	0.15	73	72	1.0
2:20:00	443.405	0.15	74	71	1.0
2:30:00	445.848	0.15	73	72	1.0
2:40:00	448.346	0.15	74	72	1.0
2:44:54	449.578				
3:00:00					
3:10:00					
3:20:00					
3:30:00					
3:40:00					
3:50:00					
4:00:00					

Signature_____

Quality Review_____

ISS-2

	Filter Change 1	Filter Change 2	Filter Change 3
Weight (lbs)			
Elapsed Time Paused (hh:mm:ss)			
Elapsed Time Resume (hh:mm:ss)			
Actual Time Pause (hh:mm:ss)	11:49:00	11:49:00	11:49:00
Actual Time Resume (hh:mm:ss)	11:49:00	11:49:00	11:49:00

Test ID	CSL-00010
Date	3/6/18
Start Time (hh:mm:ss)	11:49
End Time (hh:mm:ss)	14:32
Y (DGM calibration factor)	1.0032
Pre test leak (*A* cfm @ *B* in Hg)	0.00 @ 15 in. Hg
Post test leak (*A* cfm @ *B* in Hg)	0.00 @ 5 in. Hg

*Pre and Post leak checkes should be 60 seconds in duration

PM Sampling Flow may be 0.15-.25 cfm

Filter Assemblies		
A	FH #	FH-07,FH-6, FF-3
	Front Filter #	G-18-0012
	Back Filter #	G-18-0013
B	FH #	FH-09, FH-08, FF-21
	Front Filter #	G-18-0014
	Back Filter #	G-18-0015
C	FH #	
	Front Filter #	
	Back Filter #	

Duration (hh:mm:ss)	DGM (ft^3)	ΔH (in H_2O)	Module In Temp (°F)	Module Out Temp (°F)	Vacuum (in Hg)
0:00:00	715.535	0.15	70	70	3.0
0:10:00	717.998	0.15	70	69	2.0
0:20:00	720.428	0.15	70	70	2.0
0:30:00	722.865	0.15	71	70	2.0
0:40:00	725.349	0.15	72	71	2.0
0:50:00	727.767	0.15	73	71	2.0
1:00:00	730.102	0.15	73	72	2.0
1:10:00	732.024	0.15	74	72	2.0
1:20:00	734.378	0.15	74	73	2.0
1:30:00	736.785	0.15	74	73	2.0
1:40:00	739.238	0.15	74	73	2.0
1:50:00	741.795	0.15	75	74	2.0
2:00:00	744.175	0.15	75	74	2.0
2:10:00	746.695	0.15	75	74	2.5
2:20:00	749.173	0.15	75	74	2.5
2:30:00	751.549	0.15	75	74	2.0
2:40:00	753.897	0.15	75	74	2.0
2:44:54	755.033				
3:00:00					
3:10:00					

Signature_____

Quality Review_____

Test ID:	CSL-00010	
Date:	3/6/18	

	ISS#/AS#	Filter/FH ID #	Pre-Weight Avg (g)	Post Weight Avg (g)	Total Catch (g)	Total Catch (mg)
Ambient	AS-1	G-18-0009	0.1122	0.1122	**0.0000**	0.000
	AS-1	FF-18	63.9361	63.9362	**0.0001**	0.100
ISS 1	ISS-1	G-18-0010	0.1122	0.1203	**0.0081**	8.100
	ISS-1	G-18-0011	0.1167	0.1180	**0.0013**	1.300
	ISS-1	FF-20	63.9669	63.9668	**-0.0001**	0.000
ISS 2A	ISS-2	G-18-0012	0.1120	0.1200	**0.0080**	8.000
	ISS-2	G-18-0013	0.1130	0.1141	**0.0011**	1.100
	ISS-2	FF-03	64.2317	64.2314	**-0.0003**	0.000
ISS 2B	ISS-2	G-18-0014	0.1173	0.1179	**0.0006**	0.600
	ISS-2	G-18-0015	0.1114	0.1115	**0.0000**	0.050
	ISS-2	FF-21	63.9452	63.9453	**0.0001**	0.100
n/a	ISS-2				**0.0000**	0.000
	ISS-2				**0.0000**	0.000
	ISS-2				**0.0000**	0.000

Signature_____

Test ID:	CSL-00010
Date:	3/6/18

ISS-1

Test Duration (hh:mm:ss)	T_t	V_{mr}	v_t	T_m	T_d	V_m	v_d	T_t	T_{mr}	PR
0:00:00										
0:10:00	10	0.068	11.48212	292.2	315.7889	0.068	11.93432	315.6449	292.1778	96.25475
0:20:00	20	0.070	11.48303	292.2	315.9833	0.139	11.90142	313.9066	292.1778	98.60584
0:30:00	30	0.071	11.48621	292.4	316.3722	0.210	11.88685	313.1389	292.5944	99.21665
0:40:00	40	0.072	11.49139	292.7	316.65	0.282	11.88074	312.8167	293.2889	99.61048
0:50:00	50	0.070	11.49576	292.9	316.65	0.352	11.88	312.7778	293.8444	97.66304
1:00:00	60	0.070	11.50043	293.1	316.7611	0.422	11.88017	312.7866	294.2611	97.53896
1:10:00	70	0.056	11.50461	293.3	316.5389	0.479	11.8809	312.8253	294.6778	80.36805
1:20:00	80	0.066	11.56102	293.5	316.6222	0.545	12.12583	312.8222	294.8167	93.19954
1:30:00	90	0.071	11.55887	293.7	316.2056	0.616	12.12564	312.8124	294.9556	100.0687
1:40:00	100	0.071	11.55761	293.8	315.8722	0.687	11.87978	312.7661	295.2333	101.1234
1:50:00	110	0.072	11.55655	293.9	315.8167	0.759	11.87769	312.6565	295.3722	101.3792
2:00:00	120	0.071	11.51922	294.1	315.7889	0.830	11.6259	312.5648	295.5111	102.498
2:10:00	130	0.074	11.45264	294.2	315.15	0.904	11.10727	312.471	295.65	109.6901
2:20:00	140	0.072	11.39459	294.3	314.7611	0.976	10.83744	312.3472	295.65	109.4557
2:30:00	150	0.069	11.37397	294.4	314.7056	1.045	11.10119	312.129	295.65	102.1211
2:40:00	160	0.071	11.38468	294.5	320.3722	1.116	11.61422	311.9367	295.7889	101.6505
2:44:54	165	0.035	#VALUE!	Error	320.3722	1.151	11.86299	311.8831	Error	#VALUE!
3:00:00	180	Error	#VALUE!	Error	320.3722	Error	#DIV/0!	311.8831	Error	#VALUE!
3:10:00	190	Error	#VALUE!	Error	320.3722	Error	#DIV/0!	311.8831	Error	#VALUE!
3:20:00	200	Error	#VALUE!	Error	320.3722	Error	#DIV/0!	311.8831	Error	#VALUE!
3:30:00	210	Error	#VALUE!	Error	320.3722	Error	#DIV/0!	311.8831	Error	#VALUE!
3:40:00	220	Error	#VALUE!	Error	320.3722	Error	#DIV/0!	311.8831	Error	#VALUE!
3:50:00	230	Error	#VALUE!	Error	320.3722	Error	#DIV/0!	311.8831	Error	#VALUE!
4:00:00	240	Error	#VALUE!	Error	320.3722	Error	#DIV/0!	311.8831	Error	#VALUE!
4:10:00	250	Error	#VALUE!	Error	320.3722	Error	#DIV/0!	311.8831	Error	#VALUE!
4:20:00	260	Error	#VALUE!	Error	320.3722	Error	#DIV/0!	311.8831	Error	#VALUE!
4:30:00	270	Error	#VALUE!	Error	320.3722	Error	#DIV/0!	311.8831	Error	#VALUE!
4:40:00	280	Error	#VALUE!	Error	320.3722	Error	#DIV/0!	311.8831	Error	#VALUE!
4:50:00	290	Error	#VALUE!	Error	320.3722	Error	#DIV/0!	311.8831	Error	#VALUE!
5:00:00	300	Error	#VALUE!	Error	320.3722	Error	#DIV/0!	311.8831	Error	#VALUE!
5:10:00	310	Error	#VALUE!	Error	320.3722	Error	#DIV/0!	311.8831	Error	#VALUE!
5:20:00	320	Error	#VALUE!	Error	320.3722	Error	#DIV/0!	311.8831	Error	#VALUE!
5:30:00	330	Error	#VALUE!	Error	320.3722	Error	#DIV/0!	311.8831	Error	#VALUE!
5:40:00	340	Error	#VALUE!	Error	320.3722	Error	#DIV/0!	311.8831	Error	#VALUE!
5:50:00	350	Error	#VALUE!	Error	320.3722	Error	#DIV/0!	311.8831	Error	#VALUE!
6:00:00	360	Error	#VALUE!	Error	320.3722	Error	#DIV/0!	311.8831	Error	#VALUE!
6:10:00	370	Error	#VALUE!	Error	320.3722	Error	#DIV/0!	311.8831	Error	#VALUE!
6:20:00	380	Error	#VALUE!	Error	320.3722	Error	#DIV/0!	311.8831	Error	#VALUE!
6:30:00	390	Error	#VALUE!	Error	320.3722	Error	#DIV/0!	311.8831	Error	#VALUE!
6:40:00	400	Error	#VALUE!	Error	320.3722	Error	#DIV/0!	311.8831	Error	#VALUE!
6:50:00	410	Error	#VALUE!	Error	320.3722	Error	#DIV/0!	311.8831	Error	#VALUE!
7:00:00	420	Error	#VALUE!	Error	320.3722	Error	#DIV/0!	311.8831	Error	#VALUE!
7:10:00	430	Error	#VALUE!	Error	320.3722	Error	#DIV/0!	311.8831	Error	#VALUE!
7:20:00	440	Error	#VALUE!	Error	320.3722	Error	#DIV/0!	311.8831	Error	#VALUE!
7:30:00	450	Error	#VALUE!	Error	320.3722	Error	#DIV/0!	311.8831	Error	#VALUE!
7:40:00	460	Error	#VALUE!	Error	320.3722	Error	#DIV/0!	311.8831	Error	#VALUE!
7:50:00	470	Error	#VALUE!	Error	320.3722	Error	#DIV/0!	311.8831	Error	#VALUE!
8:00:00	480	Error	#VALUE!	Error	320.3722	Error	#DIV/0!	311.8831	Error	#VALUE!
8:10:00	490	Error	#VALUE!	Error	320.3722	Error	#DIV/0!	311.8831	Error	#VALUE!
8:20:00	500	Error	#VALUE!	Error	320.3722	Error	#DIV/0!	311.8831	Error	#VALUE!
8:30:00	510	Error	#VALUE!	Error	320.3722	Error	#DIV/0!	311.8831	Error	#VALUE!
8:40:00	520	Error	#VALUE!	Error	320.3722	Error	#DIV/0!	311.8831	Error	#VALUE!
8:50:00	530	Error	#VALUE!	Error	320.3722	Error	#DIV/0!	311.8831	Error	#VALUE!
9:00:00	540	Error	#VALUE!	Error	320.3722	Error	#DIV/0!	311.8831	Error	#VALUE!
9:10:00	550	Error	#VALUE!	Error	320.3722	Error	#DIV/0!	311.8831	Error	#VALUE!
9:20:00	560	Error	#VALUE!	Error	320.3722	Error	#DIV/0!	311.8831	Error	#VALUE!
9:30:00	570	Error	#VALUE!	Error	320.3722	Error	#DIV/0!	311.8831	Error	#VALUE!
9:40:00	580	Error	#VALUE!	Error	320.3722	Error	#DIV/0!	311.8831	Error	#VALUE!
9:50:00	590	Error	#VALUE!	Error	320.3722	Error	#DIV/0!	311.8831	Error	#VALUE!
10:00:00	600	Error	#VALUE!	Error	320.3722	Error	#DIV/0!	311.8831	Error	#VALUE!
10:10:00	610	Error	#VALUE!	Error	320.3722	Error	#DIV/0!	311.8831	Error	#VALUE!
10:20:00	620	Error	#VALUE!	Error	320.3722	Error	#DIV/0!	311.8831	Error	#VALUE!
10:30:00	630	Error	#VALUE!	Error	320.3722	Error	#DIV/0!	311.8831	Error	#VALUE!
10:40:00	640	Error	#VALUE!	Error	320.3722	Error	#DIV/0!	311.8831	Error	#VALUE!
10:50:00	650	Error	#VALUE!	Error	320.3722	Error	#DIV/0!	311.8831	Error	#VALUE!
11:00:00	660	Error	#VALUE!	Error	320.3722	Error	#DIV/0!	311.8831	Error	#VALUE!
11:10:00	670	Error	#VALUE!	Error	320.3722	Error	#DIV/0!	311.8831	Error	#VALUE!
11:20:00	680	Error	#VALUE!	Error	320.3722	Error	#DIV/0!	311.8831	Error	#VALUE!
11:30:00	690	Error	#VALUE!	Error	320.3722	Error	#DIV/0!	311.8831	Error	#VALUE!
11:40:00	700	Error	#VALUE!	Error	320.3722	Error	#DIV/0!	311.8831	Error	#VALUE!
11:50:00	710	Error	#VALUE!	Error	320.3722	Error	#DIV/0!	311.8831	Error	#VALUE!
12:00:00	720	Error	#VALUE!	Error	0	Error	#DIV/0!	311.8831	Error	#VALUE!

ISS-2

Test Duration (hh:mm:ss)	T_t	V_{mr}	v_t	T_m	T_d	V_m	v_d	T_t	T_{mr}	PR
0:00:00										
0:10:00	10	0.069744	11.48212	294.1222	316.7889	0.069744	11.93432	315.6449	294.1222	96.55956
0:20:00	20	0.06881	11.48303	294.1222	315.7889	0.138554	11.90142	313.9066	294.1222	96.40847
0:30:00	30	0.069008	11.48621	294.4	315.9833	0.207562	11.88685	313.1389	294.4	97.25453
0:40:00	40	0.070339	11.49139	294.8167	316.3722	0.277902	11.88074	312.8167	294.8167	99.03833
0:50:00	50	0.06847	11.49576	295.2333	316.65	0.346372	11.88	312.7778	295.2333	96.82635
1:00:00	60	0.06612	11.50043	295.5111	316.65	0.412492	11.88017	312.7866	295.5111	94.25205
1:10:00	70	0.054425	11.50461	295.7889	316.7611	0.466916	11.8809	312.8253	295.7889	80.00364
1:20:00	80	0.066658	11.56102	296.0667	316.5389	0.533574	12.12583	312.8222	296.0667	96.41853
1:30:00	90	0.068159	11.55887	296.2056	316.6222	0.601733	12.12564	312.8124	296.2056	98.3621
1:40:00	100	0.069461	11.55761	296.2056	316.2056	0.671194	11.87978	312.7661	296.2056	101.7897
1:50:00	110	0.072406	11.55655	296.4833	315.8722	0.7436	11.87769	312.6565	296.4833	105.2856
2:00:00	120	0.067394	11.51922	296.7611	315.8167	0.810994	11.6259	312.5648	296.7611	99.8335
2:10:00	130	0.071358	11.45264	296.7611	315.7889	0.882353	11.10727	312.471	296.7611	109.5549
2:20:00	140	0.070169	11.39459	296.7611	315.15	0.952522	10.83744	312.3472	296.7611	109.4084
2:30:00	150	0.067281	11.37397	296.7611	314.7611	1.019803	11.10119	312.129	296.7611	102.2482
2:40:00	160	0.066488	11.38468	296.7611	314.7056	1.086291	11.61422	311.9367	296.7611	96.84689
2:44:54	165	0.032168	#VALUE!	Error	320.3722	1.118459	11.86299	311.8831	Error	#VALUE!
3:00:00	180	Error	#VALUE!	Error	320.3722	Error	#DIV/0!	311.8831	Error	#VALUE!
3:10:00	190	Error	#VALUE!	Error	320.3722	Error	#DIV/0!	311.8831	Error	#VALUE!
3:20:00	200	Error	#VALUE!	Error	320.3722	Error	#DIV/0!	311.8831	Error	#VALUE!
3:30:00	210	Error	#VALUE!	Error	320.3722	Error	#DIV/0!	311.8831	Error	#VALUE!
3:40:00	220	Error	#VALUE!	Error	320.3722	Error	#DIV/0!	311.8831	Error	#VALUE!
3:50:00	230	Error	#VALUE!	Error	320.3722	Error	#DIV/0!	311.8831	Error	#VALUE!
4:00:00	240	Error	#VALUE!	Error	320.3722	Error	#DIV/0!	311.8831	Error	#VALUE!
4:10:00	250	Error	#VALUE!	Error	320.3722	Error	#DIV/0!	311.8831	Error	#VALUE!
4:20:00	260	Error	#VALUE!	Error	320.3722	Error	#DIV/0!	311.8831	Error	#VALUE!
4:30:00	270	Error	#VALUE!	Error	320.3722	Error	#DIV/0!	311.8831	Error	#VALUE!
4:40:00	280	Error	#VALUE!	Error	320.3722	Error	#DIV/0!	311.8831	Error	#VALUE!
4:50:00	290	Error	#VALUE!	Error	320.3722	Error	#DIV/0!	311.8831	Error	#VALUE!
5:00:00	300	Error	#VALUE!	Error	320.3722	Error	#DIV/0!	311.8831	Error	#VALUE!
5:10:00	310	Error	#VALUE!	Error	320.3722	Error	#DIV/0!	311.8831	Error	#VALUE!
5:20:00	320	Error	#VALUE!	Error	320.3722	Error	#DIV/0!	311.8831	Error	#VALUE!
5:30:00	330	Error	#VALUE!	Error	320.3722	Error	#DIV/0!	311.8831	Error	#VALUE!
5:40:00	340	Error	#VALUE!	Error	320.3722	Error	#DIV/0!	311.8831	Error	#VALUE!
5:50:00	350	Error	#VALUE!	Error	320.3722	Error	#DIV/0!	311.8831	Error	#VALUE!
6:00:00	360	Error	#VALUE!	Error	320.3722	Error	#DIV/0!	311.8831	Error	#VALUE!
6:10:00	370	Error	#VALUE!	Error	320.3722	Error	#DIV/0!	311.8831	Error	#VALUE!
6:20:00	380	Error	#VALUE!	Error	320.3722	Error	#DIV/0!	311.8831	Error	#VALUE!
6:30:00	390	Error	#VALUE!	Error	320.3722	Error	#DIV/0!	311.8831	Error	#VALUE!
6:40:00	400	Error	#VALUE!	Error	320.3722	Error	#DIV/0!	311.8831	Error	#VALUE!
6:50:00	410	Error	#VALUE!	Error	320.3722	Error	#DIV/0!	311.8831	Error	#VALUE!
7:00:00	420	Error	#VALUE!	Error	320.3722	Error	#DIV/0!	311.8831	Error	#VALUE!
7:10:00	430	Error	#VALUE!	Error	320.3722	Error	#DIV/0!	311.8831	Error	#VALUE!
7:20:00	440	Error	#VALUE!	Error	320.3722	Error	#DIV/0!	311.8831	Error	#VALUE!
7:30:00	450	Error	#VALUE!	Error	320.3722	Error	#DIV/0!	311.8831	Error	#VALUE!
7:40:00	460	Error	#VALUE!	Error	320.3722	Error	#DIV/0!	311.8831	Error	#VALUE!
7:50:00	470	Error	#VALUE!	Error	320.3722	Error	#DIV/0!	311.8831	Error	#VALUE!
8:00:00	480	Error	#VALUE!	Error	320.3722	Error	#DIV/0!	311.8831	Error	#VALUE!
8:10:00	490	Error	#VALUE!	Error	320.3722	Error	#DIV/0!	311.8831	Error	#VALUE!
8:20:00	500	Error	#VALUE!	Error	320.3722	Error	#DIV/0!	311.8831	Error	#VALUE!
8:30:00	510	Error	#VALUE!	Error	320.3722	Error	#DIV/0!	311.8831	Error	#VALUE!
8:40:00	520	Error	#VALUE!	Error	320.3722	Error	#DIV/0!	311.8831	Error	#VALUE!
8:50:00	530	Error	#VALUE!	Error	320.3722	Error	#DIV/0!	311.8831	Error	#VALUE!
9:00:00	540	Error	#VALUE!	Error	320.3722	Error	#DIV/0!	311.8831	Error	#VALUE!
9:10:00	550	Error	#VALUE!	Error	320.3722	Error	#DIV/0!	311.8831	Error	#VALUE!
9:20:00	560	Error	#VALUE!	Error	320.3722	Error	#DIV/0!	311.8831	Error	#VALUE!
9:30:00	570	Error	#VALUE!	Error	320.3722	Error	#DIV/0!	311.8831	Error	#VALUE!
9:40:00	580	Error	#VALUE!	Error	320.3722	Error	#DIV/0!	311.8831	Error	#VALUE!
9:50:00	590	Error	#VALUE!	Error	320.3722	Error	#DIV/0!	311.8831	Error	#VALUE!
10:00:00	600	Error	#VALUE!	Error	320.3722	Error	#DIV/0!	311.8831	Error	#VALUE!
10:10:00	610	Error	#VALUE!	Error	320.3722	Error	#DIV/0!	311.8831	Error	#VALUE!
10:20:00	620	Error	#VALUE!	Error	320.3722	Error	#DIV/0!	311.8831	Error	#VALUE!
10:30:00	630	Error	#VALUE!	Error	320.3722	Error	#DIV/0!	311.8831	Error	#VALUE!
10:40:00	640	Error	#VALUE!	Error	320.3722	Error	#DIV/0!	311.8831	Error	#VALUE!
10:50:00	650	Error	#VALUE!	Error	320.3722	Error	#DIV/0!	311.8831	Error	#VALUE!
11:00:00	660	Error	#VALUE!	Error	320.3722	Error	#DIV/0!	311.8831	Error	#VALUE!
11:10:00	670	Error	#VALUE!	Error	320.3722	Error	#DIV/0!	311.8831	Error	#VALUE!
11:20:00	680	Error	#VALUE!	Error	320.3722	Error	#DIV/0!	311.8831	Error	#VALUE!
11:30:00	690	Error	#VALUE!	Error	320.3722	Error	#DIV/0!	311.8831	Error	#VALUE!
11:40:00	700	Error	#VALUE!	Error	320.3722	Error	#DIV/0!	311.8831	Error	#VALUE!
11:50:00	710	Error	#VALUE!	Error	320.3722	Error	#DIV/0!	311.8831	Error	#VALUE!
12:00:00	720	Error	#VALUE!	Error	320.3722	Error	#DIV/0!	311.8831	Error	#VALUE!

T_t	total sampling time	min
V_{mr}	volume of dry gas sample as measured by dry gas meter during each 10 minute interval, *i* , of the test run	dry m^3
v_t	average gas velocity in the dilution tunnel (gas molecular weight may be assumed to be 29g/gmol	m/s
T_m	absolute average dry gas meter temperature	K
T_d	absolute average gas temperature in the dilution tunnel during each 10 min interval, *i* , of test run	K
V_m	volume of gas sample as measured by dry gas meter	dry m^3
v_d	average gas velocity in the dilution tunnel during each 10 min interval, *i*, of the test run	m/s
T_t	absolute average gas temperature in the dilution tunnel	K
T_{mr}	absolute average dry gas meter temperature during each 10 min interval, *i* , of the test run	K
PR	proportional rate variation for each 10 minute interval	%

Signature_____

Quality Review_____

Test ID	CSL-00010
Date	3/6/18

Module 1			
Variable	**Description**	**Value**	**Units**
	final volume module 1	449.578	cubic feet
	initial volume module 1	408.940	cubic feet
V_{m1}	total gas volume collected (module 1)	40.638	cubic feet
Average ΔH	average delta H over entirety of run	0.15	in water
T_m	average gas meter temperature	70	°F
P_{bar}	barometric pressure	29.8	in Hg
Y	DGM calibration factor	1.004	unitless
K_1	volume corrected to standard conditions	17.64	R/(in Hg)
V_{mstd}	volume gas sampled (corrected to standard conditions)	40.4749538	dscf
Total Catch	total catch (raw data)	9.4	mg
C_s	concentration of PM in tunnel gas (dry basis, corrected to standard conditions	0.00023224	g/dscf

Module 2			
Variable	**Description**	**Value**	**Units**
	final volume module 2	755.033	cubic feet
	initial volume module 2	715.535	cubic feet
V_{m2}	total gas volume collected (module 2)	39.498	cubic feet
Average ΔH	average delta H over entirety of run	0.15	in water
T_m	average gas meter temperature	73	°F
P_{bar}	barometric pressure	29.8	in Hg
Y	DGM calibration factor	1.003	unitless
K_1	volume corrected to standard conditions	17.64	°F/(in Hg)
V_{mstd}	volume gas sampled (corrected to standard conditions)	39.13774663	dscf
Total Catch	total catch (raw data)	9.85	mg
C_s	concentration of PM in tunnel gas (dry basis, corrected to standard conditions	0.000251675	g/dscf

Ambient			
Variable	**Description**	**Value**	**Units**
	final volume ambient	91.5730	cubic meters
	initial volume ambient	91.2246	cubic meters
V_{mb}	total gas volume collected (ambient)	12.3036	cubic feet
Average ΔH	average delta H over entirety of run	3.53	in water
T_m	average gas meter temperature	69.6	°F
P_{bar}	barometric pressure	29.8	in Hg
Y	DGM calibration factor	1.002	unitless
K_1	volume corrected to standard conditions	17.64	°F/(in Hg)
V_{mbstd}	volume gas sampled (corrected to standard conditions)	12.35637281	dscf
Total Catch	total catch (raw data)	0.1	mg
C_s	concentration of PM in tunnel gas (dry basis, corrected to standard conditions	8.09299E-06	g/dscf

Total Particulate Matter (based on ISS-2 and AS-1 data)			
C_s	concentration of PM in tunnel gas (dry basis, corrected to standard conditions	0.00024196	g/dscf
C_a	concentration of PM in tunnel gas (dry basis, corrected to standard conditions	8.093E-06	g/dscf
Q_{std}	average gas flow rate through dilution tunnel	302.182338	dscf/min
B_{ws}	water vapor in gas stream (assumed) (proportion by volume)	0.02	unitless
v_s	average velocity of gas through dilution tunnel	15.7196192	ft/s
A	cross-sectional area of dilution tunnel	0.349	square ft
T_s	average gas temperature in dilution tunnel	561.389512	R
T_{std}	absolute average gas temperature in dilution tunnel	528	R
P_s	average gas static pressure in dilution tunnel	29.8	in Hg
P_{std}	standard absolute pressure	29.92	in Hg
F_p	adjustment factor for center of tunnel pitot tube placement	0.95	unitless
V_{craw}	average gas velocity after multi point pitot traverse	301	ACFM
V_{cavrt}	average gas velocity at center of dilution tunnel calculated after pitot tube traverse	316	ACFM
K_p	pitot tube constant	85.49	ft/sec)[(lb/lb-mole)/(in Hg)](460+ water)]^(1/2)
C_p	pitot tube coefficient	0.99	unitless
ΔP_{avg}	average velocity pressure in dilution tunnel	0.05852941	in H_2O
M_s	dilution tunnel dry gas MW (assumed)	29	lb/(lb-mol)
Θ	total sampling time	163.00	min
E_T	total particulate emissions	11.5192287	g

Signature_____

Test ID:	CSL-00010
Date:	3/6/18

Q_{in}	Btu	#DIV/0!	
$Q_{in\ LHV}$		#DIV/0!	
$Q_{inCorrected}$	Btu	#DIV/0!	
Q_{Out}	Btu	#VALUE!	(3 sig figs)
Heat Output Rate	Btu/hr	#VALUE!	(3 sig figs)
Load Draw	Btu/hr	0	
$E_{g/MJ}$	g/MJ	#VALUE!	
$E_{lb/MMBtu}$	lb/MMBtu	#VALUE!	
$E_{g/kg}$	g/kg	#REF!	
$E_{g/hr}$	g/hr	4.240206889	
Θ_1	min	0.00	
Θ_2	min	0.00	
Θ_3	min	163.00	
Θ_4	hours	0	
Θ	hours	2.72	
η_{del}	%	#VALUE!	
$\eta_{del\ LHV}$	%	#VALUE!	

