Pacific Energy
Fireplace Products Ltd.

Project # 19-537
Model: FP25LE
AKA: FP25AR LE
Type: Residential Non-catalytic Wood Fired Heater
December 17, 2019

ASTM E3053 Standard Test Method for Determining Particulate Matter Emissions from Wood Heaters Using Cordwood Test Fuel (EPA ALT-125)

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Prepared by: Sebastian Button,
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Affidavit

PFS-TECO was contracted by Pacific Energy Fireplace Products Ltd. (Pacific Energy) to provide testing services for the FP25LE Wood-Fired Room Heater per ASTM E3053, *Standard Test Method for Determining Particulate Matter Emissions from Wood Heaters Using Cordwood Test Fuel*, which was approved for use under EPA ALT-125. All testing and associated procedures were conducted at PFS-TECO's Portland Laboratory beginning on 11/25/2019 and ending on 11/26/2019. PFS-TECO's Portland Laboratory is located at 11785 SE Highway 212 – Suite 305, Clackamas, Oregon 97015. Testing procedures followed ASTM E3053, with variances as described in EPA ALT-125. Particulate sampling was performed per ASTM E2515, *Standard Test Method for Determination of Particulate Matter Emissions Collected by a Dilution Tunnel,* with the exception of caveats described in EPA ALT-125. A copy of EPA ALT-125 is included in Appendix A for reference, as required by the approval letter.

PFS-TECO is accredited by the U.S. Environmental Protection Agency for the certification and auditing of wood heaters pursuant to subpart AAA of 40 CFR Part 60, New Source Performance Standards for Residential Wood Heaters and subpart QQQQ of 40 CFR Part 60, Standards of Performance for New Hydronic Heaters and Forced Air Furnaces, Methods 28R, 28WHH, 28 WHH-PTS, and all methods listed in Sections 60.534 and 60.5476. PFS-TECO holds EPA Accreditation Certificate Numbers 4 and 4M (mobile). PFS-TECO is accredited by IAS to ISO 17020:2012 "Criteria for Bodies Performing Inspections", and ISO 17025:2005 "Requirements for Testing Laboratories." PFS-TECO is also accredited by Standards Council of Canada to ISO 17065:2012 "Requirements for Bodies Operating Product Certification Systems."

The following people were associated with the testing, analysis and report writing associated with this project.

Sebastian Button, Laboratory Supervisor

Introduction

Pacific Energy of Duncan, BC, contracted with PFS-TECO to perform EPA certification testing on FP25LE Wood-Fired Room Heater. All testing was performed at PFS-TECO's Portland Laboratory. All testing was performed by Sebastian Button.

Notes

- Prior to start of testing, 50 hours of conditioning was performed per ASTM E3053.
- Prior to start of testing, the dilution tunnel was cleaned with a steel brush.
- Front filters were changed on sample train A at one hour for all 3 test runs.
- A total of 3 test runs were completed. Test runs were performed in accordance with ASTM E3053. No anomalies occurred. See the Run Narrative section for further detail on each run.

Wood Heater Identification and Testing

- Appliance Tested: ***FP25LE***
- Serial Number: ***PFS Tracking Number 0048***
- Manufacturer***: Pacific Energy Fireplace Products Ltd.***
- Catalyst: ***No***
- Heat exchange blower: ***Optional***
- Type: ***Wood Stove***
- Style: ***Built-In Fireplace***
- Date Received: ***Thursday, November 14, 2019***
- Testing Period – Start: ***Monday, November 25, 2019***
  Finish: ***Tuesday, November 26, 2019***
- Test Location: ***PFS-TECO Portland Laboratory***
  11785 SE HWY 212 - Suite 305, Clackamas, OR 97015
- Elevation: ***~131 Feet above sea level***
- Test Technician(s): ***Sebastian Button***
- Observers: ***None***

Test Procedures and Equipment

All Sampling and analytical procedures were performed by Sebastian Button. All procedures used are directly from ASTM E3053 and ASTM E2515. See the list below for equipment used. See Appendix C submitted with this report for calibration data.