E_1	g	#DIV/0!
E_2	g	#DIV/0!
E_3	g	-0.17914
$E_{1\_g/kg}$	g/kg	#DIV/0!
$E_{2\_g/kg}$	g/kg	#DIV/0!
$E_{3\_g/kg}$	g/kg	#N/A
ET	g	11.51922872

Run #		2
Wood Weight	lbs	0.00
Wood Moisture	%DB	#DIV/0!
Min H_2O Temp (T2)	°F	#N/A

CO_{-1}	Startup CO emission (g)	#N/A
CO_{-2}	Steady State CO emission (g)	#N/A
CO_{-3}	End CO emission (g)	#N/A
COT	Total CO emission (g)	#N/A

Signature_____

Plant Name: CLST Page: 1

General Average Report

Reporting Period: 03/06/2018 to 03/06/2018

Site Name: SAMPLE Time of Report: 03/06/18 14:51

Data Averaging Type: 1m Rolling Average Interval: 1

Date	Time	Z (none)	COND2OUT (Deg_F)	DIL_CO2 (%)	DILRATIO (RATIO)	FILT1OUT (Deg_F)	FILT2OUT (Deg_F)	ROOM_TMP (Deg_F)	TUNL_TMP (Deg_F)	UNIT_WT (lbs)	
3/6/18	10:30	1	63.3		0.112	65.1	65.5	64.5	67.9	1.55	Preburn
3/6/18	10:31	1	63.4		-0.324	65.1	65.6	64.5	67	1.41	
3/6/18	10:32	1	63.3		0.255	65	65.5	64.8	71.8	1.44	
3/6/18	10:33	1	63.5		1.598	65.2	65.6	64.8	77.2	1.27	
3/6/18	10:34	1	63.4		2.241	65.2	65.7	64.7	83.6	1.07	
3/6/18	10:35	1	63.5		2.764	65.2	65.7	64.8	85.4	0.9	
3/6/18	10:36	1	63.5		2.981	65.3	65.7	65	88	0.72	
3/6/18	10:37	1	63.6		3.257	65.3	65.9	64.9	86	0.61	
3/6/18	10:38	1	63.4		3.188	65.3	65.9	65.3	85.9	0.85	
3/6/18	10:39	1	63.6		3.209	65.4	66	65.1	86.8	11.01	
3/6/18	10:40	1	63.8		3.437	65.5	66.2	65.2	84.8	11.96	
3/6/18	10:41	1	63.9		3.306	65.5	66.2	65.3	84.5	11.94	
3/6/18	10:42	1	63.9		3.262	65.5	66.3	65.3	85.5	11.89	
3/6/18	10:43	1	64		3.077	65.7	66.5	65.3	89.3	11.81	
3/6/18	10:44	1	64.1		3.163	65.6	66.4	65.5	90.3	11.74	
3/6/18	10:45	1	64		3.215	65.6	66.4	65.7	90.6	11.65	
3/6/18	10:46	1	64.1		3.008	65.7	66.5	65.6	96.2	11.42	
3/6/18	10:47	1	64.1		2.991	65.9	66.7	65.5	101.4	11.19	
3/6/18	10:48	1	64.2		3.089	66	66.9	65.5	103.8	11.02	
3/6/18	10:49	1	64.2		3.185	66.1	66.8	65.6	102.9	10.78	
3/6/18	10:50	1	64.2		3.15	66.1	67	65.6	102.4	10.52	
3/6/18	10:51	1	64.2		2.964	66.2	67.1	65.8	105.1	10.48	
3/6/18	10:52	1	64.4		2.925	66.3	67.3	65.9	108.5	10.33	
3/6/18	10:53	1	64.6		2.927	66.4	67.4	65.9	111.9	10.11	
3/6/18	10:54	1	64.6		2.901	66.5	67.5	65.8	115.2	9.87	
3/6/18	10:55	1	64.6		2.956	66.6	67.5	66	116.4	9.6	
3/6/18	10:56	1	64.7		3.021	66.5	67.4	66.1	116.2	9.59	
3/6/18	10:57	1	65.1		3.085	66.9	67.8	66	113.9	8.95	
3/6/18	10:58	1	65		3.069	67	67.8	66.4	113.8	8.79	
3/6/18	10:59	1	64.9		3.06	67.2	68.1	66.3	112.9	8.63	
3/6/18	11:00	1	65.2		3.018	67.2	68	66.6	113.6	8.45	
3/6/18	11:01	1	65.1		2.937	67.2	68.1	66.6	114.1	8.33	
3/6/18	11:02	1	65.3		2.989	67.4	68.2	66.8	114.7	8.22	
3/6/18	11:03	1	65.4		3.023	67.5	68.4	66.9	115	8.11	
3/6/18	11:04	1	65.6		3.06	67.6	68.4	66.7	114.7	7.92	
3/6/18	11:05	1	65.7		3.036	67.6	68.5	66.8	115.7	8.01	
3/6/18	11:06	1	65.8		2.98	67.7	68.7	67.1	116.6	7.51	
3/6/18	11:07	1	65.3		2.782	67.9	68.8	67	119.6	7.4	
3/6/18	11:08	1	65.8		2.843	68	68.8	67.2	119	7.25	
3/6/18	11:09	1	66		2.849	68.1	69	67.5	123.1	7.02	
3/6/18	11:10	1	66.1		2.986	68.3	69.2	67.6	123.3	6.75	
3/6/18	11:11	1	66		2.964	68.2	69.1	67.7	122.8	6.46	
3/6/18	11:12	1	66.3		2.86	68.5	69.4	67.6	123.7	6.16	
3/6/18	11:13	1	66.4		2.847	68.5	69.3	67.7	123.7	5.99	
3/6/18	11:14	1	66.3		2.855	68.7	69.5	67.9	123.8	5.82	
3/6/18	11:15	1	66.6		2.791	68.8	69.6	67.9	125.2	5.66	
3/6/18	11:16	1	66.5		2.81	68.9	69.6	67.8	124.6	5.71	
3/6/18	11:17	1	66.6		2.884	69	69.7	68	122.5	5.49	
3/6/18	11:18	1	66.7		2.908	69.1	69.8	68.1	123.6	5.35	
3/6/18	11:19	1	66.8		2.902	69.3	69.9	68.4	123.8	5.13	
3/6/18	11:20	1	67		2.912	69.3	69.9	68.2	122.6	4.97	
3/6/18	11:21	1	67		2.853	69.4	70	68.2	123.9	6.52	
3/6/18	11:22	1	67.3		2.876	69.7	70.3	68.5	123.8	6.46	
3/6/18	11:23	1	67.2		3.027	69.8	70.3	68.5	120.1	3.19	
3/6/18	11:24	1	67.3		2.89	69.8	70.4	68.8	122.2	4.75	
3/6/18	11:25	1	67.5		2.817	70	70.5	68.2	122.2	4.87	
3/6/18	11:26	1	67.5		2.851	69.9	70.4	67.5	124.3	4.58	
3/6/18	11:27	1	67.6		2.851	69.9	70.4	67.7	125.9	4.32	
3/6/18	11:28	1	67.6		2.79	69.8	70.3	67.8	127.6	4.04	
3/6/18	11:29	1	67.7		2.836	69.9	70.2	67.6	125.7	3.96	
3/6/18	11:30	1	67.7		2.906	69.9	70.2	67.2	120.5	4.13	
3/6/18	11:31	1	67.9		2.89	70	70.3	67.7	122.6	3.46	
3/6/18	11:32	1	67.8		2.803	69.8	70.1	67.7	121.7	3.18	

3/6/18	11:33	1	68	2.798	69.6	69.8	67.8	121.6	3.05	
3/6/18	11:34	1	67.6	2.782	69.9	70.1	67.7	124.1	3.27	
3/6/18	11:35	1	67.7	2.788	69.8	70.1	68.1	127.9	3.83	
3/6/18	11:36	1	67.9	2.72	69.8	70.1	68	130.5	4.98	
3/6/18	11:37	1	67.6	2.785	69.9	70.3	68.2	128.1	4.51	
3/6/18	11:38	1	67.7	2.809	70	70.3	68	124.9	4.64	
3/6/18	11:39	1	67.7	2.76	69.9	70.3	67.7	123.6	4.06	
3/6/18	11:40	1	67.6	2.789	69.9	70.2	67.9	122.1	3.89	
3/6/18	11:41	1	67.4	2.834	69.8	70.2	67.8	121.8	4.03	
3/6/18	11:42	1	67.5	2.884	69.8	70.2	67.9	119.9	3.46	
3/6/18	11:43	1	67.6	2.872	69.8	70.2	67.5	119.6	3.29	
3/6/18	11:44	1	67.7	2.813	69.8	70.2	67.7	120.9	3.2	
3/6/18	11:45	1	67.6	2.868	69.6	70.1	67.7	119.3	3	
3/6/18	11:46	1	67.5	3.011	69.6	70.1	67.8	114.8	2.86	
3/6/18	11:47	1	67	2.988	69.6	70.5	67.7	113.2	2.89	Test Start
3/6/18	11:48	1	66.4	2.791	70.4	73.5	67.8	121.6	8.31	Fuel consumed, 2.5 lb coal bed
3/6/18	11:49	1	65.7	3.042	71.6	77.3	68	117	14.5	12
3/6/18	11:50	1	65.3	3.073	72.4	78.5	68	112	14.4	11.9
3/6/18	11:51	1	64.9	2.996	73.2	79.4	67.8	110.4	14.31	11.81
3/6/18	11:52	1	64.8	3.002	73.9	79.9	67.9	109.1	14.19	11.69
3/6/18	11:53	1	64.6	2.977	74.5	80.5	68.2	108.4	14.07	11.57
3/6/18	11:54	1	64.4	2.906	74.9	80.8	67.8	107.6	13.97	11.47
3/6/18	11:55	1	64.4	2.935	75.5	81.3	68	107.1	13.87	11.37
3/6/18	11:56	1	64.5	2.917	75.9	81.4	68.4	106.9	13.76	11.26
3/6/18	11:57	1	64.4	2.919	76.1	81.6	67.8	106.1	13.7	11.2
3/6/18	11:58	1	64.2	3.013	76.5	81.7	67.3	104.7	13.62	11.12
3/6/18	11:59	1	64.1	3.013	76.6	81.8	67.2	104.1	13.53	11.03
3/6/18	12:00	1	63.7	3.011	76.6	81.8	67.8	103.7	13.43	10.93
3/6/18	12:01	1	63.5	2.992	76.9	82	67.9	103.1	13.35	10.85
3/6/18	12:02	1	63.2	2.936	77	82	68	103.1	13.27	10.77
3/6/18	12:03	1	62.7	2.966	77.2	82.1	68	102	13.2	10.7
3/6/18	12:04	1	62.2	2.939	77.3	82.1	68	101.9	13.11	10.61
3/6/18	12:05	1	61.8	2.9	77.2	82	67.6	101.9	13.06	10.56
3/6/18	12:06	1	61.5	3.024	77.3	81.9	67.5	100.6	12.98	10.48
3/6/18	12:07	1	61	3.075	77.5	82.1	67.9	100.8	12.89	10.39
3/6/18	12:08	1	60.5	2.968	77.5	82	67.6	101.6	12.8	10.3
3/6/18	12:09	1	60.2	3.047	77.4	82	67.9	100.5	12.72	10.22
3/6/18	12:10	1	59.9	3.054	77.4	81.8	68.1	100.4	12.64	10.14
3/6/18	12:11	1	59.5	3.066	77.4	82	68.1	100.1	12.59	10.09
3/6/18	12:12	1	59.2	3.02	77.5	81.9	67.7	100.1	12.52	10.02
3/6/18	12:13	1	59	2.998	77.5	82	67.9	100.8	12.37	9.87
3/6/18	12:14	1	58.7	3.031	77.4	82	68	100.8	12.26	9.76
3/6/18	12:15	1	58.6	3.068	77.4	81.9	67.8	100.8	12.16	9.66
3/6/18	12:16	1	58.3	3.026	77.4	81.9	67.6	101.2	12.09	9.59
3/6/18	12:17	1	58.1	3.026	77.4	81.9	67.9	101.4	11.99	9.49
3/6/18	12:18	1	57.8	3.006	77.5	82	67.7	101.2	11.85	9.35
3/6/18	12:19	1	57.9	3.033	77.6	82.1	68	101.4	11.75	9.25
3/6/18	12:20	1	57.4	3.077	77.4	82	68.2	101.8	11.65	9.15
3/6/18	12:21	1	57.2	3.162	77.5	82.1	67.7	100.4	11.58	9.08
3/6/18	12:22	1	57	3.101	77.5	82.1	68	101	11.45	8.95
3/6/18	12:23	1	56.9	3.053	77.5	82	67.8	101.4	11.33	8.83
3/6/18	12:24	1	56.7	3.036	77.5	82.2	67.8	101.9	11.19	8.69
3/6/18	12:25	1	56.6	3.044	77.6	82.3	67.7	102.1	11.1	8.6
3/6/18	12:26	1	56.5	3.118	77.7	82.4	68.1	102	10.93	8.43
3/6/18	12:27	1	56.3	3.111	77.8	82.7	68.6	102.9	10.84	8.34
3/6/18	12:28	1	56.5	3.084	77.7	82.7	68.2	102.5	10.73	8.23
3/6/18	12:29	1	56.1	3.04	77.7	82.6	68.1	102.6	10.61	8.11
3/6/18	12:30	1	56.1	3.14	77.7	82.7	68.3	102.8	10.45	7.95
3/6/18	12:31	1	56	3.076	77.7	82.7	68.3	102.8	10.29	7.79
3/6/18	12:32	1	55.9	3.035	77.7	82.7	68.4	103.3	10.18	7.68
3/6/18	12:33	1	56.2	3.026	77.9	83	67.8	102.8	10.11	7.61
3/6/18	12:34	1	56	3.038	77.9	82.8	67.9	102.4	9.99	7.49
3/6/18	12:35	1	55.9	3.093	78.1	83.1	68.2	103	9.87	7.37
3/6/18	12:36	1	55.9	3.088	78.2	83.1	68.2	103.2	9.76	7.26
3/6/18	12:37	1	55.8	3.044	78.3	83.1	68	103.2	9.64	7.14
3/6/18	12:38	1	55.8	2.899	78.3	83.2	67.5	103.6	9.53	7.03
3/6/18	12:39	1	55.7	2.972	78.3	83.2	68.1	103.1	9.43	6.93
3/6/18	12:40	1	55.6	3.053	78.2	83.1	68.2	103	9.33	6.83
3/6/18	12:41	1	55.7	3.062	78.3	83	68.4	103.3	9.21	6.71
3/6/18	12:42	1	55.7	3.016	78.4	83.2	68.2	103.3	9.14	6.64
3/6/18	12:43	1	55.5	3.035	78.5	83.1	68.5	103	9.06	6.56

3/6/18	12:44	1	55.4	3.012	78.4	83.2	68.5	103.6	8.96	6.46
3/6/18	12:45	1	55.4	3.081	78.4	83.2	68.2	103.3	8.85	6.35
3/6/18	12:46	1	55.4	3.052	78.5	83.3	68.4	103.6	8.73	6.23
3/6/18	12:47	1	56.2	3.063	78	81.2	68.4	103.8	8.59	6.09
3/6/18	12:48	1	57.6	3.006	77.4	153.3	68.3	104	8.44	5.94
3/6/18	12:49	1	58.6	3.054	77.4	76.1	68.7	103.6	8.34	5.84
3/6/18	12:50	1	57.9	3.02	77.4	76	68.8	103.7	8.24	5.74
3/6/18	12:51	1	56.9	3.002	77.5	77.8	68.6	103.8	8.14	5.64
3/6/18	12:52	1	56.4	3.012	77.3	78.3	68.4	103.6	8.05	5.55
3/6/18	12:53	1	56	2.998	77.5	79.1	68.6	103.8	7.96	5.46
3/6/18	12:54	1	55.6	3.002	77.5	79.6	68.7	104	7.86	5.36
3/6/18	12:55	1	55.6	3.03	77.6	80	68.7	103.7	7.74	5.24
3/6/18	12:56	1	55.4	2.987	77.7	80.4	68.6	104.1	7.61	5.11
3/6/18	12:57	1	55.4	3.007	77.8	80.6	68.8	103.7	7.5	5
3/6/18	12:58	1	55.6	2.971	78.1	81.2	68.9	104	7.36	4.86
3/6/18	12:59	1	55.6	2.942	78.2	81.4	68.5	104	7.26	4.76
3/6/18	13:00	1	55.3	2.967	78.3	81.6	69	104	7.16	4.66
3/6/18	13:01	1	55.3	2.984	78.4	81.8	69.2	104	7.04	4.54
3/6/18	13:02	1	55.4	3.03	78.5	81.9	69.3	103.2	6.94	4.44
3/6/18	13:03	1	55.5	3.017	78.5	82	69.4	103.1	6.85	4.35
3/6/18	13:04	1	55.5	3.047	78.6	82.4	69.2	103.2	6.76	4.26
3/6/18	13:05	1	55.4	3.118	78.6	82.4	69.4	103.1	6.67	4.17
3/6/18	13:06	1	55.5	3.101	78.7	82.6	69.3	103.2	6.6	4.1
3/6/18	13:07	1	55.5	3.049	78.7	82.6	69.4	103.4	6.5	4
3/6/18	13:08	1	55.5	3.021	78.8	82.8	69.4	103.3	6.41	3.91
3/6/18	13:09	1	55.5	3.096	78.7	82.8	69.5	103.2	6.34	3.84
3/6/18	13:10	1	55.5	3.079	78.7	82.8	69.5	103.3	6.25	3.75
3/6/18	13:11	1	55.5	3.019	78.8	83	69.3	103.3	6.17	3.67
3/6/18	13:12	1	55.4	3.068	78.8	83	69.5	103.2	6.11	3.61
3/6/18	13:13	1	55.5	3.033	78.9	83.1	69.2	103.4	6.03	3.53
3/6/18	13:14	1	55.6	3.057	78.9	83.1	68.9	103.3	5.93	3.43
3/6/18	13:15	1	55.2	3.086	79	83.3	69.1	103.1	5.85	3.35
3/6/18	13:16	1	55.6	3.079	79	83.2	69.3	102.8	5.76	3.26
3/6/18	13:17	1	55.7	3.05	78.9	83.3	69	103.2	5.68	3.18
3/6/18	13:18	1	55.5	3.028	79	83.3	69.2	103.4	5.62	3.12
3/6/18	13:19	1	55.5	2.991	79	83.4	69.6	103.5	5.56	3.06
3/6/18	13:20	1	55.4	3.055	79	83.4	69.5	103.1	5.5	3
3/6/18	13:21	1	55.5	3.089	79	83.4	69.8	103	5.39	2.89
3/6/18	13:22	1	55.4	3.056	78.9	83.5	69.6	102.6	5.31	2.81
3/6/18	13:23	1	55.3	3.133	78.8	83.3	69.9	102.4	5.25	2.75
3/6/18	13:24	1	55.5	3.108	78.9	83.4	69.5	102.4	5.17	2.67
3/6/18	13:25	1	55.4	3.124	78.8	83.2	69.7	102.3	5.11	2.61
3/6/18	13:26	1	55.6	3.166	78.8	83.2	69.7	102.3	5.05	2.55
3/6/18	13:27	1	55.4	3.185	78.9	83.2	69.7	102.1	4.99	2.49
3/6/18	13:28	1	55.6	3.112	78.8	83.3	69.7	102	4.92	2.42
3/6/18	13:29	1	55.7	3.13	78.8	83.2	69.6	101.8	4.88	2.38
3/6/18	13:30	1	55.7	3.093	78.7	83.1	69.6	101.9	4.82	2.32
3/6/18	13:31	1	55.7	3.198	78.7	83.1	69.6	101.2	4.73	2.23
3/6/18	13:32	1	55.7	3.206	78.7	83.1	69.2	100.5	4.67	2.17
3/6/18	13:33	1	55.6	3.137	78.6	83	69.3	101.8	4.62	2.12
3/6/18	13:34	1	56	3.144	78.7	83.2	69.3	102.1	4.55	2.05
3/6/18	13:35	1	55.6	3.14	78.7	83	69.1	101.2	4.51	2.01
3/6/18	13:36	1	55.7	3.146	78.6	82.8	69.3	101.3	4.43	1.93
3/6/18	13:37	1	55.6	3.154	78.6	82.8	69.2	101.1	4.38	1.88
3/6/18	13:38	1	55.8	3.219	78.6	82.8	69.6	100.8	4.32	1.82
3/6/18	13:39	1	55.7	3.27	78.6	82.9	70.1	100.8	4.25	1.75
3/6/18	13:40	1	55.7	3.217	78.5	82.7	69.5	101.1	4.2	1.7
3/6/18	13:41	1	55.6	3.247	78.5	82.7	69.7	100.8	4.13	1.63
3/6/18	13:42	1	55.7	3.227	78.6	82.9	69.5	101	4.07	1.57
3/6/18	13:43	1	55.6	3.16	78.5	82.8	69.5	101	4.03	1.53
3/6/18	13:44	1	55.7	3.19	78.4	82.6	70.3	101.1	3.97	1.47
3/6/18	13:45	1	55.7	3.189	78.4	82.6	70	100.8	3.91	1.41
3/6/18	13:46	1	55.7	3.235	78.6	82.8	70.4	100.9	3.84	1.34
3/6/18	13:47	1	55.8	3.235	78.6	82.7	70.5	100.9	3.78	1.28
3/6/18	13:48	1	55.6	3.225	78.3	82.5	70.6	100.6	3.73	1.23
3/6/18	13:49	1	55.5	3.208	78.2	82.4	70.8	100.7	3.67	1.17
3/6/18	13:50	1	55.7	3.181	78.3	82.5	71	101.1	3.62	1.12
3/6/18	13:51	1	55.8	3.204	78.4	82.7	71	101.2	3.55	1.05
3/6/18	13:52	1	55.8	3.214	78.5	82.9	70.8	101.4	3.51	1.01
3/6/18	13:53	1	55.7	3.267	78.5	83	70.9	101.1	3.48	0.98
3/6/18	13:54	1	55.6	3.174	78.5	82.9	70.8	101.3	3.47	0.97

3/6/18	13:55	1	55.6	3.189	78.6	82.9	70.7	101	3.42	0.92	
3/6/18	13:56	1	55.7	3.228	78.7	82.9	70.9	100.8	3.37	0.87	
3/6/18	13:57	1	55.7	3.233	78.7	82.9	70.4	100.7	3.33	0.83	
3/6/18	13:58	1	55.6	3.205	78.6	83	70	100.5	3.3	0.8	
3/6/18	13:59	1	55.5	3.198	78.6	82.8	70.3	100.5	3.27	0.77	
3/6/18	14:00	1	55.6	3.233	78.4	82.7	70.2	100.1	3.25	0.75	
3/6/18	14:01	1	55.6	3.222	78.4	82.6	70.3	100	3.21	0.71	
3/6/18	14:02	1	55.6	3.238	78.3	82.5	70.7	99.7	3.19	0.69	
3/6/18	14:03	1	55.6	3.248	78.2	82.4	70.5	99.6	3.14	0.64	
3/6/18	14:04	1	55.4	3.236	78.4	82.5	70.1	99.6	3.12	0.62	
3/6/18	14:05	1	55.4	3.212	78.4	82.4	70.1	99.4	3.1	0.6	
3/6/18	14:06	1	55.2	3.253	78.4	82.4	70.4	98.9	3.08	0.58	
3/6/18	14:07	1	55.3	3.331	78	82.1	70.4	98.3	3.06	0.56	
3/6/18	14:08	1	55.4	3.254	78.1	82.3	70	98.2	3.06	0.56	
3/6/18	14:09	1	55.2	3.29	78	82	70.2	97.8	3.04	0.54	
3/6/18	14:10	1	55.4	3.277	77.9	81.9	69.9	97.6	3.01	0.51	
3/6/18	14:11	1	55.4	3.41	77.8	81.7	70.7	96.9	2.97	0.47	
3/6/18	14:12	1	55.4	3.251	77.7	81.7	69.8	97	2.96	0.46	
3/6/18	14:13	1	55.2	3.259	77.7	81.6	69.3	97	2.94	0.44	
3/6/18	14:14	1	55.4	3.308	77.6	81.4	69.7	97.1	2.93	0.43	
3/6/18	14:15	1	55.3	3.292	77.5	81.3	70	97.4	2.92	0.42	
3/6/18	14:16	1	55.4	3.355	77.7	81.3	70	97.5	2.88	0.38	
3/6/18	14:17	1	55.3	3.382	77.7	81.5	70.2	96.8	2.88	0.38	
3/6/18	14:18	1	55.3	3.324	77.7	81.5	70.3	96.9	2.84	0.34	
3/6/18	14:19	1	55.5	3.297	77.6	81.3	70.3	96.8	2.82	0.32	
3/6/18	14:20	1	55.5	3.242	77.6	81.4	70.2	97	2.81	0.31	
3/6/18	14:21	1	55.6	3.322	77.7	81.6	69.8	96.3	2.78	0.28	
3/6/18	14:22	1	55.6	3.369	77.6	81.4	70	95.9	2.77	0.27	
3/6/18	14:23	1	55.7	3.305	77.7	81.5	70	96.5	2.72	0.22	
3/6/18	14:24	1	55.6	3.293	77.6	81.2	70.1	96.7	2.71	0.21	
3/6/18	14:25	1	55.5	3.349	77.6	81.4	69.9	96.4	2.71	0.21	
3/6/18	14:26	1	55.6	3.355	77.6	81.4	70.2	96.8	2.68	0.18	
3/6/18	14:27	1	55.6	3.346	77.7	81.4	70.1	96.5	2.66	0.16	
3/6/18	14:28	1	55.5	3.255	77.6	81.3	70	97.2	2.63	0.13	
3/6/18	14:29	1	55.6	3.285	77.6	81.3	69.9	96.6	2.61	0.11	
3/6/18	14:30	1	55.6	3.262	77.6	81.3	70.1	96.7	2.59	0.09	
3/6/18	14:31	1	55.5	3.295	77.6	81.2	69.9	96.4	2.55	0.05	
3/6/18	14:32	1	56.8	3.253	77	79.2	69.6	96.5	2.54	0.04	Test End

Plant Name: CLST Page: 1

General Average Report

Reporting Period: 03/06/2018 to 03/06/2018

Site Name: UNIT Time of Report: 03/06/18 14:52

Data Averaging Type: 1m Rolling Average Interval: 1

Date	Time	CAT_POST (Deg_F)	CO (%)	CO2 (%)	O2 (%)	STK_CSA (Deg_F)	STK_TMP (Deg_F)	
3/6/18	10:30	64.8	-0.04	0	22.1	65.01	64.6	Preburn
3/6/18	10:31	67.9	-0.04	0	22.1	64.81	64.6	
3/6/18	10:32	116.5	-0.04	0.2	22.1	75.93	66.8	
3/6/18	10:33	318.2	-0.04	0	22.1	134.02	85.2	
3/6/18	10:34	477.4	-0.04	0	22	200.77	106.8	
3/6/18	10:35	534.1	-0.04	0	22	241.64	121.4	
3/6/18	10:36	546.7	-0.04	1.5	22	266.97	133.2	
3/6/18	10:37	522.9	0.01	3.9	22	266.59	133.2	
3/6/18	10:38	511.6	0.07	3.6	20.8	263.26	130.9	
3/6/18	10:39	426.2	0.07	1.8	19.5	253.31	134.2	
3/6/18	10:40	311.6	0.12	1.2	19	223.55	132	
3/6/18	10:41	292.5	0.13	1.6	19.4	210.5	128.8	
3/6/18	10:42	377.1	0.09	1.9	19.8	220.69	130.9	
3/6/18	10:43	517.6	0.18	3.8	20	254.88	139	
3/6/18	10:44	488.9	0.1	2.2	19.5	259.74	143.9	
3/6/18	10:45	493.4	0.09	2.5	19	262.56	145.9	
3/6/18	10:46	706.8	0.15	5.9	19.1	310.61	157.4	
3/6/18	10:47	840	0.06	6.5	18.6	364.98	172.6	
3/6/18	10:48	914	0.01	7.4	17.2	401.2	183.5	
3/6/18	10:49	806	0.01	7.2	16	396.17	184.2	
3/6/18	10:50	717.8	0.05	4	15	375.44	181.3	
3/6/18	10:51	720.9	0.08	3.9	15	373.24	182.1	
3/6/18	10:52	836	0.07	3.8	16	400	190.4	
3/6/18	10:53	927.1	0.05	5	16.6	435.57	200.5	
3/6/18	10:54	916.9	0.02	6.5	16.8	453.77	208.9	
3/6/18	10:55	884.5	-0.01	6.7	16.3	461.25	214.9	
3/6/18	10:56	871.6	-0.02	6.5	15.6	462.12	217.5	
3/6/18	10:57	891.9	-0.02	6.5	15.2	455.62	213.8	
3/6/18	10:58	866.6	-0.03	6.3	15	447.75	211.7	
3/6/18	10:59	843.3	-0.02	5.3	14.8	442.22	209	
3/6/18	11:00	832.2	-0.02	5.1	15	439.55	208.3	
3/6/18	11:01	833.3	-0.02	5.1	15.4	438.66	205.9	
3/6/18	11:02	837.5	-0.02	5.2	15.7	439.73	209.8	
3/6/18	11:03	844.8	-0.02	5.3	15.9	441.64	212	
3/6/18	11:04	849.7	-0.02	5.6	16	445.54	213.4	
3/6/18	11:05	854.3	-0.03	5.6	15.9	449.16	215.3	
3/6/18	11:06	853.6	-0.03	5.8	15.8	449.88	214.5	
3/6/18	11:07	863.8	-0.03	5.9	15.7	450.64	213.2	
3/6/18	11:08	873.2	-0.04	6	15.5	454.03	214.2	
3/6/18	11:09	888.2	-0.04	6.1	15.4	464.47	225.9	

3/6/18	11:10	1007.4	-0.04	8.2	15.3	481.97	233.9	
3/6/18	11:11	1053.8	-0.02	9.1	15	492.94	231	
3/6/18	11:12	978	-0.07	0.1	13.8	491.1	227.8	
3/6/18	11:13	953.1	-0.07	0.1	14.6	487.79	226.9	
3/6/18	11:14	943.4	-0.07	0	17.5	485.33	227.5	
3/6/18	11:15	927.8	-0.08	0	19.4	482.15	227.9	
3/6/18	11:16	894.9	-0.05	5.7	20.5	476.9	227.3	
3/6/18	11:17	867.7	-0.05	6	20.4	464.7	225	
3/6/18	11:18	882.3	-0.04	7.6	18.3	466.61	229.5	
3/6/18	11:19	899	-0.04	6.1	16.9	470.42	229	
3/6/18	11:20	847.2	-0.04	5.1	15.6	463.9	226.5	
3/6/18	11:21	800	-0.03	4.3	15.5	456.95	226.8	
3/6/18	11:22	812.1	-0.01	4.5	15.8	452.12	227.5	
3/6/18	11:23	839.7	-0.06	5.1	16.3	445.9	224.4	
3/6/18	11:24	776.7	-0.04	3.3	16.4	438.67	223.1	
3/6/18	11:25	688.2	-0.02	2.3	16.5	425.8	220.3	
3/6/18	11:26	718.1	-0.02	4.9	17.4	429.01	229.2	
3/6/18	11:27	849	-0.08	7.4	17.9	453.15	233.4	
3/6/18	11:28	909.6	-0.07	7.9	16.9	475.28	234.5	
3/6/18	11:29	929.8	-0.07	8.3	15.5	480.29	232	
3/6/18	11:30	933	-0.07	6.8	14.5	468.52	221.9	
3/6/18	11:31	939.5	-0.07	8.4	13.9	473.01	226.3	
3/6/18	11:32	955.4	-0.09	8.1	14.1	471.72	219	
3/6/18	11:33	941.6	-0.09	7.9	13.6	471.4	218.3	
3/6/18	11:34	944.8	-0.09	7.8	13.4	477	224.5	
3/6/18	11:35	901.5	-0.09	6.7	13.3	480.66	234.8	
3/6/18	11:36	828.7	-0.08	4.4	13.6	480.93	238.1	
3/6/18	11:37	824.9	-0.08	5.8	14.2	472.54	234.9	
3/6/18	11:38	948.6	-0.05	9.2	15.2	474.53	227.8	
3/6/18	11:39	997.5	-0.02	10	14.7	478.97	221.9	
3/6/18	11:40	1031	-0.07	10.2	13.4	484.56	219.2	
3/6/18	11:41	1059.2	-0.06	10.2	12.5	490.7	220.6	
3/6/18	11:42	1045.2	-0.06	9.1	11.9	486.95	217.9	
3/6/18	11:43	1038.2	-0.06	8.9	11.7	484.26	217.1	
3/6/18	11:44	1035.7	-0.07	8.9	11.8	485.24	217.4	
3/6/18	11:45	1035.1	-0.07	8.7	12	483.01	215.5	
3/6/18	11:46	973.4	-0.09	7.2	12	462.77	209.3	
3/6/18	11:47	907.3	-0.1	6.1	12.4	445.2	203.6	
3/6/18	11:48	907.4	-0.09	6.4	13.2	463.65	217.9	
3/6/18	11:49	941.8	0	5.6	14	460.54	216.7	Test Start
3/6/18	11:50	893.6	0	4.1	14.2	433.7	203	
3/6/18	11:51	872.1	0	4.1	15.1	418.45	195.5	
3/6/18	11:52	877.6	0	5.3	16	410.62	191.4	
3/6/18	11:53	871.5	0	4.2	16.3	406.25	187.9	
3/6/18	11:54	823.1	0	3.8	16.2	396.51	183.6	
3/6/18	11:55	819.8	0	3.8	16.7	390.66	182.5	
3/6/18	11:56	816.1	0	3.6	17	387.91	180.5	
3/6/18	11:57	794.7	0	3.4	17.2	382.96	179.4	

3/6/18	11:58	777.3	0	3.4	17.5	376.97	179.8
3/6/18	11:59	775	0	3.4	17.7	371.91	178.1
3/6/18	12:00	776.4	0	3.2	17.8	369.46	175.8
3/6/18	12:01	760.9	0	3.3	17.9	366.85	173
3/6/18	12:02	742.9	0	3.1	18	362.31	170.9
3/6/18	12:03	735.3	0	3.1	18	358.02	168.8
3/6/18	12:04	732.4	0	3.2	18.1	355.56	167.5
3/6/18	12:05	746.2	0	3.3	18.2	354.77	166.8
3/6/18	12:06	759.1	0	3.2	18.1	354.77	167.2
3/6/18	12:07	762.6	0	3.3	18.1	354.74	168.9
3/6/18	12:08	758.1	0	3.2	18.1	353.6	168.4
3/6/18	12:09	758.1	0.01	3.1	18.1	352.39	167
3/6/18	12:10	763.5	0.02	3.1	18.2	351.3	166.8
3/6/18	12:11	773	0.04	3.5	18.2	351.67	166
3/6/18	12:12	798.5	0.04	4.3	18.3	355.03	165.4
3/6/18	12:13	801.9	0.02	5.2	18	356.35	166.2
3/6/18	12:14	810	0.05	5.2	17.4	356.08	167.2
3/6/18	12:15	810.8	0.02	4.9	16.9	356.53	168.9
3/6/18	12:16	823.2	0.05	5	16.6	357.47	169.3
3/6/18	12:17	836.6	0.03	5.3	16.5	362.66	169.4
3/6/18	12:18	825	0.04	5	16.3	362.96	168.3
3/6/18	12:19	843.7	0.08	5.4	16.2	364.5	169.5
3/6/18	12:20	851.7	0.05	5.6	16.2	366.5	171.4
3/6/18	12:21	861.7	0.01	5.9	16	368.96	170.9
3/6/18	12:22	879.6	0	6.3	15.8	373.28	170.3
3/6/18	12:23	885.6	0	6.4	15.5	376.42	170.2
3/6/18	12:24	877.3	0	6.3	15.3	379.06	171.4
3/6/18	12:25	884.5	0	6.5	15.1	381.44	172.5
3/6/18	12:26	886	0	6.6	15	383.31	173.8
3/6/18	12:27	890	0	6.9	14.9	384.5	175.3
3/6/18	12:28	896.6	0	6.8	14.8	386.58	174.1
3/6/18	12:29	898.4	0	6.8	14.6	387.44	173
3/6/18	12:30	895	0	6.8	14.5	388.66	176.6
3/6/18	12:31	889.9	0	6.6	14.5	387.93	174.6
3/6/18	12:32	881.3	0	6.5	14.5	386.43	174.3
3/6/18	12:33	875.6	0	6.5	14.6	385.33	173.8
3/6/18	12:34	871	0	6.5	14.6	384.86	172.8
3/6/18	12:35	872.3	0	6.6	14.7	384.49	175.7
3/6/18	12:36	873.9	0	6.7	14.7	384.85	176.3
3/6/18	12:37	870.5	0	6.6	14.7	384.37	175
3/6/18	12:38	860.6	0	6.4	14.6	382.86	172.1
3/6/18	12:39	854.5	0	6.2	14.7	382.49	172
3/6/18	12:40	855.6	0	6.5	14.8	381.09	174.5
3/6/18	12:41	865.2	0	6.7	14.8	381.58	175.1
3/6/18	12:42	874.5	0	6.8	14.8	382.55	173.9
3/6/18	12:43	882.7	0	6.9	14.7	384.3	173
3/6/18	12:44	892.1	0	7.1	14.5	386.82	174.1
3/6/18	12:45	899.4	0	7.1	14.4	388.4	176.3

3/6/18	12:46	896.9	0	7.2	14.3	390.22	175.9
3/6/18	12:47	887.9	0	7.1	14.2	391.41	176.7
3/6/18	12:48	880.8	0	7	14.1	390.74	175.5
3/6/18	12:49	873.6	0	7	14.1	389.13	175.3
3/6/18	12:50	872.5	0	7	14.2	388.38	174.2
3/6/18	12:51	872.1	0	7.1	14.2	388.47	174.3
3/6/18	12:52	874.2	0	7.2	14.2	388.82	174.3
3/6/18	12:53	878.1	0	7.2	14.1	388.99	174.2
3/6/18	12:54	881.2	0	7.2	14.1	389.55	174.7
3/6/18	12:55	882.2	0	7.3	14	389.85	174.6
3/6/18	12:56	882.8	0	7.2	14	390.83	174.7
3/6/18	12:57	883	0	7.2	14	390.8	173.8
3/6/18	12:58	875	0	6.8	14	389.02	173.2
3/6/18	12:59	869.5	0	6.6	14.1	387.61	173.1
3/6/18	13:00	864.6	0	6.6	14.2	387.74	172.8
3/6/18	13:01	859.8	0	6.5	14.4	386.94	172.9
3/6/18	13:02	857.7	0	6.4	14.5	386.74	172
3/6/18	13:03	850.3	0	6.4	14.5	385.46	171.1
3/6/18	13:04	845.6	0	6.4	14.6	384.37	172.7
3/6/18	13:05	842.9	0	6.4	14.6	383.04	174.5
3/6/18	13:06	842.1	0	6.4	14.7	381.6	174.3
3/6/18	13:07	843.9	0	6.4	14.6	380.46	173
3/6/18	13:08	844.5	0	6.5	14.6	380.93	171.7
3/6/18	13:09	844.1	0	6.5	14.6	381.92	173.8
3/6/18	13:10	843.3	0	6.4	14.5	381.33	173.6
3/6/18	13:11	842.5	0	6.4	14.5	380.71	171.9
3/6/18	13:12	843.2	0	6.3	14.5	380.88	172.8
3/6/18	13:13	842.3	0	6.3	14.6	381.12	173
3/6/18	13:14	838.9	0	6.2	14.6	380.52	174.1
3/6/18	13:15	838.6	0	6.1	14.6	380.05	173.9
3/6/18	13:16	834.5	0	6.1	14.7	379.35	172.3
3/6/18	13:17	831.8	0	6.1	14.8	378.72	173.2
3/6/18	13:18	831.6	0	6	14.8	379.26	172.6
3/6/18	13:19	830.1	0	6	14.9	378.25	170.9
3/6/18	13:20	826.3	0	6	14.9	377.2	172.2
3/6/18	13:21	821.7	0	5.9	15	376.44	172.3
3/6/18	13:22	818.2	0	5.9	15	376.4	170.6
3/6/18	13:23	816.9	0	5.9	15	375.77	171.7
3/6/18	13:24	817.4	0	5.9	15.1	375.05	171.6
3/6/18	13:25	816.7	0	5.8	15.1	373.94	171.5
3/6/18	13:26	813.7	0	5.8	15.1	374.78	172.8
3/6/18	13:27	810	0	5.8	15.2	373.38	172.8
3/6/18	13:28	808.8	0	5.8	15.3	371.28	170.4
3/6/18	13:29	805.2	0	5.7	15.3	370.09	170.4
3/6/18	13:30	803.5	0	5.7	15.3	369.83	169.5
3/6/18	13:31	799.6	0	5.7	15.3	370.22	169.8
3/6/18	13:32	795.3	0	5.7	15.3	368.57	169
3/6/18	13:33	794.6	0	5.7	15.3	367.85	171

3/6/18	13:34	793.6	0	5.7	15.4	367.82	172
3/6/18	13:35	792.8	0	5.7	15.4	367.48	169.6
3/6/18	13:36	789.8	0	5.7	15.4	366.27	169.8
3/6/18	13:37	784.7	0	5.8	15.4	365.47	169.6
3/6/18	13:38	780.6	0	5.8	15.4	364.46	170.1
3/6/18	13:39	779.3	0	5.9	15.4	364.83	170.4
3/6/18	13:40	778	0	5.9	15.3	363	170.9
3/6/18	13:41	779.1	0	5.9	15.3	361.5	170.8
3/6/18	13:42	780.6	0	6	15.2	361.3	171.1
3/6/18	13:43	783.7	0	5.9	15.2	361.3	169.1
3/6/18	13:44	788.7	0	5.9	15.2	361.82	168.5
3/6/18	13:45	787.6	0	5.8	15.2	361.71	168
3/6/18	13:46	780.2	0	5.8	15.2	360.63	169.1
3/6/18	13:47	774.9	0	5.8	15.2	359.59	168.9
3/6/18	13:48	768.7	0	5.6	15.2	358.46	167.5
3/6/18	13:49	755.5	0	5.2	15.2	356.11	166.9
3/6/18	13:50	751.7	0	5.2	15.4	354.34	166.8
3/6/18	13:51	749.7	0	5.2	15.5	353.12	167.8
3/6/18	13:52	748.4	0	5.1	15.6	352.12	169.2
3/6/18	13:53	750.5	0	4.9	15.7	351.68	169.4
3/6/18	13:54	752.2	0	4.9	15.8	351.09	167.5
3/6/18	13:55	749.2	0	4.8	16	350.93	167.3
3/6/18	13:56	748	0	4.8	16	351.59	167.6
3/6/18	13:57	745.7	0	4.7	16.1	351.12	168.4
3/6/18	13:58	744.5	0	4.7	16.2	349.56	167.7
3/6/18	13:59	741.7	0	4.7	16.3	348.81	166.9
3/6/18	14:00	740	0	4.7	16.3	347.96	166.8
3/6/18	14:01	734.1	0	4.4	16.4	347.6	165.9
3/6/18	14:02	722.2	0	4.3	16.4	344.33	164.6
3/6/18	14:03	715.7	0	4.3	16.5	342.27	165.1
3/6/18	14:04	710.2	0	4.3	16.7	341.02	165.7
3/6/18	14:05	702.7	0	4.2	16.7	338.9	164.1
3/6/18	14:06	693.5	0	4.2	16.8	335.85	163
3/6/18	14:07	688.2	0	4.1	16.9	333.31	163.1
3/6/18	14:08	685.8	0	4.1	16.9	332.24	161.6
3/6/18	14:09	683.9	0	4.1	17	330.88	160.7
3/6/18	14:10	681.8	0	4.1	17	329.64	160.6
3/6/18	14:11	680.4	0	4.1	17	328.47	160.2
3/6/18	14:12	678.1	0	3.9	17.1	327.64	158.2
3/6/18	14:13	675.1	0	3.9	17.1	326.67	159.5
3/6/18	14:14	675	0	3.9	17.2	326.53	160.1
3/6/18	14:15	675.1	0	4.1	17.2	326	160.1
3/6/18	14:16	675	0	4.1	17.3	326.26	161.4
3/6/18	14:17	674.3	0	4.1	17.2	325.92	159.9
3/6/18	14:18	672.8	0	4.1	17.2	324.84	158.6
3/6/18	14:19	671.7	0	4.1	17.1	324.35	157.6
3/6/18	14:20	670.8	0	4.1	17.1	324.34	156.7
3/6/18	14:21	670.1	0	4.1	17.1	323.92	157.5

3/6/18	14:22	670	0	4.1	17.1	324.07	156.9
3/6/18	14:23	670.1	0	4.1	17.1	322.94	157.2
3/6/18	14:24	671.7	0	4.1	17.1	323.05	157.4
3/6/18	14:25	673.8	0	4.2	17.1	323.78	158.4
3/6/18	14:26	674.2	0	4.2	17.1	324.15	158.8
3/6/18	14:27	672.7	0	4.1	17.1	323.66	158.5
3/6/18	14:28	672.3	0	4.1	17.1	323.34	158.2
3/6/18	14:29	673.4	0	4.1	17.1	323.48	157.4
3/6/18	14:30	672.9	0	4.1	17.1	323.95	157.1
3/6/18	14:31	671.6	0	4.1	17.1	323.73	157.4
3/6/18	14:32	670.1	0	4.1	17.1	323.61	157.1

Plant Name: CLST Page: 1

General Average Report

Reporting Period: 03/06/2018 to 03/06/2018

Site Name: UNIT Time of Report: 03/06/18 14:53

Data Averaging Type: 1m Rolling Average Interval: 1

Date	Time	Stove Side front left CAT_PRE (Deg_F)	Stove Bottom TEMP_10 (Deg_F)	Stove Back TEMP_11 (Deg_F)	Stove Side TEMP_12 (Deg_F)	Stove Top TEMP_13 (Deg_F)	
3/6/18	10:30	65.6	66.83	66.75	67.46	65.5	Preburn
3/6/18	10:31	65.3	67.16	66.4	67.59	65.36	
3/6/18	10:32	65.2	67.09	66.92	67.32	65.73	
3/6/18	10:33	65.4	66.28	67.53	67.33	68.2	
3/6/18	10:34	65.6	66.39	69.55	67.93	74.3	
3/6/18	10:35	66.3	66.67	73.06	69.21	84.4	
3/6/18	10:36	67.5	67.06	78.93	70.56	96.54	
3/6/18	10:37	69.2	66.98	85.53	72.78	108.94	
3/6/18	10:38	71.3	67.35	92.47	75.59	119.29	
3/6/18	10:39	74.6	67.83	100.8	79.23	129.15	
3/6/18	10:40	77.5	68.65	107.21	82.56	138.08	
3/6/18	10:41	80	69.02	112.02	85.4	144.22	
3/6/18	10:42	82.1	69.52	115.62	88.31	147.81	
3/6/18	10:43	85	70.65	117	91.26	151.47	
3/6/18	10:44	87.3	71.95	118.86	93.71	157.59	
3/6/18	10:45	89.2	73.21	120.27	95.62	163.55	
3/6/18	10:46	90.6	73.66	122.14	97.63	170.02	
3/6/18	10:47	92.3	74.38	122.95	99.9	180.58	
3/6/18	10:48	93.8	75.76	123.25	101.94	197.9	
3/6/18	10:49	95.5	77.78	123.04	103.96	220.32	
3/6/18	10:50	97.9	78.8	124.51	106.71	241.14	
3/6/18	10:51	100.3	79.96	127.45	109.61	257.26	
3/6/18	10:52	102.7	81.31	130.82	112.4	267.89	
3/6/18	10:53	105.4	83.11	134.64	114.86	278.94	
3/6/18	10:54	108.3	84.55	138.35	117.47	293.73	
3/6/18	10:55	110.7	85.63	142.37	120.6	312.16	
3/6/18	10:56	113.3	87.08	146.7	123.88	328.2	
3/6/18	10:57	116.4	88.5	149.18	126.9	340.8	
3/6/18	10:58	120.3	90.22	153.3	130.6	352.88	
3/6/18	10:59	124.2	91.51	157.35	134.5	363.83	
3/6/18	11:00	128.6	93.17	160.58	138.52	372.01	
3/6/18	11:01	132	95.17	164.95	142.11	374.04	
3/6/18	11:02	136	97.63	168.89	145.78	379.92	
3/6/18	11:03	140.4	99.25	171.97	149.37	383.93	
3/6/18	11:04	144.1	101.21	175.63	153.34	387.69	
3/6/18	11:05	147.8	103.38	179.32	156.32	390.14	
3/6/18	11:06	151	105.97	182.09	159.16	392.26	
3/6/18	11:07	154.9	108.34	185.36	162.34	394.48	
3/6/18	11:08	158.6	110.65	189.34	166.26	399.19	
3/6/18	11:09	161.9	113.6	195.55	169.58	407.47	

3/6/18	11:10	164.9	116.5	199	172.1	412.84	
3/6/18	11:11	169.1	118.59	200.96	175.16	419.76	
3/6/18	11:12	173	121.14	205.01	179.23	428.39	
3/6/18	11:13	176.6	124.14	210.39	183.08	440.22	
3/6/18	11:14	181	127.47	216.9	186.5	449.47	
3/6/18	11:15	184.2	130.97	221.26	190.23	453.53	
3/6/18	11:16	188.2	133.68	224.27	194.41	454.33	
3/6/18	11:17	191.8	136.56	226.35	198.09	459.95	
3/6/18	11:18	196.7	140.09	232.88	201.17	459.23	
3/6/18	11:19	200.6	143.96	233.9	204.75	453.35	
3/6/18	11:20	204.6	147.04	235.32	208.52	450.3	
3/6/18	11:21	207.4	150.36	239.71	211.89	454.14	
3/6/18	11:22	212.2	154.4	243.28	214.95	447.63	
3/6/18	11:23	216.5	158.29	241.68	217.74	447.76	
3/6/18	11:24	220.5	161.73	244.15	220.93	441.96	
3/6/18	11:25	220.4	164.33	242.17	222.96	431.52	
3/6/18	11:26	220.7	166.26	239	224.23	426.12	
3/6/18	11:27	223.8	168.89	241.16	225.7	421.62	
3/6/18	11:28	224.8	172.67	242.37	227.77	417.84	
3/6/18	11:29	225.7	175.61	241.98	230.32	416.94	
3/6/18	11:30	227	177.81	237.56	232.34	420.04	
3/6/18	11:31	229.1	181.39	241.09	234.4	425.43	
3/6/18	11:32	230.8	181.79	239.22	235.67	423.44	
3/6/18	11:33	234.5	184.69	241.58	238.42	430.75	
3/6/18	11:34	234.9	187.88	246.28	239.96	438.47	
3/6/18	11:35	235.5	193.49	252.73	242.4	448.28	
3/6/18	11:36	239.1	197.54	258.72	245.27	453.65	
3/6/18	11:37	241.9	200.75	257.85	247.83	448.14	
3/6/18	11:38	243.5	201.26	259.26	250.04	443.67	
3/6/18	11:39	245.8	202.85	259.58	252.39	442.91	
3/6/18	11:40	247	205.17	262.07	254.46	444.57	
3/6/18	11:41	249.5	207.88	264.24	258.12	455.07	
3/6/18	11:42	251.2	209.77	262.06	260.95	459.07	
3/6/18	11:43	252.5	210.89	264.95	263.58	463.88	
3/6/18	11:44	255	213.42	266.8	266.22	471.84	
3/6/18	11:45	258.1	216.54	269.33	269.38	477.76	
3/6/18	11:46	260.6	220.33	267.06	272.67	482.33	
3/6/18	11:47	263.2	223.19	268.35	275	485.98	
3/6/18	11:48	264.3	228.41	278.94	278.23	497.31	
3/6/18	11:49	268.7	229.32	276.62	280.99	484.87	Test Start
3/6/18	11:50	270.9	229.87	272.99	283.92	477.77	
3/6/18	11:51	273.3	232.99	272.36	286.06	475.09	
3/6/18	11:52	275.9	235.65	271.49	288.25	467.61	
3/6/18	11:53	277.7	238.58	269.27	290.15	459.26	
3/6/18	11:54	279.4	240.85	267.12	292.29	455.45	
3/6/18	11:55	281.4	242.82	265.42	293.63	449.04	
3/6/18	11:56	282.6	244.56	260.8	294.18	442.14	
3/6/18	11:57	284	246.34	260.77	295.69	439.12	