Equipment List:

Equipment ID#	Equipment Description
135	Rice Lake 3'x3' floor scale w/digital weight indicator
132	Digiweigh DWP-440 Platform Scale
129	APEX XC-50-DIR Digital Emissions Sampling Box A
130	APEX XC-50-DIR Digital Emissions Sampling Box B
137	California Analytical ZRE CO2/CO/O2 IR ANALYZER
064	Digital Barometer
109A/B	Troemner 100mg/200mg Audit Weights
107	Sartorius Analytical Balance
051	10 lb audit weight
090	Dewalt Tape Measure
092	Digital Calipers
095	Anemometer
111	Microtector
115	Delmhorst Wood Moisture Meter
SA17187	Gas Analyzer Calibration Span Gas
CC170624	Gas Analyzer Calibration Mid Gas

Results

The weighted average emissions rate for the 3 run test series was measured to be **1.4 g/hr** with a Higher Heating Value efficiency of **67%.** The average CO emission rate for the 3 tests was **1.6 g/min.** The Pacific Energy FP25LE Wood-Fired Room Heater meets the 2020 cordwood PM emission standard of ≤ 2.5 g/hr per CFR 40 part 60, §60.532 (c).

Detailed individual run data can be found in Appendix A submitted with this report.

Summary Table

	High Fire Test	Low Fire Test	Medium Fire Test
Date	11/25/2019	11/25/2019	11/26/2019
Run Number	1	2	3
PM Emission Rate (g/hr)	3.54	0.71	0.91
Burn Rate (kg/hr)	4.10	0.84	1.20
Heat Output (BTU/hr)	51,530	11,005	15,419
HHV Efficiency (%)	62.8%	69.1%	67.6%
LHV Efficiency (%)	67.1%	73.9%	72.3%
CO Emissions (g/MJ output)	2.22	5.86	5.79
CO Emissions (g/kg dry fuel)	27.76	80.79	78.14
CO Emissions (g/min)	2.01	1.13	1.57
1st Hour Emission Rate (g/hr)	5.68	2.84	3.85
Weighting Factor (%)	20%	40%	40%
Weighted particulate emission average of 3 test runs: 1.4 grams per hour.			
Weighted average HHV efficiency of 3 test runs: 67%.			
Average CO emission rate for 3 test runs: 1.6 grams per minute			

Test Run Narrative

Run 1

Run 1 was performed on 11/25/2019 as a high fire test run per ASTM E3053. Emissions sampling began from a cold start ignition of kindling and start-up fuel. The test fuel load was loaded 35 minutes into the test. Testing was completed when 90% of the test fuel load was consumed. Total test time was 130 minutes, main test fuel load burn time was 95 min. The particulate emissions rate from kindling ignition to test completion was 3.54 g/hr. The burn rate of the test fuel load was 4.10 kg/hr. The main test load portion of the run had an overall HHV efficiency of 62.8%. The train A front filter was changed at 1 hr. All test results were appropriate and valid. There were no anomalies and all test criteria were met.

Run 2

Run 2 was performed on 11/25/2019 as a low fire test run per ASTM E3053. The overall test duration was 648 minutes. The burn rate for the test run was 0.84 kg/hr. The particulate emissions rate for the test run was 0.71 g/hr. The run had an overall HHV efficiency of 69.1%. The train A front filter was changed at 1 hr. All test results were appropriate and valid. There were no anomalies and all test criteria were met.

Run 3

Run 3 was performed on 11/26/2019 as a medium fire test run per ASTM E3053. The overall test duration was 459 minutes. The burn rate for the test run was 1.20 kg/hr, therefore the medium fire category requirements were met, less than the mid-point of the high and low burn rates (2.47 kg/hr). The particulate emissions rate for the test run was 0.91 g/hr. The run had an overall HHV efficiency of 67.6%. The train A front filter was changed at 1 hr. There were no anomalies and all criteria were met.