3/6/18	11:58	284.9	248.58	256.14	296.72	434.39
3/6/18	11:59	285.8	248.65	251.83	296.02	428.36
3/6/18	12:00	285.9	251.07	251.52	295.35	421.59
3/6/18	12:01	285.6	252.77	248.77	294.73	414.24
3/6/18	12:02	285.8	255.31	246.89	294.13	410.28
3/6/18	12:03	285.8	255.57	242.63	293.71	406.15
3/6/18	12:04	285.2	255.99	240.41	292.76	400.53
3/6/18	12:05	284.6	256.71	239.68	291.29	393.49
3/6/18	12:06	284.1	257.08	236.73	291.29	392.46
3/6/18	12:07	283.3	258.7	234.86	290.41	388.94
3/6/18	12:08	282.6	258.02	231.48	288.59	387.04
3/6/18	12:09	282.1	259.54	229.2	287.71	383.53
3/6/18	12:10	281.3	261.56	228.35	287.01	378.48
3/6/18	12:11	280	262.63	225.98	286.24	375.23
3/6/18	12:12	278.6	262.75	224.13	284.46	372.77
3/6/18	12:13	278	264.04	224	283.36	369.67
3/6/18	12:14	276.5	265.69	223.62	282.47	367.56
3/6/18	12:15	275.3	266.73	221.79	281.44	368.87
3/6/18	12:16	274.4	266.52	220.35	279.7	367.63
3/6/18	12:17	272.9	268	218.86	278.26	367.45
3/6/18	12:18	272.2	267.65	215.96	277.27	369.22
3/6/18	12:19	272.3	268.99	216.49	276.7	371.98
3/6/18	12:20	271.5	269.05	214.77	275.39	374.75
3/6/18	12:21	270	269.58	215.86	274.03	376.22
3/6/18	12:22	268.9	270.72	215.23	273.63	377.52
3/6/18	12:23	268.7	272.07	214.97	273.34	379.86
3/6/18	12:24	268.3	273.53	214.29	272.03	381.43
3/6/18	12:25	267.6	273.39	214.03	271.01	385.21
3/6/18	12:26	267.7	274.22	214.64	270.85	392.7
3/6/18	12:27	267.1	275.49	214.72	270.45	393.42
3/6/18	12:28	266.3	276.99	213.97	269.53	393.83
3/6/18	12:29	265.4	276.84	213.08	269.41	399.39
3/6/18	12:30	265.5	277.4	214.12	269.5	402.35
3/6/18	12:31	265.6	278.26	214.39	269.56	403.46
3/6/18	12:32	266.3	279.56	214.93	269.9	406.54
3/6/18	12:33	266.5	279.08	214.55	269.64	406.76
3/6/18	12:34	266.1	279.62	215.23	269.87	411.31
3/6/18	12:35	266.7	280.23	214.98	270.71	413.94
3/6/18	12:36	267.3	281.13	215.09	271.23	414.49
3/6/18	12:37	267	282.02	215.49	270.54	412.48
3/6/18	12:38	266.5	281.66	215.51	270.68	412.3
3/6/18	12:39	267.8	282.59	216.25	272.35	416.81
3/6/18	12:40	268.8	283.7	216.35	273.38	419.8
3/6/18	12:41	269.9	284.93	217.02	273.61	419.46
3/6/18	12:42	269.2	284.86	218.13	273.25	415.29
3/6/18	12:43	270.2	285.3	218.56	274.27	416.47
3/6/18	12:44	271.2	286.53	218.18	275.12	420.69
3/6/18	12:45	271.9	287.73	218.84	276.13	421.5

3/6/18	12:46	272.1	287.71	220.41	275.41	423.48
3/6/18	12:47	273.3	287.63	220.28	275.83	423.57
3/6/18	12:48	273.7	287.81	219.22	277.89	423.03
3/6/18	12:49	274.1	288.84	220.16	278.21	425.75
3/6/18	12:50	275.6	289.9	221.57	278.57	427.15
3/6/18	12:51	276.5	289.82	223.45	279.4	426.87
3/6/18	12:52	277.7	290.11	223.92	281.35	427.28
3/6/18	12:53	279.5	291.57	224.24	282.54	431.65
3/6/18	12:54	280.5	292.17	225.89	282.11	433.38
3/6/18	12:55	280.9	292.02	226.93	283.46	434.57
3/6/18	12:56	281.5	292.53	226.25	284.64	432.87
3/6/18	12:57	281.6	293.32	227.99	285.37	433.07
3/6/18	12:58	283.2	294.1	229.2	285.96	435.13
3/6/18	12:59	284.6	293.76	229.31	286.5	436.46
3/6/18	13:00	285.6	295.15	229.74	288.37	437.65
3/6/18	13:01	287.2	295.22	230.78	288.63	436.31
3/6/18	13:02	288.8	296.05	232.14	289.35	435.21
3/6/18	13:03	289.7	296.73	234.28	289.56	433.52
3/6/18	13:04	291.7	295.98	234.35	291.21	435.13
3/6/18	13:05	292.4	296.7	234.92	291.77	434.24
3/6/18	13:06	293.1	299.54	235.78	292.35	432.4
3/6/18	13:07	294.3	299.45	235.72	292.89	430.35
3/6/18	13:08	295.6	299.47	236.21	294.07	428.52
3/6/18	13:09	296.3	299.7	236.41	294.96	429.08
3/6/18	13:10	297.1	301.26	239.37	295.38	430.24
3/6/18	13:11	298	301.8	239.98	295.18	427.93
3/6/18	13:12	299.8	301.4	239.83	296.29	428.04
3/6/18	13:13	299.6	301.4	239.88	297.44	428.28
3/6/18	13:14	300.7	302.19	240.91	297.21	429.43
3/6/18	13:15	301.5	303.07	241.22	297.66	428.99
3/6/18	13:16	302.1	304.43	242.85	298.66	424.38
3/6/18	13:17	302.9	304.07	243.73	299.95	425.28
3/6/18	13:18	303.9	302.65	244.05	299.59	425.3
3/6/18	13:19	304.1	302.93	245.91	299.54	422.03
3/6/18	13:20	306.8	306.19	247.32	300.44	422.8
3/6/18	13:21	307.4	308.68	247.9	301.68	419.09
3/6/18	13:22	307.9	309.34	248.7	302.09	415.31
3/6/18	13:23	308.5	308.13	250.78	302.03	416.84
3/6/18	13:24	309.7	309.5	252.12	302.62	417.41
3/6/18	13:25	310.1	309.41	252.67	303.44	418.47
3/6/18	13:26	309.8	307.92	251.39	304.27	415.82
3/6/18	13:27	311.4	309.03	253.22	304.13	412.61
3/6/18	13:28	313	312.66	255.17	304.38	408.33
3/6/18	13:29	313.5	312.9	258.29	305.19	406.92
3/6/18	13:30	313.8	314.25	258.23	305.68	404.56
3/6/18	13:31	314	314.48	258.27	305.55	403.78
3/6/18	13:32	315.1	313.95	260.84	306	402.76
3/6/18	13:33	316.9	314.27	262.15	306.87	406.79

3/6/18	13:34	318	315.26	262.17	307.28	406.34
3/6/18	13:35	317.5	313.87	263.08	307.75	401.14
3/6/18	13:36	316.9	313.64	263.64	307.83	403.16
3/6/18	13:37	317.5	314.67	265.22	308.48	398.89
3/6/18	13:38	318.2	315.47	266.77	309.67	401.79
3/6/18	13:39	319.8	317.24	267.62	309.4	397.01
3/6/18	13:40	319.9	317.6	270.91	309.59	393.56
3/6/18	13:41	319.9	319.33	272.99	310.29	398.84
3/6/18	13:42	320.4	319.25	271.38	310.33	395.06
3/6/18	13:43	321.2	319.54	274.14	310.83	390.87
3/6/18	13:44	321.5	319.94	275.09	311.19	389
3/6/18	13:45	321.3	322	275.35	311.68	388.83
3/6/18	13:46	322.7	322.89	276.8	312.62	392.04
3/6/18	13:47	323.2	323.65	278.16	312.7	389.85
3/6/18	13:48	324.2	324.26	280.38	312.87	389.76
3/6/18	13:49	324.5	325.51	282.32	313.67	390.6
3/6/18	13:50	325.1	326.61	282.66	314.52	390.23
3/6/18	13:51	325.2	327.14	281.73	314.89	392.43
3/6/18	13:52	325.8	328.35	283.42	315.17	390.47
3/6/18	13:53	326	329.31	284.01	315.65	389.75
3/6/18	13:54	326.6	330.16	283.26	316.71	388.01
3/6/18	13:55	327.4	331.01	283.67	317.31	385.92
3/6/18	13:56	327.7	331.82	284.1	317.67	385.09
3/6/18	13:57	326.7	332.04	283.02	318.49	386.96
3/6/18	13:58	327.2	332.92	283.05	319.41	387.77
3/6/18	13:59	328.3	334.34	282.76	320.15	384.26
3/6/18	14:00	328.3	334.06	281.23	320.36	385.16
3/6/18	14:01	327	335.52	280.94	320.82	383.13
3/6/18	14:02	326.8	336.5	281.45	322	380.53
3/6/18	14:03	327.7	336.99	279.92	322.72	379.07
3/6/18	14:04	327.7	338.9	280.35	322.73	375.61
3/6/18	14:05	327.3	338.97	279.32	323.12	370.93
3/6/18	14:06	326.4	339.98	280.73	323.95	372.31
3/6/18	14:07	327.3	341.58	279.12	324.88	371.47
3/6/18	14:08	327.9	340.62	279.15	324.83	368.88
3/6/18	14:09	326.1	338.56	278.39	324.43	364.84
3/6/18	14:10	325.1	339.52	278.16	325.22	364.96
3/6/18	14:11	326.6	339.86	277.09	326.05	359.93
3/6/18	14:12	324.8	339.92	276.5	326.27	356.93
3/6/18	14:13	324	340.61	276.2	326.39	358.04
3/6/18	14:14	322.8	341.11	276.15	326.39	355.2
3/6/18	14:15	322.6	341.34	274.03	326.93	355.42
3/6/18	14:16	322.8	341.07	274.18	326.94	351.99
3/6/18	14:17	323.3	341.85	274.09	326.83	345.51
3/6/18	14:18	322.4	343.33	274.87	326.91	341.77
3/6/18	14:19	320.7	344.13	272.51	327.51	338.82
3/6/18	14:20	319.1	344.62	272.46	327.61	341.07
3/6/18	14:21	318.6	346.1	273.1	326.86	339.96

3/6/18	14:22	318.4	347.53	272.51	326.89	336.26	
3/6/18	14:23	317.5	348.07	273.73	327.45	335.01	
3/6/18	14:24	318.1	348.5	274.2	327.5	335.91	
3/6/18	14:25	318.3	348.19	271.85	326.85	336.8	
3/6/18	14:26	318.4	348.81	273.53	326.81	334.52	
3/6/18	14:27	317.9	349.8	272.91	326.68	334.36	
3/6/18	14:28	317.3	350.04	273.29	326.58	333.61	
3/6/18	14:29	317.1	350.99	273.6	326.15	330.29	
3/6/18	14:30	316	351.86	274.59	325.81	332.05	
3/6/18	14:31	315.7	353.03	274.8	326.2	330.72	
3/6/18	14:32	314.2	353.53	273.58	326.32	329.88	Test End

Test ID	CSL-00010						
Technician	BV, KO'B						
Date	3/12/18			**ISS-1 ΔH@**			
Start Time	12:45			**ISS-2 ΔH@**			
End Time	12:58						
Barometric Pressure	29.8	in Hg					
Room Temperature	64	F					
Relative Humidity	39	%					
Saturation Pressure	0.295	psia					
Actual Fan Speed for Test (Hz)	16	Hz					
PreTest Pitot		in. water					
Leak Rate (15 seconds)	0	in. water	<--Must be 0				
Static Pressure in Appliance (no DT)	0	in. water	Static Pressure in Appliance must be taken within 1 ft of top of appliance				
Static Pressure in Appliance (DT)	0	in.					
Difference	0	in. water	"Difference" mustbe less than 0.005 in WC				
Diameter of Tunnel (in)	8	in.					
Static Pressure in Dilution Tunnel (beginning	0	in. water					
Point			**Port A**		**Port B**		
	% of Diameter	**Distance (inches)**	**Δp (in water)**	**Temperature (F)**	**Δp (in water)**	**Temperature (F)**	
1	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	
2	**6.7**	**0.536**	0.035	64	0.035	64	
3	**25**	**2.0**	0.035	64	0.045	64	
Center	**50**	**4.0**	0.045	64	0.05	64	
4	**77**	**6.0**	0.05	64	0.055	64	
5	**93.3**	**7.46**	0.055	64	0.06	64	
6	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	
PostTest Pitot							
Staic Pressure (after test)	0	in. water					
Leak Rate (15 seconds)	0	in. water					

Signature_____

Quality Review_____

PRELIMINARY VELOCITY DETERMINATION

Test ID	CSL-00010
Date	3/12/18

Static Pressure (Pg)	0.000	in W.C.
Pitot Coeffiecent	0.99	unitless
Gas Molecular Weight (MW) wet	29.0	lb/lb-mole
Diameter of Tunnel	8.000	inches
Dilution Tunnel Cross Sectional Area	0.349	FT^2

			Port A				Port B			
POINT	**% of Diameter**	**Distance (inches)**	**Δp (in W.C.)**	**√Δp (in W.C.)**	**Temp (F)**	**Temp(R)**	**Δp (in water)**	**√Δp (in W.C.)**	**Temp (F)**	**Temp(R)**
1	**n/a**	**n/a**	n/a	#VALUE!	n/a	#VALUE!	n/a	#VALUE!	n/a	#VALUE!
2	**6.7**	**0.54**	0.035	0.19	64.0	524	0.035	0.19	64.0	524
3	**25.0**	**2.00**	0.035	0.19	64.0	524	0.045	0.21	64.0	524
Center	**50.0**	**4.00**	0.045	0.21	64.0	524	0.050	0.22	64.0	524
4	**77.0**	**6.00**	0.050	0.22	64.0	524	0.055	0.23	64.0	524
5	**93.3**	**7.46**	0.055	0.23	64.0	524	0.060	0.24	64.0	524
6	**n/a**	**n/a**	n/a	#VALUE!	n/a	#VALUE!	n/a	#VALUE!	n/a	#VALUE!
			AVERAGE	**0.21**	**AVERAGE**	**524**				

DILUTION TUNNEL CALCULATIONS						
Absolute Gas Temperature; Tst = Ts + 459.67°		**Tst =**	**524**	**°R**		
Absolute Gas Pressure; Ps = Pb + Pg/13.6		**Ps =**	**29.8**	**inches Hg**		
Gas Velocity; Vs = (85.49) x Cp x (avg √ΔP) x √(Tst avg/(Ps*Mw))		**Vs =**	**14.14**	**FT/sec**	**849**	**FT/min**
Gas Flow Rate; Qa = Vs x 60 x cross sectional area		**Qa =**	**296**	**ACFM**		

V_{stray} CALCULATIONS		**AVERAGE √Δp**	**0.21**	**(in W.C.)**		
Absolute Gas Temperature; Tst = Ts + 459.67°		**Tst =**	**524**	**°R**		
Absolute Gas Pressure; Ps = Pb + Pg/13.6		**Ps =**	**29.8**	**inches Hg**		
Gas Velocity; Vs = (85.49) x Cp x (avg √ΔP) x √(Tst avg/(Ps*Mw))		**Vs =**	**14.09**	**FT/sec**	**845**	**FT/min**
Gas Flow Rate; Qa = Vs x 60 x cross sectional area		**Qa =**	**295**	**ACFM**		

0.982	**Fp**

V_{scent} CALCULATIONS		**AVERAGE √Δp**	**0.22**	**(in W.C.)**		
Absolute Gas Temperature; Tst = Ts + 459.67°		**Tst =**	**524**	**°R**		
Absolute Gas Pressure; Ps = Pb + Pg/13.6		**Ps =**	**29.8**	**inches Hg**		
Gas Velocity; Vs = (85.49) x Cp x (avg √ΔP) x √(Tst avg/(Ps*Mw))		**Vs =**	**14.35**	**FT/sec**	**861**	**FT/min**
Gas Flow Rate; Qa = Vs x 60 x cross sectional area		**Qa =**	**301**	**ACFM**		

METER BOX CALCULATIONS		
Proposed Porportional Sampling Rate; PR	1.00	
Sample Probe Inside Diameter	.175	inches
Sample Probe Cross Sectional Area	.00017	FT^2

270	SCFM
296	ACFM

Pstd	14.696	psia
Pact	14.4	psia
Psat	0.295	psia
Humidity	0.39	%/100
Tact	523.67	R
Tstd	491.67	R

Signature_____

Test ID:	CSL-00010
Date:	3.12.18

Fuel Type
Doug Fir Crib
Preburn or Test Fuel Charge
Preburn

Test Fuel Pieces Weight (lbs)	Total Spacer Weight (lbs)	Total Test Fuel Charge Weight
10.84	0.82	11.66

Average Test Fuel MC%	Test Fuel Density		Dry Basis Weight (lbs)	Charcoal Bed Loading Range (lbs)
21.65	25		8.49	2.33 to 2.92
*must be between 19-25%	**Test Fuel Loading Density must be between 25-36 lb/ft	*** Individual piece length shall closely aproximate 5/6 the dimension of the firebox length		*****Test Fuel Load Range 7lbs +/- 0.7 lbs per ft3

Piece Number	Piece Size (in):			Weight (lbs):	Moisture Content			Average MC (%)	Volume Cubic Inches	Avg. MC% x Dry Basis Weight
	Length	Width	Height		Moisture #1 (%)	Moisture #2 (%)	Moisture #3 (%)			
1	14.50	3.50	1.50	1.36	21.2	20.1	22.4	21.23	76.125	0.00000
2	14.50	3.50	1.50	1.22	22.3	20.2	20.9	21.13	76.125	0.00000
3	14.50	3.50	1.50	1.22	19.6	20.2	23.6	21.13	76.125	0.00000
4	14.50	3.50	3.50	3.62	22.0	21.4	22.3	21.90	177.625	0.00000
5	14.50	3.50	3.50	3.42	22.7	22.9	23.0	22.87	177.625	0.00000
6								#DIV/0!	0	0.00000
7								#DIV/0!	0	0.00000
8								#DIV/0!	0	0.00000
9								#DIV/0!	0	0.00000
10								#DIV/0!	0	0.00000
11								#DIV/0!	0	0.00000
12								#DIV/0!	0	0.00000
13								#DIV/0!	0	0.00000
14								#DIV/0!	0	0.00000
15								#DIV/0!	0	0.00000
16								#DIV/0!	0	0.00000
17								#DIV/0!	0	0.00000
18								#DIV/0!	0	0.00000
19								#DIV/0!	0	0.00000
20								#DIV/0!	0	0.00000
21								#DIV/0!	0	0.00000
22								#DIV/0!	0	0.00000
23								#DIV/0!	0	0.00000
24								#DIV/0!	0	0.00000
25								#DIV/0!	0	0.00000

Total Test Fuel Volume (in^3):
583.625
Total Test Fuel Volume (ft^3):
0.3377

Technician Signature _____

Quality Review Kelli O'Brien

Number of Spacers	***10***
Total Spacer Weight (lbs)	***0.82***
Average Spacer Moisture (%)	***14.35***

Spacer Number	*Piece Size (in)*			*Spacer Weight (lbs)*	*Moisture Content (%)*
	Length	*Width*	*Height*		
1	5.00	1.50	0.75	0.08	16.4
2	5.00	1.50	0.75	0.08	13.1
3	5.00	1.50	0.75	0.08	16.2
4	5.00	1.50	0.75	0.08	15.2
5	5.00	1.50	0.75	0.08	20.1
6	5.00	1.50	0.75	0.08	10.9
7	5.00	1.50	0.75	0.08	14.0
8	5.00	1.50	0.75	0.10	10.7
9	5.00	1.50	0.75	0.08	10.5
10	5.00	1.50	0.75	0.08	16.4
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					
21					
22					
23					
24					
25					

Kelli O'Brien

Test ID:	CSL-00010
Date:	3.12.18

Fuel Type
Doug Fir Crib
Preburn or Test Fuel Charge
Test Fuel

Test Fuel Pieces Weight (lbs)	Total Spacer Weight (lbs)	Total Test Fuel Charge Weight
11.06	0.82	11.88

Average Test Fuel MC%	Test Fuel Density		Dry Basis Weight (lbs)	Charcoal Bed Loading Range (lbs)
21.22	26		8.71	2.38 to 2.97
*must be between 19-25%	**Test Fuel Loading Density must be between 25-36 lb/ft	*** Individual piece length shall closely aproximate 5/6 the dimension of the firebox length		*****Test Fuel Load Range 7lbs +/- 0.7 lbs per ft3

Piece Number	Piece Size (in):			Weight (lbs):	Moisture Content			Average MC (%)	Volume Cubic Inches	Avg. MC% x Dry Basis Weight
	Length	Width	Height		Moisture #1 (%)	Moisture #2 (%)	Moisture #3 (%)			
1	14.50	3.50	1.50	1.34	21.2	20.4	20.8	20.80	76.125	0.00000
2	14.50	3.50	1.50	1.44	20.2	20.0	21.0	20.40	76.125	0.00000
3	14.50	3.50	1.50	1.40	20.2	20.2	21.4	20.60	76.125	0.00000
4	14.50	3.50	3.50	3.34	22.3	22.0	22.6	22.30	177.625	0.00000
5	14.50	3.50	3.50	3.54	21.3	22.0	22.7	22.00	177.625	0.00000
6								#DIV/0!	0	0.00000
7								#DIV/0!	0	0.00000
8								#DIV/0!	0	0.00000
9								#DIV/0!	0	0.00000
10								#DIV/0!	0	0.00000
11								#DIV/0!	0	0.00000
12								#DIV/0!	0	0.00000
13								#DIV/0!	0	0.00000
14								#DIV/0!	0	0.00000
15								#DIV/0!	0	0.00000
16								#DIV/0!	0	0.00000
17								#DIV/0!	0	0.00000
18								#DIV/0!	0	0.00000
19								#DIV/0!	0	0.00000
20								#DIV/0!	0	0.00000
21								#DIV/0!	0	0.00000
22								#DIV/0!	0	0.00000
23								#DIV/0!	0	0.00000
24								#DIV/0!	0	0.00000
25								#DIV/0!	0	0.00000

Total Test Fuel Volume (in^3):
583.625
Total Test Fuel Volume (ft^3):
0.3377

Technician Signature _____

Quality Review Kelli O'Brien

Number of Spacers	***10***
Total Spacer Weight (lbs)	***0.82***
Average Spacer Moisture (%)	***16.67***

Spacer Number	*Piece Size (in)*			*Spacer Weight (lbs)*	*Moisture Content (%)*
	Length	*Width*	*Height*		
1	5.00	1.50	0.75	0.08	19.0
2	5.00	1.50	0.75	0.08	19.3
3	5.00	1.50	0.75	0.08	19.1
4	5.00	1.50	0.75	0.10	20.7
5	5.00	1.50	0.75	0.08	11.6
6	5.00	1.50	0.75	0.08	15.5
7	5.00	1.50	0.75	0.08	17.5
8	5.00	1.50	0.75	0.08	11.6
9	5.00	1.50	0.75	0.08	17.6
10	5.00	1.50	0.75	0.08	14.8
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					
21					
22					
23					
24					
25					

Kelli O'Brien

ClearStak

Manufacturer:	MF Fire	**Technicians:**	Kelli O'Brien
Model:	Nova		
Date:	03/12/18		Brian Vinal
Run:	3		
Control #:	CSL-00010		
Test Duration:	139		
Output Category:	N/A		

Test Results in Accordance with CSA B415.1-10

	HHV Basis	LHV Basis
Overall Efficiency	73.2%	79.1%
Combustion Efficiency	99.5%	99.5%
Heat Transfer Efficiency	74%	79.5%

Output Rate (kJ/h)	26,591	25,224	**(Btu/h)**
Burn Rate (kg/h)	1.83	4.04	**(lb/h)**
Input (kJ/h)	36,311	34,445	**(Btu/h)**

Test Load Weight (dry kg)	4.25	9.36	**dry lb**
MC wet (%)	21.22		
MC dry (%)	26.94		
Particulate (g)	4.4		
CO (g)	27		
Test Duration (h)	2.32		

Emissions	Particulate	CO
g/MJ Output	0.07	0.44
g/kg Dry Fuel	1.04	6.32
g/h	1.90	11.58
lb/MM Btu Output	0.17	1.01

Air/Fuel Ratio (A/F)	14.49

VERSION: **2.4** **4/15/10**

Method 28 Data Collection	
Date	3/12/18
Operator	BV, KO'B
Test Type	Method 28R
Run #	3
Wood Heater Information	
Manufacturer/ Model	MF Fire, Nova
Test ID	CSL-00010
Volume of water in Appliance (gal)	n/a
Weight of Appliance (empty) (lbs)	303.2
Volume of water in Storage (gal)	n/a
Weight of Storage Tank(s) (empty) (lbs)	n/a
Primary Air Setting (Hz)	n/a single burnrate stove
Secondary Air Setting (Hz)	n/a single burnrate stove
Thermostat Setting (F)	n/a
Fuel Type	Doug Fir crib wood

Velocity Traverse	
Static Pressure (in WC)	0
Vstrav (ACFM)	295
Vscent (ACFM)	301
Pre-Test Conditions	
Desired Flow Rate (load Side) (GPM)	n/a
Pre-test destratification volume pumped (need 2x) (gal)	n/a
Pre-test temperature difference (post destratification) (F)	n/a
Test facility temp at test start (F)	68
Room air velocity (FPM)	9,11,5
Ambient relative humidity (%)	37
Ambient barometric pressure (in Hg)	29.8
Adjustments to pre-test fuel	See Kelvin
Coal-bed weight prior to test start (lbs)	2.66

Post-Test Conditions	
Time of TFS_{avg} (hh:mm) (leave blank if Cat III or IV)	
room air velocity immediately following run (FPM)	8,9,7
test facility temperature after run (F)	75
ambient relative humidity after run (%)	29
ambient barometric pressure after run (in Hg)	29.7
Weight of unburnt fuel (lbs)	n/a

Note** When inputting data from the logger, the start time of the input must coincide with the start time of the test.

Signature_____

Ambient

Test ID	CSL-00010
Date	3/6/18
Start Time (hh:mm:ss)	14:40
End Time (hh:mm:ss)	16:59
Y (DGM calibration factor)	1.00243
Pre test leak (*A* cfm @ *B* in Hg)	0.00 @20 in. WC
Post test leak (*A* cfm @ *B* in Hg)	0.00 @ 20 in. WC

Filter Assemblies		
A	FH #	FH-01, FF-04
	Front Filter #	G-18-0024
	Back Filter #	n/a
B	FH #	
	Front Filter #	
	Back Filter #	

*Pre and Post leak checkes should be 60 seconds in duration

Duration (hh:mm:ss)	DGM (m^3)	ΔH (in H_2O)	Flow (l/min)	ΔP (in H_2O)
0:00:00	91.9520	4.0	2.0	0.050
0:10:00	91.9731	4.0	2.0	0.055
0:20:00	91.9955	3.5	2.0	0.055
0:30:00	92.0176	3.5	2.0	0.055
0:40:00	92.0395	3.5	2.0	0.050
0:50:00	92.0614	3.5	2.0	0.050
1:00:00	92.0831	3.5	2.0	0.055
1:10:00	92.1007	3.5	2.0	0.055
1:20:00	92.1224	3.5	2.0	0.055
1:30:00	92.1440	3.5	2.0	0.055
1:40:00	92.1658	3.5	2.0	0.050
1:50:00	92.1872	3.5	2.0	0.055
2:00:00	92.2087	3.5	2.0	0.055
2:10:00	92.2305	3.5	2.0	0.050
2:20:00	92.2500			
2:30:00				
2:40:00				
2:44:54				
3:00:00				
3:10:00				
3:20:00				
3:30:00				
3:40:00				
3:50:00				
4:00:00				

Signature_____

Quality Review Kelli O'Brien

ISS-1

Test ID	CSL-00010
Date	3/12/18
Start Time (hh:mm:ss)	14:40:00
End Time (hh:mm:ss)	16:59:00
Y (DGM calibration factor)	1.004
Pre test leak (*A* cfm @ *B* in Hg)	0.00 @ 15 in. Hg
Post test leak (*A* cfm @ *B* in Hg)	0.00 @ 5 in Hg

Filter Assemblies		
A	FH #	FH-02, FH-04, FF-08
	Front Filter #	G-18-0025
	Back Filter #	G-18-0026
B	FH #	
	Front Filter #	
	Back Filter #	

*Pre and Post leak checkes should be 60 seconds in duration

PM Sampling Flow may be 0.15-.25 cfm

Duration (hh:mm:ss)	DGM (ft^3)	ΔH (in H_2O)	Module In Temp (°F)	Module Out Temp (°F)	Vacuum (in Hg)
0:00:00	493.972	0.15	65	64	1.0
0:10:00	496.350	0.15	65	64	1.0
0:20:00	498.748	0.15	66	64	1.0
0:30:00	501.163	0.15	67	65	1.0
0:40:00	503.515	0.15	68	66	1.0
0:50:00	505.894	0.15	69	67	1.0
1:00:00	508.213	0.15	69	67	1.0
1:10:00	510.170	0.15	70	68	1.0
1:20:00	512.515	0.15	71	69	1.0
1:30:00	514.885	0.15	72	70	1.0
1:40:00	517.280	0.15	73	70	1.0
1:50:00	519.678	0.15	73	71	1.0
2:00:00	521.995	0.15	74	71	1.0
2:10:00	524.368	0.15	74	72	1.0
2:20:00	526.481				
2:30:00					
2:40:00					
2:44:54					
3:00:00					
3:10:00					
3:20:00					
3:30:00					
3:40:00					
3:50:00					
4:00:00					

Signature_____

Quality Review_____

ISS-2

	Filter Change 1	Filter Change 2	Filter Change 3
Weight (lbs)			
Elapsed Time Paused (hh:mm:ss)	14:40		
Elapsed Time Resume (hh:mm:ss)	15:40		
Actual Time Pause (hh:mm:ss)	14:40:00	14:40:00	14:40:00
Actual Time Resume (hh:mm:ss)	14:40:00	14:40:00	14:40:00

Test ID	CSL-00010
Date	3/12/18
Start Time (hh:mm:ss)	14:40
End Time (hh:mm:ss)	16:59
Y (DGM calibration factor)	1.0032
Pre test leak (*A* cfm @ *B* in Hg)	0.00 @ 15 in. Hg
Post test leak (*A* cfm @ *B* in Hg)	0.00 @ 5 in. Hg

Filter Assemblies

A	FH #	FH-07,FH-6, FF-5
	Front Filter #	G-18-0027
	Back Filter #	G-18-0028
B	FH #	FH-09, FH-08, FF-14
	Front Filter #	G-18-0032
	Back Filter #	G-18-0031
C	FH #	
	Front Filter #	
	Back Filter #	

*Pre and Post leak checkes should be 60 seconds in duration

PM Sampling Flow may be 0.15-.25 cfm

Duration (hh:mm:ss)	DGM (ft^3)	ΔH (in H_2O)	Module In Temp (°F)	Module Out Temp (°F)	Vacuum (in Hg)
0:00:00	798.613	0.15	67	67	2.0
0:10:00	801.062	0.15	67	67	2.0
0:20:00	803.420	0.15	68	67	2.0
0:30:00	805.760	0.15	69	68	2.0
0:40:00	808.074	0.15	70	68	2.0
0:50:00	810.400	0.15	70	69	2.0
1:00:00	812.584	0.15	71	69	2.0
1:10:00	814.670	0.15	72	70	2.0
1:20:00	817.085	0.15	73	71	2.0
1:30:00	819.522	0.15	74	72	2.0
1:40:00	821.880	0.15	75	73	2.0
1:50:00	824.351	0.15	75	74	2.0
2:00:00	826.738	0.15	76	74	2.0
2:10:00	829.118	0.15	76	75	2.0
2:20:00	831.117				
2:30:00					
2:40:00					
2:44:54					
3:00:00					
3:10:00					

Signature_____

Quality Review_____

Test ID:	CSL-00010	
Date:	3/12/18	

	ISS#/AS#	Filter/FH ID #	Pre-Weight Avg (g)	Post Weight Avg (g)	Total Catch (g)	Total Catch (mg)
Ambient	AS-1	G-18-0024	0.1163	0.1163	**0.0000**	0.000
	AS-1	FF-04	63.8933	63.8932	**-0.0002**	0.000
ISS 1	ISS-1	G-18-0025	0.1121	0.1155	**0.0034**	3.450
	ISS-1	G-18-0026	0.1117	0.1116	**0.0000**	0.000
	ISS-1	FF-08	63.9892	63.9891	**-0.0001**	0.000
ISS 2A	ISS-2	G-18-0027	0.1164	0.1196	**0.0032**	3.250
	ISS-2	G-18-0028	0.1128	0.1129	**0.0001**	0.100
	ISS-2	FF-05	63.8484	63.8484	**0.0000**	0.000
ISS 2B	ISS-2	G-18-0032	0.1180	0.1181	**0.0001**	0.100
	ISS-2	G-18-0031	0.1120	0.1117	**-0.0003**	0.000
	ISS-2	FF-14	63.9026	63.9026	**0.0000**	0.000
n/a	ISS-2				**0.0000**	0.000
	ISS-2				**0.0000**	0.000
	ISS-2				**0.0000**	0.000

Signature_____

Quality Review_____

Test ID:	CSL-00010
Date:	3/12/18

ISS-1

Test Duration (hh:mm:ss)	T_t	V_{mr}	v_s	T_m	T_d	V_m	v_m	T_s	T_{mr}	PR
0:00:00										
0:10:00	10	0.067	11.03261	291.2	313.9556	0.067	11.47466	315.0086	291.2056	95.82623
0:20:00	20	0.068	11.1216	291.3	314.2333	0.135	11.72867	314.15	291.3444	95.23123
0:30:00	30	0.068	11.1685	291.5	314.5389	0.204	11.72213	313.8	291.7611	96.12694
0:40:00	40	0.067	11.09454	291.7	314.0944	0.270	11.45179	313.7543	292.3167	95.41349
0:50:00	50	0.067	11.04664	291.9	313.9	0.338	11.17559	313.7422	292.8722	98.35991
1:00:00	60	0.066	11.08741	292.1	313.8722	0.403	11.44822	313.5589	293.15	94.38565
1:10:00	70	0.055	11.11924	292.3	313.6778	0.459	11.71641	313.4937	293.4278	80.00468
1:20:00	80	0.066	11.14514	292.5	313.4556	0.525	11.71432	313.3818	293.9833	95.80211
1:30:00	90	0.067	11.1669	292.8	313.3444	0.592	11.71186	313.2501	294.5389	96.69024
1:40:00	100	0.068	11.13767	293.0	312.8167	0.660	11.44017	313.1178	294.9556	99.26956
1:50:00	110	0.068	11.15733	293.2	312.5944	0.728	11.43639	312.9108	295.2333	99.31126
2:00:00	120	0.066	11.17436	293.4	312.2056	0.794	11.70222	312.7347	295.5111	93.89537
2:10:00	130	0.067	11.15197	293.5	311.9	0.861	11.42876	312.4935	295.7889	98.09508
2:20:00	140	0.060	#VALUE!	Error	314.9278	0.921	11.14964	312.2869	Error	#VALUE!
2:30:00	150	Error	#VALUE!	Error	314.9278	Error	#DIV/0!	312.2869	Error	#VALUE!
2:40:00	160	Error	#VALUE!	Error	314.9278	Error	#DIV/0!	312.2869	Error	#VALUE!
2:44:54	165	Error	#VALUE!	Error	314.9278	Error	#DIV/0!	312.2869	Error	#VALUE!
3:00:00	180	Error	#VALUE!	Error	314.9278	Error	#DIV/0!	312.2869	Error	#VALUE!
3:10:00	190	Error	#VALUE!	Error	314.9278	Error	#DIV/0!	312.2869	Error	#VALUE!
3:20:00	200	Error	#VALUE!	Error	314.9278	Error	#DIV/0!	312.2869	Error	#VALUE!
3:30:00	210	Error	#VALUE!	Error	314.9278	Error	#DIV/0!	312.2869	Error	#VALUE!
3:40:00	220	Error	#VALUE!	Error	314.9278	Error	#DIV/0!	312.2869	Error	#VALUE!
3:50:00	230	Error	#VALUE!	Error	314.9278	Error	#DIV/0!	312.2869	Error	#VALUE!
4:00:00	240	Error	#VALUE!	Error	314.9278	Error	#DIV/0!	312.2869	Error	#VALUE!
4:10:00	250	Error	#VALUE!	Error	314.9278	Error	#DIV/0!	312.2869	Error	#VALUE!
4:20:00	260	Error	#VALUE!	Error	314.9278	Error	#DIV/0!	312.2869	Error	#VALUE!
4:30:00	270	Error	#VALUE!	Error	314.9278	Error	#DIV/0!	312.2869	Error	#VALUE!
4:40:00	280	Error	#VALUE!	Error	314.9278	Error	#DIV/0!	312.2869	Error	#VALUE!
4:50:00	290	Error	#VALUE!	Error	314.9278	Error	#DIV/0!	312.2869	Error	#VALUE!
5:00:00	300	Error	#VALUE!	Error	314.9278	Error	#DIV/0!	312.2869	Error	#VALUE!
5:10:00	310	Error	#VALUE!	Error	314.9278	Error	#DIV/0!	312.2869	Error	#VALUE!
5:20:00	320	Error	#VALUE!	Error	314.9278	Error	#DIV/0!	312.2869	Error	#VALUE!
5:30:00	330	Error	#VALUE!	Error	314.9278	Error	#DIV/0!	312.2869	Error	#VALUE!
5:40:00	340	Error	#VALUE!	Error	314.9278	Error	#DIV/0!	312.2869	Error	#VALUE!
5:50:00	350	Error	#VALUE!	Error	314.9278	Error	#DIV/0!	312.2869	Error	#VALUE!
6:00:00	360	Error	#VALUE!	Error	314.9278	Error	#DIV/0!	312.2869	Error	#VALUE!
6:10:00	370	Error	#VALUE!	Error	314.9278	Error	#DIV/0!	312.2869	Error	#VALUE!
6:20:00	380	Error	#VALUE!	Error	314.9278	Error	#DIV/0!	312.2869	Error	#VALUE!
6:30:00	390	Error	#VALUE!	Error	314.9278	Error	#DIV/0!	312.2869	Error	#VALUE!
6:40:00	400	Error	#VALUE!	Error	314.9278	Error	#DIV/0!	312.2869	Error	#VALUE!
6:50:00	410	Error	#VALUE!	Error	314.9278	Error	#DIV/0!	312.2869	Error	#VALUE!
7:00:00	420	Error	#VALUE!	Error	314.9278	Error	#DIV/0!	312.2869	Error	#VALUE!
7:10:00	430	Error	#VALUE!	Error	314.9278	Error	#DIV/0!	312.2869	Error	#VALUE!
7:20:00	440	Error	#VALUE!	Error	314.9278	Error	#DIV/0!	312.2869	Error	#VALUE!
7:30:00	450	Error	#VALUE!	Error	314.9278	Error	#DIV/0!	312.2869	Error	#VALUE!
7:40:00	460	Error	#VALUE!	Error	314.9278	Error	#DIV/0!	312.2869	Error	#VALUE!
7:50:00	470	Error	#VALUE!	Error	314.9278	Error	#DIV/0!	312.2869	Error	#VALUE!
8:00:00	480	Error	#VALUE!	Error	314.9278	Error	#DIV/0!	312.2869	Error	#VALUE!
8:10:00	490	Error	#VALUE!	Error	314.9278	Error	#DIV/0!	312.2869	Error	#VALUE!
8:20:00	500	Error	#VALUE!	Error	314.9278	Error	#DIV/0!	312.2869	Error	#VALUE!
8:30:00	510	Error	#VALUE!	Error	314.9278	Error	#DIV/0!	312.2869	Error	#VALUE!
8:40:00	520	Error	#VALUE!	Error	314.9278	Error	#DIV/0!	312.2869	Error	#VALUE!
8:50:00	530	Error	#VALUE!	Error	314.9278	Error	#DIV/0!	312.2869	Error	#VALUE!
9:00:00	540	Error	#VALUE!	Error	314.9278	Error	#DIV/0!	312.2869	Error	#VALUE!
9:10:00	550	Error	#VALUE!	Error	314.9278	Error	#DIV/0!	312.2869	Error	#VALUE!
9:20:00	560	Error	#VALUE!	Error	314.9278	Error	#DIV/0!	312.2869	Error	#VALUE!
9:30:00	570	Error	#VALUE!	Error	314.9278	Error	#DIV/0!	312.2869	Error	#VALUE!
9:40:00	580	Error	#VALUE!	Error	314.9278	Error	#DIV/0!	312.2869	Error	#VALUE!
9:50:00	590	Error	#VALUE!	Error	314.9278	Error	#DIV/0!	312.2869	Error	#VALUE!
10:00:00	600	Error	#VALUE!	Error	314.9278	Error	#DIV/0!	312.2869	Error	#VALUE!
10:10:00	610	Error	#VALUE!	Error	314.9278	Error	#DIV/0!	312.2869	Error	#VALUE!
10:20:00	620	Error	#VALUE!	Error	314.9278	Error	#DIV/0!	312.2869	Error	#VALUE!
10:30:00	630	Error	#VALUE!	Error	314.9278	Error	#DIV/0!	312.2869	Error	#VALUE!
10:40:00	640	Error	#VALUE!	Error	314.9278	Error	#DIV/0!	312.2869	Error	#VALUE!
10:50:00	650	Error	#VALUE!	Error	314.9278	Error	#DIV/0!	312.2869	Error	#VALUE!
11:00:00	660	Error	#VALUE!	Error	314.9278	Error	#DIV/0!	312.2869	Error	#VALUE!
11:10:00	670	Error	#VALUE!	Error	314.9278	Error	#DIV/0!	312.2869	Error	#VALUE!
11:20:00	680	Error	#VALUE!	Error	314.9278	Error	#DIV/0!	312.2869	Error	#VALUE!
11:30:00	690	Error	#VALUE!	Error	314.9278	Error	#DIV/0!	312.2869	Error	#VALUE!
11:40:00	700	Error	#VALUE!	Error	314.9278	Error	#DIV/0!	312.2869	Error	#VALUE!
11:50:00	710	Error	#VALUE!	Error	314.9278	Error	#DIV/0!	312.2869	Error	#VALUE!
12:00:00	720	Error	#VALUE!	Error	0	Error	#DIV/0!	312.2869	Error	#VALUE!

ISS-2

Test Duration (hh:mm:ss)	T_t	V_{mr}	v_s	T_m	T_d	V_m	v_m	T_s	T_{mr}	PR
0:00:00										
0:10:00	10	0.069348	11.03261	292.5944	314.2056	0.069348	11.47466	315.0086	292.5944	95.90254
0:20:00	20	0.066771	11.1216	292.7333	313.9556	0.136119	11.72867	314.15	292.7333	92.97135
0:30:00	30	0.066261	11.1685	293.15	314.2333	0.202381	11.72213	313.8	293.15	93.71323
0:40:00	40	0.065525	11.09454	293.5667	314.5389	0.267906	11.45179	313.7543	293.5667	95.01817
0:50:00	50	0.065865	11.04664	293.8444	314.0944	0.333771	11.17559	313.7422	293.8444	97.63901
1:00:00	60	0.061844	11.08741	294.1222	313.9	0.395615	11.44822	313.5589	294.1222	90.93697
1:10:00	70	0.059069	11.11924	294.5389	313.8722	0.454684	11.71641	313.4937	294.5389	86.40773
1:20:00	80	0.068385	11.14514	295.0944	313.6778	0.523069	11.71432	313.3818	295.0944	99.60279
1:30:00	90	0.069008	11.1669	295.65	313.4556	0.592077	11.71186	313.2501	295.65	100.082
1:40:00	100	0.066771	11.13767	296.2056	313.3444	0.658848	11.44017	313.1178	296.2056	98.73696
1:50:00	110	0.069971	11.15733	296.6222	312.8167	0.728819	11.43639	312.9108	296.6222	102.9987
2:00:00	120	0.067592	11.17436	296.9	312.5944	0.796411	11.70222	312.7347	296.9	97.20773
2:10:00	130	0.067394	11.15197	297.1778	312.2056	0.863805	11.42876	312.4935	297.1778	98.87843
2:20:00	140	0.056605	#VALUE!	Error	311.9	0.920411	11.14964	312.2869	Error	#VALUE!
2:30:00	150	Error	#VALUE!	Error	314.9278	Error	#DIV/0!	312.2869	Error	#VALUE!
2:40:00	160	Error	#VALUE!	Error	314.9278	Error	#DIV/0!	312.2869	Error	#VALUE!
2:44:54	165	Error	#VALUE!	Error	314.9278	Error	#DIV/0!	312.2869	Error	#VALUE!
3:00:00	180	Error	#VALUE!	Error	314.9278	Error	#DIV/0!	312.2869	Error	#VALUE!
3:10:00	190	Error	#VALUE!	Error	314.9278	Error	#DIV/0!	312.2869	Error	#VALUE!
3:20:00	200	Error	#VALUE!	Error	314.9278	Error	#DIV/0!	312.2869	Error	#VALUE!
3:30:00	210	Error	#VALUE!	Error	314.9278	Error	#DIV/0!	312.2869	Error	#VALUE!
3:40:00	220	Error	#VALUE!	Error	314.9278	Error	#DIV/0!	312.2869	Error	#VALUE!
3:50:00	230	Error	#VALUE!	Error	314.9278	Error	#DIV/0!	312.2869	Error	#VALUE!
4:00:00	240	Error	#VALUE!	Error	314.9278	Error	#DIV/0!	312.2869	Error	#VALUE!
4:10:00	250	Error	#VALUE!	Error	314.9278	Error	#DIV/0!	312.2869	Error	#VALUE!
4:20:00	260	Error	#VALUE!	Error	314.9278	Error	#DIV/0!	312.2869	Error	#VALUE!
4:30:00	270	Error	#VALUE!	Error	314.9278	Error	#DIV/0!	312.2869	Error	#VALUE!
4:40:00	280	Error	#VALUE!	Error	314.9278	Error	#DIV/0!	312.2869	Error	#VALUE!
4:50:00	290	Error	#VALUE!	Error	314.9278	Error	#DIV/0!	312.2869	Error	#VALUE!
5:00:00	300	Error	#VALUE!	Error	314.9278	Error	#DIV/0!	312.2869	Error	#VALUE!
5:10:00	310	Error	#VALUE!	Error	314.9278	Error	#DIV/0!	312.2869	Error	#VALUE!
5:20:00	320	Error	#VALUE!	Error	314.9278	Error	#DIV/0!	312.2869	Error	#VALUE!
5:30:00	330	Error	#VALUE!	Error	314.9278	Error	#DIV/0!	312.2869	Error	#VALUE!
5:40:00	340	Error	#VALUE!	Error	314.9278	Error	#DIV/0!	312.2869	Error	#VALUE!
5:50:00	350	Error	#VALUE!	Error	314.9278	Error	#DIV/0!	312.2869	Error	#VALUE!
6:00:00	360	Error	#VALUE!	Error	314.9278	Error	#DIV/0!	312.2869	Error	#VALUE!
6:10:00	370	Error	#VALUE!	Error	314.9278	Error	#DIV/0!	312.2869	Error	#VALUE!
6:20:00	380	Error	#VALUE!	Error	314.9278	Error	#DIV/0!	312.2869	Error	#VALUE!
6:30:00	390	Error	#VALUE!	Error	314.9278	Error	#DIV/0!	312.2869	Error	#VALUE!
6:40:00	400	Error	#VALUE!	Error	314.9278	Error	#DIV/0!	312.2869	Error	#VALUE!
6:50:00	410	Error	#VALUE!	Error	314.9278	Error	#DIV/0!	312.2869	Error	#VALUE!
7:00:00	420	Error	#VALUE!	Error	314.9278	Error	#DIV/0!	312.2869	Error	#VALUE!
7:10:00	430	Error	#VALUE!	Error	314.9278	Error	#DIV/0!	312.2869	Error	#VALUE!
7:20:00	440	Error	#VALUE!	Error	314.9278	Error	#DIV/0!	312.2869	Error	#VALUE!
7:30:00	450	Error	#VALUE!	Error	314.9278	Error	#DIV/0!	312.2869	Error	#VALUE!
7:40:00	460	Error	#VALUE!	Error	314.9278	Error	#DIV/0!	312.2869	Error	#VALUE!
7:50:00	470	Error	#VALUE!	Error	314.9278	Error	#DIV/0!	312.2869	Error	#VALUE!
8:00:00	480	Error	#VALUE!	Error	314.9278	Error	#DIV/0!	312.2869	Error	#VALUE!
8:10:00	490	Error	#VALUE!	Error	314.9278	Error	#DIV/0!	312.2869	Error	#VALUE!
8:20:00	500	Error	#VALUE!	Error	314.9278	Error	#DIV/0!	312.2869	Error	#VALUE!
8:30:00	510	Error	#VALUE!	Error	314.9278	Error	#DIV/0!	312.2869	Error	#VALUE!
8:40:00	520	Error	#VALUE!	Error	314.9278	Error	#DIV/0!	312.2869	Error	#VALUE!
8:50:00	530	Error	#VALUE!	Error	314.9278	Error	#DIV/0!	312.2869	Error	#VALUE!
9:00:00	540	Error	#VALUE!	Error	314.9278	Error	#DIV/0!	312.2869	Error	#VALUE!
9:10:00	550	Error	#VALUE!	Error	314.9278	Error	#DIV/0!	312.2869	Error	#VALUE!
9:20:00	560	Error	#VALUE!	Error	314.9278	Error	#DIV/0!	312.2869	Error	#VALUE!
9:30:00	570	Error	#VALUE!	Error	314.9278	Error	#DIV/0!	312.2869	Error	#VALUE!
9:40:00	580	Error	#VALUE!	Error	314.9278	Error	#DIV/0!	312.2869	Error	#VALUE!
9:50:00	590	Error	#VALUE!	Error	314.9278	Error	#DIV/0!	312.2869	Error	#VALUE!
10:00:00	600	Error	#VALUE!	Error	314.9278	Error	#DIV/0!	312.2869	Error	#VALUE!
10:10:00	610	Error	#VALUE!	Error	314.9278	Error	#DIV/0!	312.2869	Error	#VALUE!
10:20:00	620	Error	#VALUE!	Error	314.9278	Error	#DIV/0!	312.2869	Error	#VALUE!
10:30:00	630	Error	#VALUE!	Error	314.9278	Error	#DIV/0!	312.2869	Error	#VALUE!
10:40:00	640	Error	#VALUE!	Error	314.9278	Error	#DIV/0!	312.2869	Error	#VALUE!
10:50:00	650	Error	#VALUE!	Error	314.9278	Error	#DIV/0!	312.2869	Error	#VALUE!
11:00:00	660	Error	#VALUE!	Error	314.9278	Error	#DIV/0!	312.2869	Error	#VALUE!
11:10:00	670	Error	#VALUE!	Error	314.9278	Error	#DIV/0!	312.2869	Error	#VALUE!
11:20:00	680	Error	#VALUE!	Error	314.9278	Error	#DIV/0!	312.2869	Error	#VALUE!
11:30:00	690	Error	#VALUE!	Error	314.9278	Error	#DIV/0!	312.2869	Error	#VALUE!
11:40:00	700	Error	#VALUE!	Error	314.9278	Error	#DIV/0!	312.2869	Error	#VALUE!
11:50:00	710	Error	#VALUE!	Error	314.9278	Error	#DIV/0!	312.2869	Error	#VALUE!
12:00:00	720	Error	#VALUE!	Error	314.9278	Error	#DIV/0!	312.2869	Error	#VALUE!