Test Conditions Summary

Testing conditions for all runs fell within allowable specifications of ASTM E3053 and ASTM E2515. A summary of facility conditions, fuel burned, and run times is listed below.

Runs	Ambient (°F)		Relative Humidity (%)		Average Barometric Pressure (In. Hg.)	Preburn Fuel Weight (lbs)	Test Fuel Weight (lbs)	Test Fuel Moisture (%DB)	Test Run Time (Min)
	Pre	Post	Pre	Post					
1	62	68	39.1	34.3	30.07	7.17[1]	20.06	21.6%	130[2]
2	69	66	34.3	40.7	30.03	20.06	24.34	21.3%	648
3	71	67	26	19.8	29.40	20.97	24.8	22.2%	459

[1]This is the weight of the kindling and startup fuel

[2]Total test time was 130 min, high fire test load burn duration was 95 min.

Appliance Operation and Test Settings

The appliance was operated according to procedures as described in the Operations Manual, found in Appendix B submitted with this report. Detailed run information can be found in Appendix A submitted with this report.

Settings & Run Notes

	Pre-Burn Air Setting	Test Run Air and Fan Settings
Run 1	N/A – Cold Start Ignition	Air control set to high fire test setting (fully open), blower off for first 5 min, then turned on (single speed fan).
Run 2	Air control set to High Fire Setting in accordance with ASTM E3053	Air control set to low fire test setting (fully closed), blower off for first 10 min, then turned on (single speed fan).
Run 3	Air control set to High Fire Setting in accordance with ASTM E3053	Air control set to medium fire test setting (3/16” PAC Opening), blower off for first 10 min, then turned on (single speed fan).

Appliance Description

Model(s): FP25LE

Additional Models Discussion: In addition to the tested model, this design is offered as the FP25AR LE. The difference between the models is that the FP25 LE has a rectangular door design, while the FP25AR LE has an arched door design. Both models use an identical design in aspects that may affect emissions or air control and are presumed to have the same emissions performance as the test specimen provided for certification.

Appliance Type: Built-in Fireplace

Firebox Volume: 2.10 ft^3

Air Introduction System: Primary Air enters the firebox from the front bottom of the appliance and is channeled up the sides on the appliance and down through the air wash, as well as through a pilot air opening in the front of the firebox. Primary air is controlled via a damper arm located below the ashlip which moves left (open) to right (closed). Secondary air is pulled through a fixed opening in to rear bottom of the appliance and channeled up through secondary air baffle. Dimensions on all these features can be found in Appendix D.

Baffles: A stainless steel secondary air baffle directs all flames towards the front of the firebox. The baffle is partially insulated with Superwool Blanket.

Refractory Insulation: The firebox is lined with 1" thick firebrick.

Flue Outlet: 6-inch exhaust outlet located on the top of the appliance.

Fan: The NEO 2.5 LE is equipped from the factory with a convection fan that attaches to the rear of the appliance.

Appliance Dimensions

FP25LE Unit Dimensions

Height	Width	Depth	Firebox Volume
45.25"	41.5"	24"	2.10 ft^3

Appliance design drawings can be found in Appendix D submitted with the CBI copy of this report.

Appliance Front

Appliance Left

Appliance Right

Appliance Rear

Test Fuel Properties

Test fuel used was Maple cordwood, split and air-dried to the specified moisture content range. Typical fuel loads are pictured below:

Typical Kindling Load

Typical Startup Load

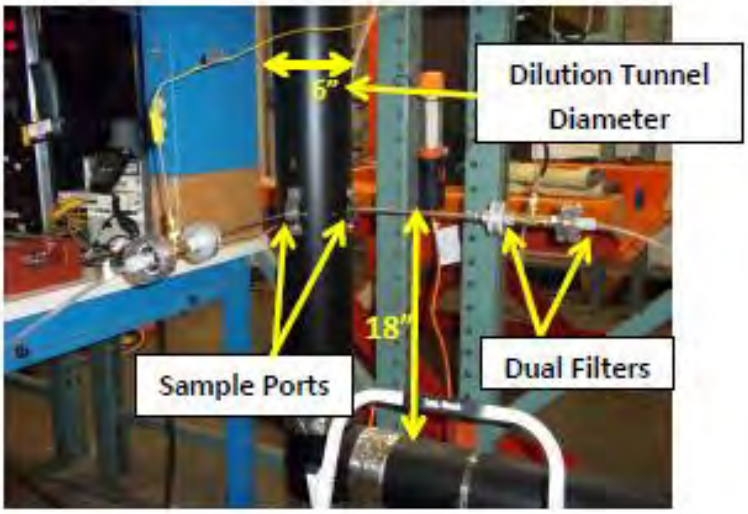
Typical High Fire Load

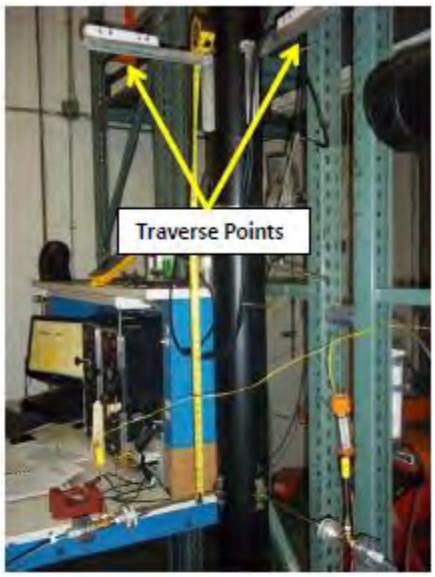
Typical Low Fire Load

Sampling Locations and Descriptions

Sample ports are located 16.5 feet downstream from any disturbances and 1 foot upstream from any disturbances. Flow rate traverse data was collected 12 feet downstream from any disturbances and 5.5 feet upstream from any disturbances. (See below).

Sample Points





Sampling Methods

ASTM E2515 was used in collecting particulate samples. The dilution tunnel is 6 inches in diameter. All sampling conditions per ASTM E2515 were followed. No alternate procedures were used with the exception of caveats described in ALT-125: Pall TX40 Emfab filters were used, filter temperatures were maintained between 80 and 90°F for all tests, filters were weighed in pairs where applicable, and no sampling intervals fell outside of proportional rates of +/- 10%.

Analytical Methods Description

All sample recovery and analysis procedures followed ASTM E2515 procedures. At the end of each test run, filters, O-Rings and probes were removed from their housings, dessicated for a minimum of 24 hours, and then weighed at 6 hour intervals to a constant weight per ASTM E2515-11 Section 10.

Calibration, Quality Control and Assurances

Calibration procedures and results were conducted per EPA Method 28R, ASTM E2515-11 and ASTM E3053. Test method quality control procedures (leak checks, volume meter checks, stratification checks, proportionality results) followed the procedures outlined.

Appliance Sealing and Storage

Upon completion of testing, the appliance was secured with metal strapping and the seal below was applied, the appliance was then returned to the manufacturer's location at: 2975 Allenby Road Duncan, BC V9L 6V8, Canada, for archival.

Sealing Label

ATTENTION:

THIS SEAL IS NOT TO BE BROKEN WITHOUT PRIOR AUTHORIZATION FROM THE UNITED STATES ENVIRONMENTAL PROTECTION AGENCY.

THIS APPLIANCE HAS BEEN SEALED INACCORDANCE WITH REQUIREMNTS OF 40CFR PART 60 SUBPART AAA §60.535 (a)(2)(vii)

REPORT #_____ DATE SEALED_____

MANUFACTURER_____ MODEL #_____

Sealed Unit

List of Appendices

The following appendices have been submitted electronically in conjunction with this report:

Appendix A – Test Run Data, Technician Notes, Sample Analysis, and Alternate Test Method Approval

Appendix B – Labels and Manuals

Appendix C –Equipment Calibration Records

Appendix D – Design Drawings (CBI Report Only)