T_t	total sampling time	min
V_{mr}	volume of dry gas sample as measured by dry gas meter during each 10 minute interval, *i* , of the test run	dry m^3
v_s	average gas velocity in the dilution tunnel (gas molecular weight may be assumed to be 29g/gmol	m/s
T_m	absolute average dry gas meter temperature	K
T_d	absolute average gas temperature in the dilution tunnel during each 10 min interval, *i* , of test run	K
V_m	volume of gas sample as measured by dry gas meter	dry m^3
v_m	average gas velocity in the dilution tunnel during each 10 min interval, *i*, of the test run	m/s
T_s	absolute average gas temperature in the dilution tunnel	K
T_{mr}	absolute average dry gas meter temperature during each 10 min interval, *i* , of the test run	K
PR	proportional rate variation for each 10 minute interval	%

Signature

Quality Review

Test ID	CSL-00010
Date	3/12/18

Module 2			
Variable	**Description**	**Value**	**Units**
	final volume module 2	812.584	cubic feet
	initial volume module 2	798.613	cubic feet
V_{m2}	total gas volume collected (module 2)	13.971	cubic feet
Average ΔH	average delta H over entirety of run	0.15	in water
T_m	average gas meter temperature	67	°F
P_{bar}	barometric pressure	29.8	in Hg
Y	DGM calibration factor	1.003	unitless
K_1	volume corrected to standard conditions	17.64	°F/(in Hg)
V_{mstd}	volume gas sampled (corrected to standard conditions)	13.9943261	dscf
Total Catch	total catch (raw data)	3.35	mg
C_s	concentration of PM in tunnel gas (dry basis, corrected to standard conditions	0.00023938	g/dscf

Ambient			
Variable	**Description**	**Value**	**Units**
	final volume ambient	91.9520	cubic meters
	initial volume ambient	91.9520	cubic meters
V_{mR}	total gas volume collected (ambient)	0.0000	cubic feet
Average ΔH	average delta H over entirety of run	4.00	in water
T_m	average gas meter temperature	68.6	°F
P_{bar}	barometric pressure	29.8	in Hg
Y	DGM calibration factor	1.002	unitless
K_1	volume corrected to standard conditions	17.64	°F/(in Hg)
V_{mRstd}	volume gas sampled (corrected to standard conditions)	0	dscf
Total Catch	total catch (raw data)	0	mg
C_R	concentration of PM in tunnel gas (dry basis, corrected to standard conditions	#DIV/0!	g/dscf

Total Particulate Matter (based on ISS-2 and AS-1 data)			
C_s	concentration of PM in tunnel gas (dry basis, corrected to standard conditions	0.00023938	g/dscf
C_R	concentration of PM in tunnel gas (dry basis, corrected to standard conditions	0	g/dscf
Q_{std}	average gas flow rate through dilution tunnel	285.978588	dscf/min
B_{ws}	water vapor in gas stream (assumed) (proportion by volume)	0.02	unitless
v_s	average velocity of gas through dilution tunnel	15.0219268	ft/s
A	cross-sectional area of dilution tunnel	0.349	square ft
T_s	average gas temperature in dilution tunnel	566.87	R
T_{std}	absolute average gas temperature in dilution tunnel	528	R
P_s	average gas static pressure in dilution tunnel	29.8	in Hg
P_{std}	standard absolute pressure	29.92	in Hg
F_p	adjustment factor for center of tunnel pitot tube placement	0.98	unitless
V_{straw}	average gas velocity after multi point pitot traverse	295	ACFM
V_{scent}	average gas velocity at center of dilution tunnel calculated after pitot tube traverse	301	ACFM
K_p	pitot tube constant	85.49	ft/sec((lb/lb-mole)(in Hg))/((R)(in
C_p	pitot tube coefficient	0.99	unitless
ΔP_{avg}	average velocity pressure in dilution tunnel	0.05	in H_2O
M_s	dilution tunnel dry gas MW (assumed)	29	lb/(lb-mol)
Θ	total sampling time	60.00	min
E_T	total particulate emissions	4.10750012	g

Signature_____

Quality Review_____

Test ID	CSL-00010
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Module 1			
Variable	**Description**	**Value**	**Units**
	final volume module 1	526.481	cubic feet
	initial volume module 1	493.972	cubic feet
V_{m1}	total gas volume collected (module 1)	32.509	cubic feet
Average ΔH	average delta H over entirety of run	0.15	in water
T_m	average gas meter temperature	69	°F
P_{bar}	barometric pressure	29.8	in Hg
Y	DGM calibration factor	1.004	unitless
K_1	volume corrected to standard conditions	17.64	R/(in Hg)
V_{mstd}	volume gas sampled (corrected to standard conditions)	32.4789829	dscf
Total Catch	total catch (raw data)	3.45	mg
C_s	concentration of PM in tunnel gas (dry basis, corrected to standard conditions	0.00010622	g/dscf

Module 2			
Variable	**Description**	**Value**	**Units**
	final volume module 2	831.117	cubic feet
	initial volume module 2	798.613	cubic feet
V_{m2}	total gas volume collected (module 2)	32.504	cubic feet
Average ΔH	average delta H over entirety of run	0.15	in water
T_m	average gas meter temperature	71	°F
P_{bar}	barometric pressure	29.8	in Hg
Y	DGM calibration factor	1.003	unitless
K_1	volume corrected to standard conditions	17.64	°F/(in Hg)
V_{mstd}	volume gas sampled (corrected to standard conditions)	32.31503117	dscf
Total Catch	total catch (raw data)	3.45	mg
C_s	concentration of PM in tunnel gas (dry basis, corrected to standard conditions	0.000106761	g/dscf

Ambient			
Variable	**Description**	**Value**	**Units**
	final volume ambient	92.2500	cubic meters
	initial volume ambient	91.9520	cubic meters
V_{mA}	total gas volume collected (ambient)	10.5238	cubic feet
Average ΔH	average delta H over entirety of run	3.57	in water
T_m	average gas meter temperature	71.8	°F
P_{bar}	barometric pressure	29.8	in Hg
Y	DGM calibration factor	1.002	unitless
K_1	volume corrected to standard conditions	17.64	°F/(in Hg)
V_{mAstd}	volume gas sampled (corrected to standard conditions)	10.52621601	dscf
Total Catch	total catch (raw data)	0	mg
C_s	concentration of PM in tunnel gas (dry basis, corrected to standard conditions	0	g/dscf

Total Particulate Matter (based on ISS-2 and AS-1 data)			
C_s	concentration of PM in tunnel gas (dry basis, corrected to standard conditions	0.00010649	g/dscf
C_a	concentration of PM in tunnel gas (dry basis, corrected to standard conditions	0	g/dscf
Q_{std}	average gas flow rate through dilution tunnel	296.272424	dscf/min
B_{ws}	water vapor in gas stream (assumed) (proportion by volume)	0.02	unitless
v_s	average velocity of gas through dilution tunnel	15.4321401	ft/s
A	cross-sectional area of dilution tunnel	0.349	square ft
T_s	average gas temperature in dilution tunnel	562.116429	R
T_{std}	absolute average gas temperature in dilution tunnel	528	R
P_s	average gas static pressure in dilution tunnel	29.8	in Hg
P_{std}	standard absolute pressure	29.92	in Hg
F_p	adjustment factor for center of tunnel pitot tube placement	0.98	unitless
V_{craw}	average gas velocity after multi point pitot traverse	295	ACFM
V_{cavrt}	average gas velocity at center of dilution tunnel calculated after pitot tube traverse	301	ACFM
K_p	pitot tube constant	85.49	ft/sec)[(lb/lb-mole)/(in Hg)](460+ water)]^(1/2)
C_p	pitot tube coefficient	0.99	unitless
ΔP_{avg}	average velocity pressure in dilution tunnel	0.05321429	in H_2O
M_s	dilution tunnel dry gas MW (assumed)	29	lb/(lb-mol)
Θ	total sampling time	139.00	min
E_T	total particulate emissions	4.3855394	g

Signature: Kelli O'Brien

Quality Review:

Test ID:	CSL-00010
Date:	3/12/18

Q_{in}	Btu	#DIV/0!	
$Q_{in\ LHV}$		#DIV/0!	
$Q_{inCorrected}$	Btu	#DIV/0!	
Q_{Out}	Btu	#VALUE!	(3 sig figs)
Heat Output Rate	Btu/hr	#VALUE!	(3 sig figs)
Load Draw	Btu/hr	0	
$E_{g/MJ}$	g/MJ	#VALUE!	
$E_{lb/MMBtu}$	lb/MMBtu	#VALUE!	
$E_{g/kg}$	g/kg	#REF!	
$E_{g/hr}$	g/hr	1.893038588	
Θ_1	min	0.00	
Θ_2	min	0.00	
Θ_3	min	139.00	
Θ_4	hours	0	
Θ	hours	2.32	
η_{del}	%	#VALUE!	
$\eta_{del\ LHV}$	%	#VALUE!	

E_1	g	4.10750
E_2	g	#DIV/0!
E_3	g	0.00000
$E_{1\_g/kg}$	g/kg	#REF!
$E_{2\_g/kg}$	g/kg	#DIV/0!
$E_{3\_g/kg}$	g/kg	#N/A
ET	g	4.385539395

Run #		4
Wood Weight	lbs	0.00
Wood Moisture	%DB	#DIV/0!
Min H_2O Temp (T2)	°F	#N/A

CO_{1}	Startup CO emission (g)	#N/A
CO_{2}	Steady State CO emission (g)	#N/A
CO_{3}	End CO emission (g)	#N/A
COT	Total CO emission (g)	#N/A

Signature

Quality Review

Fill in boxes in light red. Calculated values are yellow.

Measurement Uncertainty for Total Particulate Emissions

	Measured Value	Measurement Uncertainty (+/-)	Units
Sample Filter Catch Average ISS1 and ISS2 (Fc):	0.00345	0.000273205	g
Sample Flow Rate (Qsample):	0.23	0.0023	dscfm
Sampling Duration (theta):	139	0.1	minutes
Background Filter Catch (BGc):	0	0.000273205	g
Background Filter Flow Rate (Qbg):	0.076	0.00076	dscfm
Tunnel Flow Rate (Qstd):	296	5.92	dscfm

Number of Total Weighings Required to Find Sample Filter Catch:	3
Number of Total Weighings Required to Find Background Filter Catch:	3

Et = (Cs-Cr)Qstd(Theta)
Cs= sample filter catch/(sample flow rate*test duration) g/dscf
Cr= room background filter catch / (sample flow*test duration) g/dscf
Qstd = average dilution tunnel flow rate, dscf/min
Theta = sampling time, minutes

Calculating MU of Cs		
Cs	0.000107914	
Delta Cs/Delta Fc	0.031279324	
Delta Cs/Delta Qsample	-0.00046919	
Delta Cs/Delta Theta	-7.76357E-07	
MU of Cs	8.61389E-06	g

Calculating MU of Cr		
Cr	0	
Delta Cr/DeltaBGc	0.094661113	
Delta Cr/Delta Qbg	0	
Delta Cr/Delta Theta	0	
MU of Cr	2.58619E-05	g

Calculating MU of Et		
Et	4.44	g
Delta Et/Delta Cs	41144	
Delta Et/Delta Cr	41144	
Delta Et/Delta Qstd	0.015	
Delta Et/Delta theta	0.031942446	
MU of Et	1.125046502	g

ET =	4.44	grams
with a 95% Confidence Interval of:	1.125046502	(+/-) grams

Signature: Kelli O'Brien

Plant Name: CLST Page: 1

General Average Report

Reporting Period: 03/12/2018 to 03/12/2018

Site Name: SAMPLE Time of Report: 03/12/18 17:35

Data Averaging Type: 1m Rolling Average Interval: 1

Date	Time	Z (none)	COND2OUT (Deg_F)	DIL_CO2 (%)	DILRATIO (RATIO)	FILT1OUT (Deg_F)	FILT2OUT (Deg_F)	ROOM_TMP (Deg_F)	TUNL_TMP (Deg_F)	UNIT_WT (lbs)	Fuel consumed + coal bed
3/12/18	14:40	1	63.6		3.142	66.7	67.4	65.4	107.2	14.54	11.88
3/12/18	14:41	1	63.5		2.95	67.4	71.3	65	112.7	14.54	11.88
3/12/18	14:42	1	63.3		3.01	68.5	74.4	65.3	116.2	14.59	11.93
3/12/18	14:43	1	63.1		3.164	69.3	75.1	65	108	14.27	11.61
3/12/18	14:44	1	63		3.087	69.9	75.5	64.9	106.5	14.1	11.44
3/12/18	14:45	1	63.1		3.029	70.4	76.1	65	106	13.91	11.25
3/12/18	14:46	1	63		3.048	71	76.7	65.1	105.2	13.72	11.06
3/12/18	14:47	1	63		3.034	71.5	76.9	65.2	105	13.56	10.9
3/12/18	14:48	1	62.9		2.984	71.9	77.3	65.2	104.9	13.41	10.75
3/12/18	14:49	1	62.7		2.997	72.3	77.6	65	104.5	13.25	10.59
3/12/18	14:50	1	62.7		2.984	72.6	77.9	65	104.6	13.1	10.44
3/12/18	14:51	1	62.6		3.018	73	78	65.3	104.4	12.94	10.28
3/12/18	14:52	1	62.7		2.994	73.1	78.1	65.2	104.4	12.77	10.11
3/12/18	14:53	1	62.5		3.03	73.3	78.3	65.5	104.3	12.61	9.95
3/12/18	14:54	1	62.2		2.999	73.6	78.6	65.6	104.4	12.46	9.8
3/12/18	14:55	1	61.8		3.018	74	78.9	65.6	104.2	12.32	9.66
3/12/18	14:56	1	61.3		3.035	74.1	79	65.6	104	12.16	9.5
3/12/18	14:57	1	60.6		3.032	74.3	79.1	65.6	103.8	11.99	9.33
3/12/18	14:58	1	59.9		3.002	74.4	79	65.8	103.9	11.81	9.15
3/12/18	14:59	1	59.6		2.967	74.6	79.5	65.7	103.9	11.67	9.01
3/12/18	15:00	1	59.1		3.046	74.6	79.4	65.8	103.7	11.52	8.86
3/12/18	15:01	1	58.7		3.054	74.7	79.5	66	103.4	11.35	8.69
3/12/18	15:02	1	58.2		3.089	74.8	79.5	66	103.3	11.21	8.55
3/12/18	15:03	1	57.9		3.048	74.8	79.6	65.7	103.6	11.03	8.37
3/12/18	15:04	1	57.6		3.021	75	79.7	65.8	103.9	10.84	8.18
3/12/18	15:05	1	57.3		3.06	75	79.7	65.9	103.3	10.69	8.03
3/12/18	15:06	1	57.1		3.102	75.2	79.8	66.2	103.1	10.52	7.86
3/12/18	15:07	1	56.9		3.008	75.3	80	65.9	103.9	10.38	7.72
3/12/18	15:08	1	56.7		2.98	75.4	80.2	66.3	104.1	10.23	7.57
3/12/18	15:09	1	56.6		2.922	75.6	80.3	66.3	104.7	10.07	7.41
3/12/18	15:10	1	56.3		2.941	75.7	80.5	66.3	104.3	9.91	7.25
3/12/18	15:11	1	56		2.974	75.7	80.5	66.6	104.4	9.75	7.09
3/12/18	15:12	1	55.8		2.941	75.8	80.5	66.3	104.4	9.61	6.95
3/12/18	15:13	1	55.7		3.023	76	80.7	66.6	103.7	9.44	6.78
3/12/18	15:14	1	55.6		3.046	76.2	80.7	67.2	103.7	9.28	6.62
3/12/18	15:15	1	55.5		3.027	76.4	80.8	67.2	104.6	9.11	6.45
3/12/18	15:16	1	55.5		3.011	76.5	80.9	66.8	105.1	8.96	6.3
3/12/18	15:17	1	55.5		2.971	76.7	81.1	66.8	105.5	8.82	6.16
3/12/18	15:18	1	55.5		2.876	76.8	81.2	66.7	105.7	8.67	6.01
3/12/18	15:19	1	55.1		2.812	76.8	81.3	66.9	106.3	8.52	5.86
3/12/18	15:20	1	55		2.906	76.6	81.1	67.1	105.8	8.39	5.73
3/12/18	15:21	1	55		2.887	76.7	81.2	67	106	8.28	5.62
3/12/18	15:22	1	54.9		2.888	76.7	81.3	66.8	105.7	8.15	5.49
3/12/18	15:23	1	54.7		2.922	76.7	81.4	66.7	105.6	8.05	5.39
3/12/18	15:24	1	54.7		2.956	76.7	81.3	66.8	105	7.93	5.27
3/12/18	15:25	1	54.7		2.953	76.7	81.3	67	104.8	7.83	5.17
3/12/18	15:26	1	54.5		2.902	76.7	81.4	66.3	104.4	7.71	5.05
3/12/18	15:27	1	54.5		2.879	76.7	81.3	66.5	104.4	7.61	4.95
3/12/18	15:28	1	54.4		2.875	76.5	81.1	66.6	104.6	7.53	4.87
3/12/18	15:29	1	54.3		2.899	76.6	81.3	66.5	104.2	7.43	4.77
3/12/18	15:30	1	54.2		2.908	76.7	81.2	66.6	103.5	7.32	4.66
3/12/18	15:31	1	54.2		2.897	76.5	81	66.6	103.7	7.23	4.57
3/12/18	15:32	1	54.1		2.918	76.3	80.9	66.3	103.3	7.12	4.46
3/12/18	15:33	1	54.2		2.912	76.3	80.9	66.4	103.6	7.03	4.37
3/12/18	15:34	1	54.2		2.932	76.3	80.9	66.4	103.4	6.93	4.27
3/12/18	15:35	1	54		2.955	76.2	80.7	66.5	102.7	6.82	4.16
3/12/18	15:36	1	53.9		2.987	76.1	80.7	66.3	102.1	6.72	4.06
3/12/18	15:37	1	53.9		3.03	76.2	80.9	67	103.1	6.62	3.96
3/12/18	15:38	1	53.7		3.083	76.4	81	67.7	103.3	6.51	3.85
3/12/18	15:39	1	53.8		3.159	76.6	81.3	68.2	103.4	6.42	3.76
3/12/18	15:40	1	54.3		3.199	76.3	113.6	68.3	103.5	6.35	3.69
3/12/18	15:41	1	55.6		3.186	75.8	94.3	68.4	103.3	6.26	3.6
3/12/18	15:42	1	55.8		3.124	76.1	76.1	68.5	103.5	6.17	3.51

3/12/18	15:43	1	55.1	3.126	76.4	77.7	68.6	103.7	6.08	3.42
3/12/18	15:44	1	54.9	3.136	76.7	78.7	68.7	103.9	6	3.34
3/12/18	15:45	1	54.5	3.14	76.8	79.3	68.9	104.3	5.95	3.29
3/12/18	15:46	1	54.3	3.16	76.9	79.6	69	104.1	5.86	3.2
3/12/18	15:47	1	54.3	3.109	77.3	80.1	68.7	104.2	5.79	3.13
3/12/18	15:48	1	54.1	3.116	77.5	80.5	69.1	104	5.72	3.06
3/12/18	15:49	1	54.1	3.122	77.8	80.7	69.3	103.4	5.66	3
3/12/18	15:50	1	54	3.114	77.9	80.9	69.4	103.4	5.58	2.92
3/12/18	15:51	1	54.1	3.168	78.1	81.2	69.6	103.4	5.53	2.87
3/12/18	15:52	1	54.1	3.191	78.2	81.4	69.8	103.5	5.45	2.79
3/12/18	15:53	1	54	3.196	78.3	81.6	69.7	103.3	5.38	2.72
3/12/18	15:54	1	54	3.149	78.6	81.7	69.9	103.3	5.31	2.65
3/12/18	15:55	1	53.9	3.159	78.6	81.9	69.7	103.2	5.24	2.58
3/12/18	15:56	1	54.1	3.185	78.9	82.1	69.8	103	5.18	2.52
3/12/18	15:57	1	54.2	3.218	78.8	82.2	70.1	103	5.11	2.45
3/12/18	15:58	1	54.2	3.166	78.9	82.2	70.1	103.1	5.04	2.38
3/12/18	15:59	1	54.2	3.188	79	82.2	70.2	102.6	4.98	2.32
3/12/18	16:00	1	54.2	3.188	79.2	82.3	70.3	102.7	4.93	2.27
3/12/18	16:01	1	54.1	3.189	79.2	82.5	70.4	103	4.86	2.2
3/12/18	16:02	1	54.2	3.235	79.3	82.5	70.7	102.8	4.8	2.14
3/12/18	16:03	1	54.2	3.274	79.3	82.5	70.7	102.3	4.74	2.08
3/12/18	16:04	1	54.2	3.289	79.4	82.5	70.6	102.1	4.68	2.02
3/12/18	16:05	1	54.2	3.294	79.6	82.7	70.7	102	4.63	1.97
3/12/18	16:06	1	54.2	3.268	79.5	82.8	70.6	102.2	4.57	1.91
3/12/18	16:07	1	54.2	3.269	79.6	82.8	70.8	102.2	4.52	1.86
3/12/18	16:08	1	54.2	3.263	79.6	82.8	70.8	102	4.47	1.81
3/12/18	16:09	1	54.2	3.186	79.7	82.8	70.7	102.1	4.38	1.72
3/12/18	16:10	1	54.2	3.208	79.7	83	70.8	101.9	4.33	1.67
3/12/18	16:11	1	54.5	3.224	79.6	82.8	70.7	101.8	4.29	1.63
3/12/18	16:12	1	54.3	3.246	79.6	82.8	70.6	101.6	4.23	1.57
3/12/18	16:13	1	54.5	3.24	79.7	83	71	101.5	4.19	1.53
3/12/18	16:14	1	54.4	3.263	79.7	82.9	71.4	101.3	4.11	1.45
3/12/18	16:15	1	54.4	3.284	79.7	82.9	71.4	101.4	4.06	1.4
3/12/18	16:16	1	54.4	3.278	79.7	82.9	71.5	101.6	4	1.34
3/12/18	16:17	1	54.4	3.299	79.8	83.1	71.5	101.6	3.96	1.3
3/12/18	16:18	1	54.4	3.295	79.9	83.1	71.4	101.5	3.91	1.25
3/12/18	16:19	1	54.5	3.3	79.8	83	71.6	101.5	3.85	1.19
3/12/18	16:20	1	54.5	3.254	79.9	83.1	70.7	101	3.82	1.16
3/12/18	16:21	1	54.4	3.242	79.8	83	71.2	100.4	3.77	1.11
3/12/18	16:22	1	54.4	3.264	79.7	82.8	71.3	100.3	3.74	1.08
3/12/18	16:23	1	54.6	3.337	79.7	82.8	71.9	100	3.69	1.03
3/12/18	16:24	1	54.7	3.345	79.8	82.9	71.9	100.4	3.65	0.99
3/12/18	16:25	1	54.6	3.343	79.7	82.9	71.9	100.6	3.61	0.95
3/12/18	16:26	1	54.5	3.339	79.7	83	72	100.7	3.59	0.93
3/12/18	16:27	1	54.5	3.348	79.6	82.8	71.6	100.2	3.52	0.86
3/12/18	16:28	1	54.7	3.352	79.5	82.7	71.6	99.8	3.5	0.84
3/12/18	16:29	1	54.6	3.392	79.6	82.7	71.6	99	3.46	0.8
3/12/18	16:30	1	54.6	3.344	79.6	82.7	71.8	99.6	3.45	0.79
3/12/18	16:31	1	54.5	3.385	79.5	82.7	72.2	99.8	3.37	0.71
3/12/18	16:32	1	54.5	3.437	79.5	82.7	72.2	99.6	3.36	0.7
3/12/18	16:33	1	54.7	3.393	79.5	82.7	71.9	99.6	3.35	0.69
3/12/18	16:34	1	54.6	3.368	79.6	82.7	71.6	99.3	3.32	0.66
3/12/18	16:35	1	54.6	3.408	79.5	82.7	71.7	99.1	3.26	0.6
3/12/18	16:36	1	54.6	3.368	79.5	82.6	71.8	99.5	3.25	0.59
3/12/18	16:37	1	54.7	3.434	79.4	82.5	72.3	99.3	3.23	0.57
3/12/18	16:38	1	54.7	3.471	79.4	82.4	72.4	99.1	3.2	0.54
3/12/18	16:39	1	54.6	3.488	79.4	82.5	72.4	98.8	3.16	0.5
3/12/18	16:40	1	54.6	3.451	79.5	82.5	72.1	98.6	3.15	0.49
3/12/18	16:41	1	54.6	3.478	79.4	82.4	72.3	98.7	3.14	0.48
3/12/18	16:42	1	54.6	3.499	79.3	82.4	72.3	98.5	3.12	0.46
3/12/18	16:43	1	54.7	3.457	79.5	82.5	72.1	98.5	3.07	0.41
3/12/18	16:44	1	54.7	3.409	79.5	82.4	71.8	98.1	3.05	0.39
3/12/18	16:45	1	54.7	3.36	79.4	82.3	72.1	98.4	3.03	0.37
3/12/18	16:46	1	54.7	3.434	79.3	82.2	72.2	98.2	3.01	0.35
3/12/18	16:47	1	54.7	3.5	79.3	82	72.3	97.9	3	0.34
3/12/18	16:48	1	54.8	3.54	79.3	81.9	72.4	97.6	2.95	0.29
3/12/18	16:49	1	54.9	3.541	79.3	81.9	72	97	2.95	0.29
3/12/18	16:50	1	54.9	3.514	79.3	82	72.3	97.4	2.92	0.26
3/12/18	16:51	1	54.9	3.514	79.2	81.9	72.2	97.4	2.91	0.25
3/12/18	16:52	1	54.8	3.556	79.2	81.9	72.4	97.3	2.88	0.22
3/12/18	16:53	1	54.9	3.523	79.2	81.8	72.3	97.5	2.86	0.2

3/12/18	16:54	1	55.1	3.494	79.1	81.8	72	97.2	2.85	0.19
3/12/18	16:55	1	55.1	3.491	79.2	81.9	72.1	97.1	2.83	0.17
3/12/18	16:56	1	55	3.479	79.2	81.9	72.2	97.1	2.79	0.13
3/12/18	16:57	1	54.9	3.445	79.2	81.9	72.2	97.1	2.76	0.1
3/12/18	16:58	1	55	3.447	79.1	81.7	71.7	96.3	2.76	0.1
3/12/18	16:59	1	55.7	3.443	78.7	80.4	71.8	96.3	2.75	0

Plant Name: CLST Page: 1

General Average Report

Reporting Period: 03/12/2018 to 03/12/2018

Site Name: UNIT Time of Report: 03/12/18 17:34

Data Averaging Type: 1m Rolling Average Interval: 1

Date	Time	TEMP_10 (Deg_F)	TEMP_11 (Deg_F)	TEMP_12 (Deg_F)	TEMP_13 (Deg_F)	CAT_PRE (Deg_F)		
3/12/18	14:40	267.49	218.62	293.83	567.21	279.9	325.41	Average Surface Temp
3/12/18	14:41	271.86	220.67	298.92	564.8	281.4		
3/12/18	14:42	273.98	219.1	302.28	560.94	284.4		
3/12/18	14:43	270.19	220.35	300.81	541.77	287.4		
3/12/18	14:44	272.77	222.21	302.97	539.06	290.5		
3/12/18	14:45	275.27	223.58	305.08	533.69	292.6		
3/12/18	14:46	275.78	223.4	305.81	531.88	293.5		
3/12/18	14:47	275.23	221.79	304.95	529.39	292.9		
3/12/18	14:48	276.43	221.38	307.08	533.68	293.6		
3/12/18	14:49	279.4	224	309.42	528.6	294.3		
3/12/18	14:50	281.43	225.19	310.29	528.51	297.5		
3/12/18	14:51	282.31	226.55	311.15	528.4	296.8		
3/12/18	14:52	282.79	224.75	311.4	532.7	293.7		
3/12/18	14:53	282.38	220.57	310.12	528.71	294.9		
3/12/18	14:54	283.21	223.19	310.36	532.07	295		
3/12/18	14:55	285.73	223.77	311.74	531.51	294.4		
3/12/18	14:56	287.01	225.8	311.29	530.92	294.1		
3/12/18	14:57	286.59	224.69	309.91	534.67	293.7		
3/12/18	14:58	287.33	223	309.76	531.61	294.1		
3/12/18	14:59	288.4	224.56	310.08	533.68	293.4		
3/12/18	15:00	288.91	224.07	311.42	533.28	295.9		
3/12/18	15:01	289.74	226.53	309.11	539	294.1		
3/12/18	15:02	290.44	226.19	311.19	545.93	292.8		
3/12/18	15:03	290.6	225.11	310.41	546.34	291.9		
3/12/18	15:04	289.68	223.48	311.47	542	294.9		
3/12/18	15:05	292.48	227.05	312.47	552.54	297		
3/12/18	15:06	291.41	228.46	311.75	546.85	296.8		
3/12/18	15:07	292.21	226.67	310.99	560.95	294.5		
3/12/18	15:08	290.61	225.74	309.8	562.45	292.4		
3/12/18	15:09	290.43	222.6	310.03	552.27	294.7		
3/12/18	15:10	290.84	223.03	311.3	555.05	295.1		
3/12/18	15:11	292.77	224.53	312.91	559.54	296.7		
3/12/18	15:12	293.02	222.59	312.72	561.14	297.5		
3/12/18	15:13	299.47	223.89	322.33	584.41	307.3		
3/12/18	15:14	301.15	229.51	323.92	588.91	307		
3/12/18	15:15	297.64	230.65	318.57	579.76	301.2		
3/12/18	15:16	295.42	227.12	318.02	577.49	299.1		
3/12/18	15:17	296.96	224.76	319.11	581.64	297.9		
3/12/18	15:18	298.23	224.73	319.46	588.44	297.8		
3/12/18	15:19	297.58	226.78	320.05	584.95	300.3		
3/12/18	15:20	297.74	222.99	320.47	585.18	304.2		
3/12/18	15:21	298.29	222.92	320.56	589.86	304.6		
3/12/18	15:22	298.97	224.51	321.17	589.95	302		