Appendix E – Manufacturer QAP (CBI Report Only)

WOOD HEATER TESTING SUMMARY

SECTION 1 – Model Identification	
Model Name(s)/Number(s)	FP25
Manufacturer	Pacific Energy Fireplace Products
Address 1	2975 Allenby Road
Address 2	Duncan, BC V9L 6V8, Canada
Appliance Category(s) (Free-standing, Insert, etc.)	Built-in Fireplace
Usable Firebox Volume - ft^3	2.1
Catalytic/Non-Cat	Non-Cat
Convection Air Fan (No, Standard, Optional)	Optional
SECTION 1B – Laboratory Information	
Testing Laboratory	PFS-TECO
Address 1	11785 SE Hwy 212 Ste 305
Address 2	Clackamas, OR 97015
ISO/Accreditation Info	ISO 17025
Dates Tested	11/25/19 - 11/26/2019
Test Methods/Standards	ASTM E3053 (ALT-125), ASTM E2515
Dilution Tunnel Inside Diameter - in.	6.00
Filter Diameter - mm	47
Filter Material	Pall Type TX40

SECTION 2 – Test Conditions Summary

Test Run #	1	2	3	
Date Tested	11/25/2019	11/25/2019	11/26/2019	
Test Run Category (L, M, H)	High Fire	Low Fire	Medium Fire	
Average Barometric Pressure - in Hg	30.07	30.03	29.40	
Max. Observed Ambient Temp - °F	69	75	71	
Min. Observed Ambient Temp - °F	62	65	66	
Max. Observed Filter Temp - °F	88	90	88	
Test Fuel Load				
Cordwood Fuel Species	Maple, Hard	Maple, Hard	Maple, Hard	
Specific Gravity (from Table 1)	0.6	0.6	0.6	
Higher Heating Value - Btu/lb (from Annex A1)	8587	8587	8587	
Nom. Test Fuel Load Piece Length - in.	16	16	16	
Number of Test Fuel Pieces	5	5	5	
Test Fuel Weight				
Kindling - As Fired lb	2.98	N/A	N/A	
Kindling Wt. - As % of Test Fuel Load	15%	N/A	N/A	
Kindling Moisture - % DB	10%	N/A	N/A	
Kindling - kg DB	1.23	N/A	N/A	
SU Fuel - As Fired lb	4.19	N/A	N/A	
SU Fuel Wt. - As % of Test Fuel Load	21%	N/A	N/A	
SU Fuel Moisture - % DB	21%	N/A	N/A	
SU Fuel - kg DB	1.57	N/A	N/A	
Test Fuel Load - As Fired lb	20.06	24.34	24.8	
Ave. Test Fuel Load MC % DB	21.6%	21.3%	22.2%	
Test Fuel Load - kg DB	7.48	9.10	9.21	
Test Fuel Loading Density - lb/ft3	9.55	11.59	11.81	
Residual SU Fuel Wt. - As Fired lb	2.04	N/A	N/A	
Residual SU Fuel Wt. - As % of Test Fuel Load	10%	N/A	N/A	
Test Run Duration - minutes	130	648	459	
Test Run Duration - h	2.17	10.80	7.65	
Run Duration of High Fire Load Only - minutes	95	N/A	N/A	
Run Duration of High Fire Load Only - h	1.58	N/A	N/A	
Test Fuel Load Wt. at End of Test - As Fired lb	2.2	0	0	
Total Fuel Burned - kg DB	8.36	9.10	9.21	
% Test Fuel Load Wt. at End of Test	11.0%	0.0%	0.0%	