3/12/18	15:23	301.34	223.47	322.45	589.56	301.4
3/12/18	15:24	301.48	224.05	323.06	589.12	302.6
3/12/18	15:25	302.05	223.61	324.09	575.79	307.8
3/12/18	15:26	303.63	225.98	323.4	572.62	307.8
3/12/18	15:27	303.91	226.95	324.09	565.92	309.5
3/12/18	15:28	305.58	226.76	326.27	564.34	308.9
3/12/18	15:29	305.49	229.95	325.87	565.85	307.6
3/12/18	15:30	305.42	228.72	325.96	552.46	309.8
3/12/18	15:31	305.94	227.29	327.65	545.87	312.5
3/12/18	15:32	307.51	229.91	328.71	550.42	312.2
3/12/18	15:33	307.53	227.16	329.11	543.95	313.5
3/12/18	15:34	309.04	227.45	328.79	541.12	312.3
3/12/18	15:35	308.25	228.36	328.53	540.02	312.4
3/12/18	15:36	311.37	228.99	332.62	540.48	318.6
3/12/18	15:37	317.84	235.23	337.14	558.44	325.2
3/12/18	15:38	319.54	240.25	337.65	560.6	324.5
3/12/18	15:39	320.72	242.6	337.85	560.67	326.4
3/12/18	15:40	322.17	244.02	339.42	559.03	326.5
3/12/18	15:41	323.72	243.43	341.06	559.94	327.9
3/12/18	15:42	324.75	244.08	340.95	556.64	329
3/12/18	15:43	325.52	245.95	342.99	555.82	329.8
3/12/18	15:44	327	248.2	344.25	553.96	331.2
3/12/18	15:45	328.75	248.37	345.51	550.89	330.6
3/12/18	15:46	329.65	248.97	345.91	548.8	331.8
3/12/18	15:47	330.04	249	347.81	543.06	331.9
3/12/18	15:48	331.32	249.43	347.91	541.39	332.8
3/12/18	15:49	333.17	250.52	349.25	536.88	333.5
3/12/18	15:50	334.39	250.4	349.13	534.45	333.7
3/12/18	15:51	335.28	251.75	350.05	531.82	334.8
3/12/18	15:52	335.97	252.7	350.76	529.46	334.3
3/12/18	15:53	337.11	253.1	350.62	524.37	334
3/12/18	15:54	339.15	253.25	350.24	521.31	335.8
3/12/18	15:55	339.87	254.35	350.25	520.96	336.6
3/12/18	15:56	340.29	255.57	350.83	516.74	337.8
3/12/18	15:57	340.73	256.02	352.16	513.89	336.5
3/12/18	15:58	341.79	256.52	352.39	512.6	336.4
3/12/18	15:59	341.97	256.35	353.35	510.81	336.3
3/12/18	16:00	342.74	256.68	352.7	506.88	337
3/12/18	16:01	343.46	257.36	352.65	503.65	336.6
3/12/18	16:02	344.72	257.62	353.73	501.29	336.7
3/12/18	16:03	345.85	258.31	353.02	501.1	337.6
3/12/18	16:04	346.01	259.15	352.97	499.58	337.7
3/12/18	16:05	346.34	259.48	353.86	496.93	337.6
3/12/18	16:06	347.5	260.65	353.94	494.77	336.9
3/12/18	16:07	348.18	259.64	354.49	493.24	336.9
3/12/18	16:08	348.16	260.07	355.84	488.71	336.1
3/12/18	16:09	348.35	260.51	356.93	489.6	336.4
3/12/18	16:10	349.23	260.62	355.45	487.22	335.9
3/12/18	16:11	350.34	261.44	354.41	484.47	335.9
3/12/18	16:12	350.23	262.98	355.16	481.18	336.1
3/12/18	16:13	350.99	264.05	354.83	482	337.3

3/12/18	16:14	352.23	264.31	354.48	483.87	338.7		
3/12/18	16:15	352.97	265.32	354.09	481.93	337.7		
3/12/18	16:16	353.31	265.59	353.62	479.94	337.1		
3/12/18	16:17	353.32	265.56	354.03	480.3	337.3		
3/12/18	16:18	354.08	265.76	354.15	481.14	338.1		
3/12/18	16:19	355	265.95	353.81	479.74	338		
3/12/18	16:20	355.18	265.35	354.78	479.72	337.5		
3/12/18	16:21	355.62	266.87	355.39	478.28	337.5		
3/12/18	16:22	355.86	267.46	355.5	477.71	338.8		
3/12/18	16:23	356.52	267.93	354.79	474.05	337.9		
3/12/18	16:24	356.91	269.81	355.07	472.8	336.5		
3/12/18	16:25	357.26	270.71	354.5	472.45	336.6		
3/12/18	16:26	357.47	271.19	354.72	471.44	336		
3/12/18	16:27	358.17	269.71	355.15	469.28	336.4		
3/12/18	16:28	359.71	270.25	353.74	467.17	338.1		
3/12/18	16:29	359.4	270.84	354.28	466.87	337.2		
3/12/18	16:30	360.2	271.54	353.82	464.88	337.9		
3/12/18	16:31	360.89	272.1	354.64	463.28	337.8		
3/12/18	16:32	361.7	273.6	353.94	461.55	337.8		
3/12/18	16:33	362.03	273.67	353.09	459.88	337.1		
3/12/18	16:34	361.6	274.96	353.21	454.94	335.4		
3/12/18	16:35	361.84	275.78	352.95	454.52	336.4		
3/12/18	16:36	363.01	276.79	352.52	452.66	336.8		
3/12/18	16:37	363.62	276.64	352.63	452.05	335.6		
3/12/18	16:38	363.44	277.35	353.23	449.36	336		
3/12/18	16:39	363.77	277.31	353.32	445.58	336.1		
3/12/18	16:40	364.71	277.85	352.93	442.94	335.6		
3/12/18	16:41	365.53	279.11	352.22	439.81	335.6		
3/12/18	16:42	365.36	280.13	352.41	436.93	335.8		
3/12/18	16:43	365.21	279.24	352.47	435.85	335.2		
3/12/18	16:44	364.73	278.64	352.72	432.34	333.8		
3/12/18	16:45	366.25	278.63	351.13	430.45	333.3		
3/12/18	16:46	366.35	279.83	350.72	429.07	333.3		
3/12/18	16:47	366.61	280.48	350.57	426.21	333.9		
3/12/18	16:48	367.21	280.54	350.92	424.28	334.4		
3/12/18	16:49	367.53	280.7	351.19	421.49	334.1		
3/12/18	16:50	368.12	282.89	350.1	419.15	333		
3/12/18	16:51	368.12	283.21	350.98	416.97	333.2		
3/12/18	16:52	368.37	284.17	350.23	416.06	333.5		
3/12/18	16:53	368.96	284.15	348.52	413.25	332.9		
3/12/18	16:54	369.67	284.66	348.5	411.1	332.8		
3/12/18	16:55	369.37	284.22	348.74	409.27	332.7		
3/12/18	16:56	369.62	284.1	348.38	407.7	332.2		
3/12/18	16:57	369.96	285.13	347.25	406.05	332.6		
3/12/18	16:58	370.86	285.97	347.32	404.63	332.4		
3/12/18	16:59	371.3	286.74	346.96	403.81	332.2	348.202	Average Surface Temp

Plant Name: CLST Page: 1

General Average Report

Reporting Period: 03/12/2018 to 03/12/2018

Site Name: UNIT Time of Report: 03/12/18 17:34

Data Averaging Type: 1m Rolling Average Interval: 1

Date	Time	CO2 (%)	CAT_PRE (Deg_F)	CO (%)	CAT_POST (Deg_F)	O2 (%)	STK_CSA (Deg_F)	STK_TMP (Deg_F)
3/12/18	14:40	7.2	279.9	0	911	-999<	419.39	196.8
3/12/18	14:41	5.8	281.4	0.01	881.9	-999<	426.15	204.9
3/12/18	14:42	4.8	284.4	0.09	851.7	-999<	437.99	217.8
3/12/18	14:43	5.5	287.4	0.06	860.8	-999<	416.43	201
3/12/18	14:44	8.3	290.5	0.04	899	-999<	409.07	193.2
3/12/18	14:45	9.9	292.6	0.03	910.8	-999<	408.04	189.3
3/12/18	14:46	9.4	293.5	0.02	918.7	-999<	407.81	187.3
3/12/18	14:47	8.6	292.9	0	915.3	-999<	407.79	186
3/12/18	14:48	8.4	293.6	0	905.5	-999<	406.04	183.6
3/12/18	14:49	8.3	294.3	0.01	908.5	-999<	404.71	183.3
3/12/18	14:50	8.2	297.5	0.01	908.1	-999<	404.01	183.2
3/12/18	14:51	8.9	296.8	0.01	908.1	-999<	404.27	183.3
3/12/18	14:52	8.9	293.7	0.01	914.9	-999<	404.43	182.5
3/12/18	14:53	8.9	294.9	0.01	912.2	-999<	404.01	183.2
3/12/18	14:54	8.7	295	0.02	918.1	-999<	403.5	182
3/12/18	14:55	9	294.4	0.01	911.3	-999<	402.87	182
3/12/18	14:56	9.1	294.1	0.01	915	-999<	403.23	182.2
3/12/18	14:57	9.2	293.7	0.02	922.8	-999<	403.36	181.5
3/12/18	14:58	9.3	294.1	0.01	930	-999<	403.39	180.1
3/12/18	14:59	9.6	293.4	0	933.8	-999<	404	179
3/12/18	15:00	10	295.9	0	938.1	-999<	405.56	181.1
3/12/18	15:01	10.3	294.1	0	952.3	-999<	405.99	180.4
3/12/18	15:02	10.4	292.8	0	966.7	-999<	406.66	181.2
3/12/18	15:03	11	291.9	0	987	-999<	408.95	181.1
3/12/18	15:04	10.9	294.9	0	989.7	-999<	410.78	180.8
3/12/18	15:05	10.8	297	0	980.6	-999<	410.57	180.4
3/12/18	15:06	10.7	296.8	0	972.1	-999<	410.27	180.8
3/12/18	15:07	10.5	294.5	0	965.2	-999<	409.63	180.4
3/12/18	15:08	10.6	292.4	0	961.4	-999<	409.66	178.8
3/12/18	15:09	10.9	294.7	0	965.9	-999<	409.97	178.3
3/12/18	15:10	11.1	295.1	0	974.1	-999<	409.38	178.1
3/12/18	15:11	11.5	296.7	0	980.6	-999<	409.23	179.1
3/12/18	15:12	12	297.5	0	993.6	-999<	410.07	178.3
3/12/18	15:13	12.5	307.3	0	1007.6	-999<	410.42	178.6
3/12/18	15:14	12.9	307	0	1026.5	-999<	410.41	178.5
3/12/18	15:15	12.6	301.2	0	1029.7	-999<	411.2	180.5
3/12/18	15:16	12.5	299.1	0	1031.4	-999<	414.04	182.2
3/12/18	15:17	12.2	297.9	0	1027.5	-999<	416.47	181.7
3/12/18	15:18	11.4	297.8	0	1018.6	-999<	416.67	179
3/12/18	15:19	10.9	300.3	0	1007.1	-999<	415.35	177.7

3/12/18	15:20	10.6	304.2	0	996.6	-999<	413.99	179.4
3/12/18	15:21	10.3	304.6	0	989.5	-999<	413.37	179.4
3/12/18	15:22	9.6	302	0.02	969	-999<	411.43	179.2
3/12/18	15:23	9.1	301.4	0.01	946.8	-999<	407.95	180.3
3/12/18	15:24	8.7	302.6	0.03	936.8	-999<	404.83	179.8
3/12/18	15:25	8.4	307.8	0.03	930.8	-999<	402.84	178.6
3/12/18	15:26	8.3	307.8	0.03	922.4	-999<	400.48	176.8
3/12/18	15:27	8.3	309.5	0.03	916.8	-999<	397.13	175.5
3/12/18	15:28	8.3	308.9	0.04	912.4	-999<	395.56	176
3/12/18	15:29	8.2	307.6	0.05	909.4	-999<	394.05	175.6
3/12/18	15:30	8.2	309.8	0.06	909.4	-999<	393.11	173.9
3/12/18	15:31	8.3	312.5	0.05	905.8	-999<	391.54	174.2
3/12/18	15:32	8.5	312.2	0.06	904.2	-999<	390.11	174.2
3/12/18	15:33	8.6	313.5	0.05	904.8	-999<	390.04	174.8
3/12/18	15:34	8.7	312.3	0.05	904.2	-999<	390.15	175
3/12/18	15:35	8.9	312.4	0.06	904.8	-999<	388.98	173.5
3/12/18	15:36	9.1	318.6	0.06	904.8	-999<	388.22	173.4
3/12/18	15:37	8.7	325.2	0.09	900.2	-999<	387.81	176.4
3/12/18	15:38	8.3	324.5	0.1	903.4	-999<	387.5	177.5
3/12/18	15:39	7.9	326.4	0.1	902.7	-999<	386.69	179.5
3/12/18	15:40	7.7	326.5	0.1	893.5	-999<	386.09	180.9
3/12/18	15:41	7.6	327.9	0.1	885.8	-999<	384.38	179.3
3/12/18	15:42	7.4	329	0.1	878	-999<	382.94	178
3/12/18	15:43	7.3	329.8	0.11	870.5	-999<	381.91	178.3
3/12/18	15:44	7.2	331.2	0.11	864.1	-999<	379.91	178.9
3/12/18	15:45	7.2	330.6	0.11	856.8	-999<	379.25	179.9
3/12/18	15:46	7.1	331.8	0.12	850.6	-999<	378.72	180
3/12/18	15:47	7	331.9	0.12	844.6	-999<	377.77	179
3/12/18	15:48	7	332.8	0.13	838.1	-999<	375.75	177.8
3/12/18	15:49	6.9	333.5	0.13	833.2	-999<	373.4	175.7
3/12/18	15:50	6.9	333.7	0.13	829.2	-999<	371.48	175.2
3/12/18	15:51	6.9	334.8	0.13	826.3	-999<	370.66	176.8
3/12/18	15:52	6.9	334.3	0.13	823.8	-999<	369.56	177.1
3/12/18	15:53	6.9	334	0.13	820.9	-999<	368.59	177.2
3/12/18	15:54	6.9	335.8	0.13	818.4	-999<	367.67	175.2
3/12/18	15:55	6.8	336.6	0.13	813.8	-999<	366.48	175.5
3/12/18	15:56	6.7	337.8	0.13	808.6	-999<	365.36	175.7
3/12/18	15:57	6.7	336.5	0.12	804.2	-999<	363.7	175.8
3/12/18	15:58	6.6	336.4	0.12	801.1	-999<	362.37	174.6
3/12/18	15:59	6.7	336.3	0.12	799.9	-999<	362.39	173.4
3/12/18	16:00	6.6	337	0.11	798.2	-999<	362.69	173.7
3/12/18	16:01	6.6	336.6	0.11	794.8	-999<	361.85	174.2
3/12/18	16:02	6.6	336.7	0.11	792.3	-999<	361.09	174.6
3/12/18	16:03	6.6	337.6	0.1	789.4	-999<	360.16	174.4
3/12/18	16:04	6.6	337.7	0.1	786.4	-999<	359.09	174.3
3/12/18	16:05	6.6	337.6	0.1	784.7	-999<	357.57	174
3/12/18	16:06	6.5	336.9	0.09	784.6	-999<	357.04	173.7
3/12/18	16:07	6.6	336.9	0.09	782.1	-999<	357	173.3

3/12/18	16:08	6.5	336.1	0.09	779.3	-999<	357.15	172.7
3/12/18	16:09	6.6	336.4	0.08	775.2	-999<	355.6	170.6
3/12/18	16:10	6.6	335.9	0.08	772.5	-999<	354.25	170.7
3/12/18	16:11	6.6	335.9	0.08	770.9	-999<	353.34	170.8
3/12/18	16:12	6.6	336.1	0.08	769.9	-999<	353.09	171.2
3/12/18	16:13	6.6	337.3	0.08	768.7	-999<	352.39	169.7
3/12/18	16:14	6.9	338.7	0.06	768.6	-999<	350.56	169.1
3/12/18	16:15	7.1	337.7	0.05	775.2	-999<	350.25	169.9
3/12/18	16:16	7.1	337.1	0.05	780.6	-999<	350.51	170.2
3/12/18	16:17	6.8	337.3	0.06	780.4	-999<	351.2	170.6
3/12/18	16:18	6.4	338.1	0.05	774.5	-999<	350.68	170.5
3/12/18	16:19	6.3	338	0.05	767.9	-999<	349.59	170.1
3/12/18	16:20	6.3	337.5	0.04	764.2	-999<	348.61	169.3
3/12/18	16:21	6.2	337.5	0.04	760.1	-999<	346.92	165.9
3/12/18	16:22	6.2	338.8	0.05	756.3	-999<	345.4	166.1
3/12/18	16:23	6.1	337.9	0.04	752.7	-999<	343.93	165.8
3/12/18	16:24	6.1	336.5	0.04	750.2	-999<	342.98	167.1
3/12/18	16:25	6	336.6	0.04	747.2	-999<	342.4	167.8
3/12/18	16:26	6	336	0.04	744.2	-999<	342.03	167.6
3/12/18	16:27	6.1	336.4	0.04	742.4	-999<	341.04	167.4
3/12/18	16:28	6.2	338.1	0.03	741.9	-999<	339.29	166.2
3/12/18	16:29	6.2	337.2	0.03	741.5	-999<	338.63	164.3
3/12/18	16:30	6.1	337.9	0.03	739.7	-999<	338.7	164.9
3/12/18	16:31	5.9	337.8	0.02	737.1	-999<	337.57	165.6
3/12/18	16:32	5.6	337.8	0.02	730.7	-999<	337.16	166.4
3/12/18	16:33	5.4	337.1	0.02	723.8	-999<	335.94	165.7
3/12/18	16:34	5.4	335.4	0.02	719	-999<	335.12	164.9
3/12/18	16:35	5.3	336.4	0.01	715.6	-999<	333.35	165.2
3/12/18	16:36	5.3	336.8	0.01	713.4	-999<	332.25	165.2
3/12/18	16:37	5.3	335.6	0.01	710.4	-999<	331.6	165
3/12/18	16:38	5.3	336	0.01	706.7	-999<	330.85	165.1
3/12/18	16:39	5.3	336.1	0.01	703	-999<	329.82	164.3
3/12/18	16:40	5.3	335.6	0.01	701.1	-999<	328.25	163.6
3/12/18	16:41	5.3	335.6	0	698.1	-999<	327.39	164.1
3/12/18	16:42	5.3	335.8	0	695.8	-999<	326.99	164
3/12/18	16:43	5.3	335.2	0	693	-999<	326.04	163.3
3/12/18	16:44	5.3	333.8	0	690.5	-999<	324.93	161.5
3/12/18	16:45	4.7	333.3	0.01	683.3	-999<	323.69	160.7
3/12/18	16:46	4.5	333.3	0	674.7	-999<	322.39	161.3
3/12/18	16:47	4.5	333.9	0	670.2	-999<	321.53	161.8
3/12/18	16:48	4.5	334.4	0	667.5	-999<	319.79	161.5
3/12/18	16:49	4.5	334.1	0	665.9	-999<	317.82	160.3
3/12/18	16:50	4.5	333	0	663.1	-999<	317.25	160.4
3/12/18	16:51	4.5	333.2	0	661.5	-999<	317.89	160.5
3/12/18	16:52	4.4	333.5	0	659.7	-999<	317.03	160.8
3/12/18	16:53	4.3	332.9	0	656.7	-999<	315.98	161
3/12/18	16:54	4.3	332.8	0	654.8	-999<	315.25	160.1
3/12/18	16:55	4.4	332.7	0	653	-999<	314.89	159.3

3/12/18	16:56	4.4	332.2	0	651.2	-999<	314.53	158.7
3/12/18	16:57	4.3	332.6	0	649.5	-999<	313.64	158.1
3/12/18	16:58	4.4	332.4	0	646.8	-999<	312.4	156.5
3/12/18	16:59	4.4	332.2	0	644.9	-999<	312.16	156.1

Plant Name: CLST Page: 1

General Average Report

Reporting Period: 03/12/2018 to 03/12/2018

Site Name: SAMPLE Time of Report: 03/12/18 17:32

Data Averaging Type: 1m Rolling Average Interval: 1

Preburn

Date	Time	Z (none)	COND2OUT (Deg_F)	DIL_CO2 (%)	DILRATIO (RATIO)	FILT1OUT (Deg_F)	FILT2OUT (Deg_F)	ROOM_TMP (Deg_F)	TUNL_TMP (Deg_F)	UNIT_WT (lbs)
3/12/18	13:04	1	64.3		0.698	66.2	68.1	64.6	67.1	1.66
3/12/18	13:05	1	64.3		-0.277	66.1	67.9	64.4	66.7	1.65
3/12/18	13:06	1	64.3		0.45	66	67.7	64.4	66.8	1.72
3/12/18	13:07	1	64.2		0.119	66	67.6	64.4	68	1.57
3/12/18	13:08	1	64.2		1.253	65.9	67.5	64.4	69.6	1.48
3/12/18	13:09	1	64.2		2.196	65.9	67.3	64.2	74.4	1.38
3/12/18	13:10	1	64.1		3.033	65.8	67.1	64.2	78	1.29
3/12/18	13:11	1	64.1		3.409	65.6	66.9	64.2	79.4	1.2
3/12/18	13:12	1	64		3.41	65.7	66.9	64.5	83.9	1.03
3/12/18	13:13	1	64		3.371	65.8	66.8	64.5	89.7	0.91
3/12/18	13:14	1	64		3.509	65.7	66.7	64.3	92	4.24
3/12/18	13:15	1	63.9		3.854	65.6	66.6	64.3	89.8	12.38
3/12/18	13:16	1	63.8		3.688	65.7	66.5	64.4	91.9	12.19
3/12/18	13:17	1	63.7		3.474	65.8	66.5	64.5	96.6	11.92
3/12/18	13:18	1	63.9		3.567	65.8	66.5	65.2	95.9	11.75
3/12/18	13:19	1	64		3.599	65.8	66.5	65.2	95.2	11.59
3/12/18	13:20	1	64		3.705	65.7	66.4	65.1	95.3	11.45
3/12/18	13:21	1	64		3.758	65.8	66.5	64.9	95.7	11.3
3/12/18	13:22	1	63.9		3.779	65.9	66.5	64.8	96.3	11.2
3/12/18	13:23	1	63.9		3.778	65.8	66.4	64.7	96	11.06
3/12/18	13:24	1	63.9		3.659	65.9	66.5	64.7	97	10.81
3/12/18	13:25	1	63.8		3.486	65.9	66.5	64.4	100.4	10.82
3/12/18	13:26	1	63.9		3.401	65.9	66.4	64.6	104.8	10.71
3/12/18	13:27	1	64		3.451	65.9	66.4	64.8	107	10.21
3/12/18	13:28	1	64		3.427	65.9	66.5	64.9	110	9.99
3/12/18	13:29	1	63.9		3.533	66	66.5	65	109.2	9.83
3/12/18	13:30	1	63.9		3.576	66.1	66.5	65.1	107.5	9.84
3/12/18	13:31	1	64		3.415	66.2	66.5	65	110.4	9.77
3/12/18	13:32	1	64		3.458	66.3	66.6	65.1	112	9.17
3/12/18	13:33	1	64		3.35	66.4	66.7	65.2	114.8	8.9
3/12/18	13:34	1	64		3.318	66.4	66.6	65.3	117	8.67
3/12/18	13:35	1	64.2		3.288	66.6	67	65.3	118.1	8.42
3/12/18	13:36	1	64.3		3.317	66.7	67	65.3	119.2	8.24
3/12/18	13:37	1	64.3		3.307	66.8	67	65.3	120.1	8.02
3/12/18	13:38	1	64.4		3.322	67.1	67.2	65.5	120.1	7.85
3/12/18	13:39	1	64.4		3.211	67	67.1	65.1	119.1	7.59
3/12/18	13:40	1	64.4		3.045	67	67.1	64.6	119.2	7.38
3/12/18	13:41	1	64.5		2.966	66.8	66.9	64.2	119.4	7.21
3/12/18	13:42	1	64.4		3.074	66.8	66.9	64.4	118.7	7.02
3/12/18	13:43	1	64.4		3.127	66.8	66.8	64.8	120.9	6.86
3/12/18	13:44	1	64.5		3.053	66.6	66.6	64.8	122.8	6.67
3/12/18	13:45	1	64.5		2.989	66.5	66.6	64.7	123.9	6.5
3/12/18	13:46	1	64.4		3.008	66.6	66.7	65	125.6	6.34
3/12/18	13:47	1	64.5		3.001	66.4	66.5	65.1	126.1	6.16
3/12/18	13:48	1	64.1		3.002	66.3	66.5	64.9	126.7	5.99
3/12/18	13:49	1	64.3		3.012	66.3	66.3	65.1	126.5	5.83
3/12/18	13:50	1	64.3		2.981	66.3	66.4	65.5	126.9	5.67
3/12/18	13:51	1	64.3		2.964	66.3	66.3	65.2	126.5	5.49