SECTION 3 – Test Run Results Summary

Test Run #	1	2	3	
Date Tested	11/25/19	11/25/19	11/26/19	
Test Run Category	High Fire	Low Fire	Medium Fire	
Burn Rate - kg/h DB	4.10	0.84	1.20	
Heat Output - Btu/h	51,530	11,005	15,419	
Average Dilution Tunnel Flow Rate - dscfm	293.50	318.51	293.20	
Average Sample Flow Rates - dscfm				
Train 1	0.151	0.157	0.157	
Train 2	0.156	0.160	0.158	
Total PM Emissions - g				
Train 1	7.54	7.68	6.58	
Train 2	7.79	7.68	7.27	
Average	7.665	7.681	6.924	
PM Emission Train Precision - %	1.6%	0.0%	5.0%	
PM Emission Train Precision - g/kg	0.01	0.00	0.04	
PM Emission Rate - g/h	3.54	0.71	0.91	
Total CO Emissions - g	191	734	720	
CO Emissions Rate - g/h	120	68	94	
Overall Efficiency - CSA B415.1-10				
% HHV Basis	63%	69%	68%	
% LHV Basis	67%	74%	72%	

SECTION 4 - Weighted Average Summary

Test Run Category	High Fire	Low Fire	Medium Fire
Burn Rate - kg/h DB	4.10	0.84	1.20
PM Emission Rate - g/h	3.54	0.71	0.91
CO Emissions Rate - g/h	120.3	68.0	94.1
Overall Efficiency - CSA B415.1-10			
% HHV Basis	63%	69%	68%
% LHV Basis	67%	74%	72%
Heat Output - Btu/h	51500	11000	15400
Category Weighting	20%	40%	40%

ASTM E 3053 Weighted Averages			
PM Emission Rate - g/h	1.4		
CO Emissions Rate - g/h (Arithmetic Average)	94.1		
CO Emissions Rate - g/min (Arithmetic Average)	1.6		
Overall Efficiency - CSA B415.1-10			
% HHV Basis	67%		
% LHV Basis	72%		
Heat Output Range - Btu/h	11000	to	51500

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
RESEARCH TRIANGLE PARK, NC 27711

FEB 2 8 2018

OFFICE OF
AIR QUALITY PLANNING
AND STANDARDS

Mr. Justin White
Hearthstone QHPP, Inc.
#17 Stafford Ave.
Morrisville, VT 05661

Dear Mr. White,

I am writing in response to your letter dated January 12, 2018, regarding wood heaters manufactured by Hearthstone QHPP, Inc. (Hearthstone). This response, dated February 28, 2018, supercedes our previous response (dated February 26, 2018) to correct an inaccuracy regarding required changes to ASTM E3053-17.

You are requesting to use an alternative test method, using cord wood, as referenced in section 60.532(c) of 40 CFR part 60, Subpart AAA, Standards of Performance for New Residential Wood Heaters (Subpart AAA) to meet the 2020 cord wood alternative compliance option. The 2020 cord wood alternative compliance option states that each affected wood heater manufactured or sold at retail for use in the United States on or after May 15, 2020, must not discharge into the atmosphere any gases that contain particulate matter in excess of 2.5 g/hr. Compliance must be determined by a cord wood test method approved by the Administrator along with the procedures in 40 CFR 60.534. You have requested approval to use the procedures and specifications found in ASTM Method E3053-17, a cord wood test method titled, "Standard Test Method for Determining Particulate Matter Emissions from Wood Heaters using Cordwood Test Fuel," in conjunction with ASTM E2515-11 and Canadian Standards Administration (CSA) Method CSA-B415.1-10, which are specified in 40 CFR 60.534.

We understand that Hearthstone is also requesting that the alternative method proposed above be approved to apply broadly to all wood heaters manufactured by Hearthstone meeting the requirements of Subpart AAA, from the approval date of this request until such time that Subpart AAA is revised or replaced to require a different cord wood certification method, providing all requirements of section 60.533 of Subpart AAA are met.

With the caveats set forth below, we approve your alternative test method request for certifying wood heaters using ASTM E3053-17 in conjunction with section 60.534 of Subpart AAA to meet the 2020 cord wood compliance option until such time that Subpart AAA is revised or replaced to require a different cord wood certification method. We also approve application of this alternative method to all wood heaters manufactured by Hearthstone meeting the requirements of Subpart AAA.