3/12/18	13:52	1	64.3	3	66.2	66.3	65	126	5.29
3/12/18	13:53	1	64.2	3.073	66.2	66.3	65.4	126.1	5.13
3/12/18	13:54	1	64.2	3.145	66.6	66.6	65.9	125	4.98
3/12/18	13:55	1	64.3	3.163	66.6	66.7	66.3	125.8	4.8
3/12/18	13:56	1	64.2	3.179	66.7	66.7	66.4	126.2	4.65
3/12/18	13:57	1	64.2	3.097	66.9	67	66.3	127.9	4.52
3/12/18	13:58	1	64.4	3.168	66.8	66.9	66.5	127	4.41
3/12/18	13:59	1	64.2	3.101	67	67.1	66.1	128.1	4.25
3/12/18	14:00	1	64.6	3.017	67.2	67.4	66.1	129.5	4.28
3/12/18	14:01	1	64.5	3.079	67.2	67.3	65.8	124.8	4
3/12/18	14:02	1	64.5	2.997	67.2	67.2	65.7	125	4.16
3/12/18	14:03	1	64.5	3.021	67.1	67.1	65.7	123.1	3.75
3/12/18	14:04	1	64.5	2.93	67	67	65.4	123.5	4.75
3/12/18	14:05	1	64.5	2.959	67.2	67.2	65.5	123.3	3.83
3/12/18	14:06	1	64.4	3.141	67.1	67	65.2	112.6	3.47
3/12/18	14:07	1	64.4	2.811	67.1	66.9	64.8	121	3.4
3/12/18	14:08	1	64.3	2.897	67	66.8	64.5	121.7	3.34
3/12/18	14:09	1	64.3	2.958	66.9	66.7	64.4	119.7	3.31
3/12/18	14:10	1	64.2	2.955	66.9	66.6	64.1	116.7	3.32
3/12/18	14:11	1	64.3	2.849	66.8	66.6	64.7	120.6	3.41
3/12/18	14:12	1	64.3	2.864	66.8	66.4	64.9	120.5	3.03
3/12/18	14:13	1	64.3	2.946	66.7	66.4	64.7	117.3	3.3
3/12/18	14:14	1	64.2	3.117	66.6	66.3	64.6	110.8	4.99
3/12/18	14:15	1	64.1	2.833	66.7	66.3	64.3	112.2	4.96
3/12/18	14:16	1	64	2.701	66.7	66.3	64.5	116.3	4.67
3/12/18	14:17	1	63.8	2.742	66.7	66.2	64.2	115.6	4.45
3/12/18	14:18	1	63.9	2.773	66.6	66.2	64.7	116.2	4.22
3/12/18	14:19	1	63.9	2.764	66.5	66	64.5	117	3.99
3/12/18	14:20	1	63.8	2.725	66.5	66	64.3	118.6	3.77
3/12/18	14:21	1	63.7	2.813	66.4	65.9	64.4	119.4	3.56
3/12/18	14:22	1	63.7	2.921	66.6	66.1	64.8	119.6	3.38
3/12/18	14:23	1	63.7	2.892	66.6	66.3	64.2	120.3	3.57
3/12/18	14:24	1	63.6	2.911	66.6	66.2	64.4	121.8	3.76
3/12/18	14:25	1	63.5	2.807	66.6	66.2	64.7	125.8	4.98
3/12/18	14:26	1	63.7	2.809	66.6	66.3	64.5	126.7	4.89
3/12/18	14:27	1	63.5	2.977	66.7	66.4	64.7	120.1	4.74
3/12/18	14:28	1	63.6	2.957	66.8	66.5	64.3	117	4.71
3/12/18	14:29	1	63.8	2.924	66.9	66.7	64.5	119	4.19
3/12/18	14:30	1	63.8	2.939	67	66.7	64.8	120.2	3.97
3/12/18	14:31	1	63.8	2.938	66.9	66.7	64.8	121.2	3.79
3/12/18	14:32	1	63.8	3.022	66.7	66.6	65.5	120.8	3.61
3/12/18	14:33	1	63.9	3.067	66.7	66.7	65.8	119.7	3.45
3/12/18	14:34	1	63.9	3.043	66.8	66.8	65.7	120.1	3.82
3/12/18	14:35	1	63.8	3.089	66.9	66.9	65.6	118.3	3.2
3/12/18	14:36	1	63.9	3.012	66.8	66.8	65.3	119.1	3.06
3/12/18	14:37	1	63.8	2.974	66.7	66.9	65.4	119.8	2.94
3/12/18	14:38	1	63.8	3.139	66.7	66.8	65.5	114.6	3.27
3/12/18	14:39	1	63.8	3.181	66.6	66.7	65.5	109.3	2.74
3/12/18	14:40	1	63.6	3.142	66.7	67.4	65.4	107.2	2.67

Plant Name: CLST Page: 1

General Average Report

Reporting Period: 03/12/2018 to 03/12/2018 Preburn

Site Name: UNIT Time of Report: 03/12/18 17:29

Data Averaging Type: 1m Rolling Average Interval: 1

Date	Time	CAT_PRE (Deg_F)	CO (%)	CO2 (%)	STK_CSA (Deg_F)	STK_TMP (Deg_F)
3/12/18	13:04	63.4	-0.07	-0.2	66.32	65.4
3/12/18	13:05	63	-0.07	-0.2	65.99	65.2
3/12/18	13:06	63.1	-0.07	-0.2	65.73	65.2
3/12/18	13:07	63.3	-0.07	-0.1	66.15	65.4
3/12/18	13:08	62.9	-0.06	0	77.43	69.1
3/12/18	13:09	62.7	-0.07	0	116.89	86.2
3/12/18	13:10	63	-0.07	0	160.53	105.4
3/12/18	13:11	63.7	-0.07	0	180.87	115.4
3/12/18	13:12	64.9	-0.07	0	212.17	129.9
3/12/18	13:13	66.4	-0.07	0	258.98	149.3
3/12/18	13:14	67.9	-0.07	-0.1	277.22	161.4
3/12/18	13:15	70.1	-0.07	-0.1	263.88	162.5
3/12/18	13:16	72.7	-0.07	-0.1	277.86	165.6
3/12/18	13:17	75.7	-0.07	0	321.36	176.1
3/12/18	13:18	78.2	-0.08	-0.1	341.01	174.7
3/12/18	13:19	80.9	-0.08	-0.1	338.35	173.1
3/12/18	13:20	83.9	-0.08	-0.1	339.62	176.9
3/12/18	13:21	87.6	-0.08	-0.1	341.37	180.8
3/12/18	13:22	90.9	-0.08	-0.1	339.93	183.9
3/12/18	13:23	93.8	-0.09	-0.1	333.67	182.7
3/12/18	13:24	96.6	-0.09	-0.1	330.33	183
3/12/18	13:25	100.1	-0.09	0	344.64	189.8
3/12/18	13:26	103.2	-0.09	0	393.29	201.1
3/12/18	13:27	105.8	-0.09	0	420.4	210.3
3/12/18	13:28	108.2	-0.09	-0.1	434.1	219.5
3/12/18	13:29	110.5	-0.1	-0.1	429.89	221.1
3/12/18	13:30	113.3	-0.1	-0.1	426.85	216.5
3/12/18	13:31	116.5	-0.1	-0.1	426.97	219.9
3/12/18	13:32	119.5	-0.1	0	427.57	227.1
3/12/18	13:33	122.4	-0.1	0	443.71	231
3/12/18	13:34	125.9	-0.1	0	455.91	236.4
3/12/18	13:35	129.3	-0.11	0	458.88	238.8
3/12/18	13:36	132.5	-0.11	0	456.53	244
3/12/18	13:37	136.1	-0.11	0	452.83	246.6
3/12/18	13:38	139.1	-0.11	0	450.96	246.9
3/12/18	13:39	138.7	-0.12	0	452.65	238.7
3/12/18	13:40	140.7	-0.12	0	453.79	230.7
3/12/18	13:41	145.2	-0.12	0	453.81	227.9
3/12/18	13:42	149	-0.12	0	453.61	231.3
3/12/18	13:43	152.1	-0.13	0	452.18	240.2

3/12/18	13:44	155.7	-0.13	0	452.89	241.8
3/12/18	13:45	160.1	-0.1	2.5	454.84	241.5
3/12/18	13:46	163.6	-0.05	6.8	455.25	247.5
3/12/18	13:47	166.9	-0.04	7	456.41	248.2
3/12/18	13:48	169.6	-0.05	6.9	455.86	250.4
3/12/18	13:49	172.2	-0.05	7.1	455.18	250.1
3/12/18	13:50	175.2	-0.06	7.5	455.57	248.5
3/12/18	13:51	178.3	-0.08	7.9	457.67	246.8
3/12/18	13:52	184.1	-0.09	8.4	458.42	248
3/12/18	13:53	188.9	-0.1	8.4	459.96	252
3/12/18	13:54	191.8	-0.11	8	461.13	251.9
3/12/18	13:55	195.8	-0.11	7.6	462.22	254.6
3/12/18	13:56	199.3	-0.1	6.9	462.55	256.6
3/12/18	13:57	202.4	-0.09	6.2	458.98	257.2
3/12/18	13:58	206.2	-0.08	6	456.3	257.9
3/12/18	13:59	208.7	-0.07	5.7	455.85	258.3
3/12/18	14:00	207	-0.08	4.8	453.04	257.4
3/12/18	14:01	209	-0.12	6.1	440.93	247.5
3/12/18	14:02	212.2	-0.12	5	440.29	243.2
3/12/18	14:03	214.8	-0.13	5.7	436.9	239
3/12/18	14:04	218	-0.13	4.8	436.51	235.4
3/12/18	14:05	220	-0.1	3.6	427.22	236.2
3/12/18	14:06	221.4	-0.12	3.4	402.47	213.9
3/12/18	14:07	223.1	-0.18	0	410.98	222.5
3/12/18	14:08	226	-0.13	0	408.04	230
3/12/18	14:09	227.8	0	-0.2	401.66	227.7
3/12/18	14:10	229.9	-0.01	-0.1	395.21	219.3
3/12/18	14:11	232	0.24	5.8	395.5	223.7
3/12/18	14:12	234.5	0.65	10.8	393.02	224.1
3/12/18	14:13	234	0.34	7.9	388.67	219.7
3/12/18	14:14	236.5	0.28	2.9	369.68	207.7
3/12/18	14:15	237.5	0.07	3.4	368.53	199.1
3/12/18	14:16	238	0.08	7.1	385.81	204.4
3/12/18	14:17	239	0.04	11.8	415.73	205
3/12/18	14:18	238.6	0.04	13.3	443.09	207.5
3/12/18	14:19	238.8	0.22	12.5	460.39	209.5
3/12/18	14:20	239	0.48	10.8	473.39	212.3
3/12/18	14:21	240.4	0.18	11.4	482.01	219
3/12/18	14:22	240.6	0	10.5	484.17	224.9
3/12/18	14:23	239.7	0	9.2	480.91	226.4
3/12/18	14:24	241.7	0.02	8.3	477.67	231.3
3/12/18	14:25	245.3	0.04	6.7	480.94	236.1
3/12/18	14:26	245.9	0.05	8.3	478.18	239.2
3/12/18	14:27	249	0.08	12	473.03	229.2
3/12/18	14:28	252.4	0.08	12.7	469.6	220
3/12/18	14:29	254.4	0.15	13.2	483.64	224.1
3/12/18	14:30	256.7	0.03	11.6	492.73	227.7
3/12/18	14:31	260.9	0.01	10.9	496.42	230.5

3/12/18	14:32	271.6	0.07	10.5	497.02	232.5
3/12/18	14:33	271.4	-0.01	9.1	495.2	231
3/12/18	14:34	267.5	-0.01	8.5	491.24	231.1
3/12/18	14:35	267.9	-0.01	8.1	482.19	228.7
3/12/18	14:36	270.3	-0.02	7.6	479.47	227.4
3/12/18	14:37	270.9	-0.02	7.8	480.34	227.1
3/12/18	14:38	274.3	-0.02	8.3	463.98	219.4
3/12/18	14:39	277.1	-0.01	8.2	435.43	205
3/12/18	14:40	279.9	-0.01	7.2	419.39	196.8

Plant Name: CLST Page: 1

General Average Report

Reporting Period: 03/12/2018 to 03/12/2018 Preburn

Site Name: UNIT Time of Report: 03/12/18 17:30

Data Averaging Type: 1m Rolling Average Interval: 1

Date	Time	CAT_PRE (Deg_F)	TEMP_10 (Deg_F)	TEMP_11 (Deg_F)	TEMP_12 (Deg_F)	TEMP_13 (Deg_F)
3/12/18	13:04	63.4	64.3	63	64.97	63.91
3/12/18	13:05	63	64.36	63.15	64.73	64.01
3/12/18	13:06	63.1	64.69	63.44	64.48	64.45
3/12/18	13:07	63.3	64.56	63.17	64.72	64.12
3/12/18	13:08	62.9	64.19	63.29	64.55	64.5
3/12/18	13:09	62.7	64.27	63.39	64.42	67.08
3/12/18	13:10	63	64.54	63.66	64.89	72.88
3/12/18	13:11	63.7	64.64	63.4	65.56	80.38
3/12/18	13:12	64.9	64.31	63.33	66.53	88.97
3/12/18	13:13	66.4	64.31	63.66	67.57	100.54
3/12/18	13:14	67.9	64.52	64.2	68.93	115.77
3/12/18	13:15	70.1	65.04	64.48	70.9	130.77
3/12/18	13:16	72.7	65.12	64.51	72.95	144.66
3/12/18	13:17	75.7	65.41	65.06	74.49	161.6
3/12/18	13:18	78.2	66.02	66.1	76.74	185.65
3/12/18	13:19	80.9	67.1	66.96	79.63	213.08
3/12/18	13:20	83.9	67.82	67.3	82.96	236.46
3/12/18	13:21	87.6	68.45	68.34	85.7	255.12
3/12/18	13:22	90.9	69.45	69.76	88.66	269.51
3/12/18	13:23	93.8	70.81	70.93	91.64	278.16
3/12/18	13:24	96.6	72.16	71.5	94.66	285.33
3/12/18	13:25	100.1	73.1	72.72	97.14	293.32
3/12/18	13:26	103.2	74.52	74.29	99.24	301.48
3/12/18	13:27	105.8	76.56	76.11	102.04	318.94
3/12/18	13:28	108.2	78.77	77.32	105.45	342.39
3/12/18	13:29	110.5	80.24	78.75	108.41	364.29
3/12/18	13:30	113.3	81.84	80.05	111.31	380.21
3/12/18	13:31	116.5	83.81	81.67	114.51	397.51
3/12/18	13:32	119.5	86.16	82.65	117.48	409.93
3/12/18	13:33	122.4	88.68	84.45	120.52	418.69
3/12/18	13:34	125.9	90.63	86.66	123.42	429.47
3/12/18	13:35	129.3	92.99	89.03	126.72	443.88
3/12/18	13:36	132.5	95.83	90.73	130.77	457.61
3/12/18	13:37	136.1	98.38	92.05	134.28	465.08
3/12/18	13:38	139.1	100.92	94.4	137.25	469.4
3/12/18	13:39	138.7	102.83	97.16	139.38	458.71
3/12/18	13:40	140.7	105.45	99.62	143.56	457.46
3/12/18	13:41	145.2	108.49	101.81	148.18	457.65
3/12/18	13:42	149	110.33	103.88	150.57	458.14
3/12/18	13:43	152.1	112.64	106.39	154.54	461.11

3/12/18	13:44	155.7	115.82	108.42	159.39	462.99
3/12/18	13:45	160.1	119.19	110.37	163.01	456.95
3/12/18	13:46	163.6	122.19	112.34	166.61	459.67
3/12/18	13:47	166.9	124.98	115.26	169.61	461.33
3/12/18	13:48	169.6	127.96	117.65	171.94	460.62
3/12/18	13:49	172.2	131.53	119.52	176.37	460.1
3/12/18	13:50	175.2	134.83	122	179.97	459.85
3/12/18	13:51	178.3	137.95	124.31	184.08	462.84
3/12/18	13:52	184.1	142.25	126.07	190.89	470.86
3/12/18	13:53	188.9	146.11	127.93	196.81	474.08
3/12/18	13:54	191.8	150.28	130.34	200.71	477.74
3/12/18	13:55	195.8	153.87	132.82	204.79	484.83
3/12/18	13:56	199.3	157.51	135.98	208.78	490.1
3/12/18	13:57	202.4	161.5	137.89	213.34	493.28
3/12/18	13:58	206.2	165.72	140.24	217.52	493.41
3/12/18	13:59	208.7	169.08	143.36	219.81	487.92
3/12/18	14:00	207	170.15	144.93	221.03	481.64
3/12/18	14:01	209	172.48	149.02	222.78	473.13
3/12/18	14:02	212.2	176.01	150.79	225.58	465.96
3/12/18	14:03	214.8	178	153.43	227.84	464.38
3/12/18	14:04	218	181.52	155.63	231.52	464.34
3/12/18	14:05	220	186.41	155.74	236.64	465.58
3/12/18	14:06	221.4	189.63	159.68	238.66	462.36
3/12/18	14:07	223.1	194.13	163.6	240.52	457.99
3/12/18	14:08	226	198.69	168.29	242.94	454.56
3/12/18	14:09	227.8	201.47	170.65	245.13	442.99
3/12/18	14:10	229.9	204.55	170.2	247.83	436.01
3/12/18	14:11	232	208.85	171.23	250.17	434.06
3/12/18	14:12	234.5	210.79	173.63	251.29	427.96
3/12/18	14:13	234	212.68	178.57	252.92	418.05
3/12/18	14:14	236.5	216.08	180.43	253.6	411.73
3/12/18	14:15	237.5	219.58	181.53	253.84	403.87
3/12/18	14:16	238	222.21	183.87	254.54	397.05
3/12/18	14:17	239	224	187.37	256.04	394.46
3/12/18	14:18	238.6	225.12	189.33	256.23	402.11
3/12/18	14:19	238.8	225.55	189.6	254.63	412.46
3/12/18	14:20	239	228.16	192.49	254.46	432.25
3/12/18	14:21	240.4	232.25	193.48	256.24	462.21
3/12/18	14:22	240.6	231.35	197.1	255.02	476.15
3/12/18	14:23	239.7	232.72	198.62	254.48	490.62
3/12/18	14:24	241.7	238.33	197.64	257.87	504.92
3/12/18	14:25	245.3	241.82	199.5	258.53	514.45
3/12/18	14:26	245.9	245.24	203.1	259.43	516.28
3/12/18	14:27	249	246.55	205.31	261.66	518.31
3/12/18	14:28	252.4	249.28	205.87	263.73	518.57
3/12/18	14:29	254.4	253.95	206.68	268.63	529.64
3/12/18	14:30	256.7	254.42	208.93	270.42	538.76
3/12/18	14:31	260.9	254.92	210.58	271.86	550.69

3/12/18	14:32	271.6	260.88	210.18	282.07	573.78
3/12/18	14:33	271.4	260.59	214.31	282.03	576.16
3/12/18	14:34	267.5	256.87	214.5	278.13	572.21
3/12/18	14:35	267.9	258.44	213.81	281.03	577.29
3/12/18	14:36	270.3	261.22	216.46	284.67	577.14
3/12/18	14:37	270.9	261.19	216.89	287.41	574.42
3/12/18	14:38	274.3	263.46	215.71	290.06	568.35
3/12/18	14:39	277.1	265.82	216.98	292.2	570.21
3/12/18	14:40	279.9	267.49	218.62	293.83	567.21

CSL-00010

Appendix D

Kelvin Notes from MF FIRE Testing CSL-00010 V1			
Date:	***Time:***	***Comment:***	***Picture:***
		Test #1	
3.5.18	9:55	"preburn fuel 11.28 lbs"	
3.5.18	10:13	"1.44 lbs kindling added"	
3.5.18	10:19	"added preburn fuel. 11.28 lbs. Scale weight was 11.82 lbs."	

3.5.18	10:44	“test fuel crib ready 11.72 lbs”	
3.5.18	10:47	“opened stove door, poked coals”	
3.5.18	10:55	“poked coals”	
3.5.18	11:03	“poked fuel”	
3.5.18	11:05	“added 1.76 lbs”	
3.5.18	11:15	“removed 2.9 lbs”	
3.5.18	11:16	“added 1.3 lbs”	
3.5.18	11:18	“poked coals”	
3.5.18	11:21	“added 1.42 lbs”	
3.5.18	11:25	“added 1.66 lbs”	
3.5.18	11:30	“poked coals”	
3.5.18	11:33	“poked coals”	
3.5.18	11:37	“coal bed status”	
3.5.18	11:41	“Start time 11:41 am”	
3.5.18	11:42	“14.20 lbs”	
3.5.18	11:42	“2.6 coal bed”	
3.5.18	11:44	“Start Pic”	
3.5.18	11:56	“Closed door during start at 55 sec”	
3.5.18	14:19	“Stop time 14:19”	
Test #2			

3.6.18	9:20	“preburn fuel 11.52 lbs”	
3.6.18	10:16	“1.46 lbs of kindling and paper”	
3.6.18	10:30	“lighting kindling”	
3.6.18	10:39	“added preburn fuel”	

3.6.18	10:40	“test fuel 11.98 lbs”	
3.6.18	11:18	“poked coals”	
3.6.18	11:22	“added 2.96 lbs to preburn”	
3.6.18	11:23	“Removed 4.12 lbs”	
3.6.18	11:24	“added 1.8 lbs”	
3.6.18	11:31	“poked coals”	
3.6.18	11:36	“added 2.06 lbs”	
3.6.18	11:38	“poked coals	
3.6.18	11:49	“test start”	
3.6.18	11:49	“Test Start 11:49”	
3.6.18	14:32	“test end”	
Test # 3			

3.12.18	10:55	“preburn fuel”	
3.12.18	12:17	“test fuel”	

3.12.18	13:04	“1.60 kindling and paper”	
3.12.18	13:06	“lighting kindling”	
3.12.18	13:15	“added 11.66 lbs preburn fuel”	
3.12.18	13:25	“repositioned fuel”	

3.12.18	13:26	“secondary air is noticeably better, working”	
3.12.18	13:32	“poked fuel”	
3.12.18	13:37	“poked fuel”	
3.12.18	14:01	“poked fuel”	
3.12.18	14:07	“poked fuel”	
3.12.18	14:14	“Removed 0.4 lbs bad coals, added 2.42 lbs preburn”	
3.12.18	14:25	“added 2.06 lbs to preburn”	
3.12.18	14:39	“coal bed pre-raked”	
3.12.18	14:43	“ignore o2. O2 will be derived from	
3.12.18	16:03	“Test start 2:40 pm”	
3.12.18	17:25	“Test ended 14:19”	
3.12.18	17:28	“Incorrect. Test ended at 4:59 pm”	

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Appendix E

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
RESEARCH TRIANGLE PARK, NC 27711

MAR 0 6 2018

OFFICE OF
AIR QUALITY PLANNING
AND STANDARDS

Ms. Kelli O'Brien
Lab Manager
ClearStak
99 Canal Street
Putnum, CT 06260

Dear Ms. O'Brien,

I am writing in response to your letter dated March 4, 2018, regarding certification testing of the Nova model wood stove, a prototype single burn rate wood stove manufactured by MF Fire. You are requesting to use alternative test procedures for recovery and preparation of the particulate matter (PM) samples from the front half filter and probe assembly. In particular, you propose use of the acetone probe rinse and filter sample recovery and preparation procedures described in sections 8.7 and 11.0 of Method 5, Determination of Particulate Matter Emissions from Stationary Sources (40 CFR 60, Appendix A), in lieu of the procedures in section 10.2.2 of ASTM E2515-11, Standard Test Method for Determination of Particulate Matter Emissions Collected by a Dilution Tunnel which is required under 40 CFR 60, Subparts AAA and QQQQ.

The difference between the sample recovery and preparation procedures of Method 5 and ASTM E2515-11 is that Method 5 determines PM in the probe and filter assembly by (1) collecting PM in the probe through acetone rinses of the probe, drying down the rinse in beakers, dessication, followed by weighing and (2) removal of the filter, dessicating, and then weighing, as opposed to ASTM E2515-11 where the entire 100+ gram probe assembly is weighed before and after a test run. We understand that ClearStak typically performs gravimetric analysis of their PM samples (acetone rinses and filters) at an offsite location and not in the wood heater emission testing laboratory to ensure quality low mass (e.g., milligram) measurements uninfluenced by ground vibrations caused by daily operations of testing facilities.

You state that through past experience, you have found that probe PM collected through acetone rinses which are then transported in sample jars offer far less possible sample contamination than handling the front half probe and filter assembly. You propose to collect the acetone rinses after testing according to section 8.7 of Method 5, transport them to your laboratory, then transfer the rinses from the jars to clean and desiccated pre-weighed 100 mL beakers where they are dried down and desiccated according to section 11.2.2 of Method 5, and finally weighed according ASTM E2515-11 in 6-hour intervals until two consecutive weights are achieved within 0.2mg. Likewise, the filters (which were pre-weighed before testing as required in section 8.1.3 of Method 5) are recovered according to section 8.7 of Method 5, transported to the laboratory, dessicated according to section 11.2.1 of Method 5, and weighed according ASTM E2515-11.

We understand ClearStak is requesting to use these alternative procedures for PM recovery, dry down, and desiccation of the front half probe and filter assembly samples for ASTM E2515-11 testing of MF Fire's prototype single burn rate stove, Nova, and for all future ASTM E2515-11 emissions testing of residential wood heaters, hydronic heaters, and forced-air furnaces per 40 CFR Part 60 Subparts AAA and QQQQ.

With this letter, we are approving your alternative test procedures detailed above in conjunction with ASTM E2515-11 for certification testing of the MF Fire's prototype single burn rate stove, Nova, as well as all wood heaters, hydronic heaters, and forced-air furnaces subject to 40 CFR Part 60 Subpart AAA and QQQQ. A copy of this letter must be included in each certification test report where this alternative test method is utilized.

It is reasonable that this alternative test method approval be broadly applicable to certification testing of all wood heaters, hydronic heaters, and forced-air furnaces subject to the requirements of 40 CFR part 60, Subparts AAA and QQQQ. For this reason, we will post this letter as ALT-126 on our website at *http://www3.epa.gov/ttn/emc/approalt.html* for use by other interested parties. This alternative method approval is valid until such time that Subparts AAA and QQQQ are revised or replaced to require a different certification method, and at such time, this alternative will be reconsidered and possibly withdrawn.

If you have additional questions regarding this approval, please contact Michael Toney of my staff at 919-541-5247 or toney.mike@epa.gov.

Sincerely,

Steffan M. Johnson, Group Leader
Measurement Technology Group

cc: Amanda Aldridge, EPA/OAQPS/OID
Adam Baumgart-Getz, EPA/OAQPS/OID
Rafael Sanchez, EPA/OECA
Michael Toney, EPA/OAQPS/AQAD

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Appendix F

SCOPE OF ACCREDITATION TO ISO/IEC 17025:2005

CLEARSTAK, LLC[1]
99 Canal Street
PO BOX 109
Putnam, Connecticut 06260
Ms. Kelli O'Brien Phone: 860-237-8245
e-mail: kelli@clearstak.com

CHEMICAL

Valid To: February 28, 2019 Certificate Number: 3968.01

In recognition of the successful completion of the A2LA evaluation process, accreditation is granted to this laboratory at the location listed above as well as the one satellite laboratory location listed below to perform the following tests on wood heaters:

Test Description	**Test Method(s)**
Particulate Emissions and Efficiency	EPA Method 28 EPA Method 28 WHH EPA Method 28 WHH PTS ASTM E2618 ASTM E2779 ASTM E2780
Carbon Monoxide, Carbon Dioxide and Oxygen	CSA B415
Standard Test Method for Determination of Particulate Matter Emissions Collected by a Dilution Tunnel	ASTM E2515
Determination of Particulate Matter from Stationary Sources – Sample Recovery	EPA Method 5 section 8.7

5202 Presidents Court, Suite 220 | Frederick, MD 21703-8398 | Phone: 301 644 3248 | Fax: 240 454 9449 | www.A2LA.org

[1] This accreditation covers testing performed at the main laboratory listed above, and at the satellite laboratories indicated below.

CLEARSTAK, LLC
479 Tolland Turnpike
Willington, CT 06279

Test Description	**Test Method(s)**
Standard Test Method for Determination of Particulate Matter Emissions Collected by a Dilution Tunnel	ASTM E2515
Determination of Particulate Matter from Stationary Sources – Sample Recovery	EPA Method 5 section 8.7

Accredited Laboratory

A2LA has accredited

CLEARSTAK, LLC

Putnam, CT

for technical competence in the field of

Chemical Testing

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2005 *General requirements for the competence of testing and calibration laboratories*. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (*refer to joint ISO-ILAC-IAF Communiqué dated 8 January 2009*).

Presented this 21st day of March 2017.

President and CEO
For the Accreditation Council
Certificate Number 3968.01
Valid to February 28, 2019

For the tests to which this accreditation applies, please refer to the laboratory's Chemical Scope of Accreditation.