As required in Subpart AAA, section 60.354(d), you or your approved test laboratory must also measure the first hour of particulate matter emissions for each test run using a separate filter in one of the two parallel sampling trains. These results must be reported separately and also included in the total particulate matter emissions per run. Also, as required by Subpart AAA, section 60.534(e), you must have your approved laboratory measure the efficiency, heat output, and carbon monoxide emissions of the tested wood heater using CSA-B415.1-10. For measurement of particulate matter emission concentrations, ASTM 2515-11 must be used.

The following change to ASTM E3053-17 must be followed:

1. Coal bed conditions prior to loading test fuel. The coal bed shall be a level plane without valleys or ridges for all test runs in the high, low, and medium burn rate categories.

The following changes to ASTM E2515-11 must be followed:

1. The filter temperature must be maintained between 80 and 90 degrees F during testing.

2. Filters must be weighed in pairs to reduce weighing error propagation; see ASTM 2515-11, Section 10.2.1 Analytical Procedure.

3. Sample filters must be Pall TX-40 or equivalent Teflon-coated glass fiber, and of 47 mm, 90 mm, 100 mm, or 110 mm in diameter.

4. Only one point is allowed outside the +/- 10 percent proportionality range per test run.

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 all wood heaters subject to the requirements of 40 CFR part 60, Subpart AAA. For this reason, we will post this letter as ALT-125 on our website at *http://www3.epa.gov/ttn/emc/approalt.html* for use by other interested parties. As noted earlier in this letter, this alternative method approval is valid until such time that Subpart AAA is revised or replaced to require a different cord wood 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

FP25 LE Seasoning Data 50 Hours

Date: Sept 27 2019									
RND 1									
	Moisture Content dry basis						Mass	Time	Stack Temp
	Piece 1	Piece 2	Piece 3	Piece 4	Piece 5		lbs	Hours	˚F
Top	19.2	20.6	22.4	18.2	19.8		5.3	0	119
Bottom	20	20.9	18	18	20		3.8	1	1273
Side	20.7	19.1	22.4	19	16.7		3.5	1	804
							5.8	0	
							2.5	0	
								0	
Average Dry basis						19.66666667	%MC_{DRY}	0	
Average Wet basis						16.43454039	%Mcwet	0	
Fuel Load Mass lbs						20.9	lbs	Total Hours	2

Date: October 18 2019									
RND 2									
	Moisture Content dry basis						Mass	Time	Stack Temp
	Piece 1	Piece 2	Piece 3	Piece 4	Piece 5		lbs	Hours	˚F
Top	20.4	18	18	20.5	26		5.3	0	160
Bottom	25	18.3	19.5	18	26		4.3	1	937
Side	21.6	18	18	18	22.8		4	1	721
							5	0	
							3.1	0	
								0	
Average Dry basis						20.54	%MC_{DRY}	0	
Average Wet basis						17.03998673	%Mcwet	0	
Fuel Load Mass lbs						21.7	lbs	Total Hours	2

Date: October 31 2019									
RND 4									
	Moisture Content dry basis						Mass	Time	Stack Temp
	Piece 1	Piece 2	Piece 3	Piece 4	Piece 5		lbs	Hours	˚F
Top	20.6	22.5	25.7	28.7	20.1		3.8	0	213
Bottom	22.6	23	26.4	25.3	25.9		3.75	1	1104
Side	25.3	19.6	24.6	22.1	18.2		5.1	1	787
							4.1	0	
							3.65	0	
								0	
Average Dry basis						23.37333333	%MC_{DRY}	0	
Average Wet basis						18.94520696	%Mcwet	0	
Fuel Load Mass lbs						20.4	lbs	Total Hours	2

Date: October 31 2019									
RND 5									
	Moisture Content dry basis						Mass	Time	Stack Temp
	Piece 1	Piece 2	Piece 3	Piece 4	Piece 5		lbs	Hours	˚F
Top	25.2	28	25	25	19.6		5.2	0	673
Bottom	27	22.9	21.9	25	27		5.1	1	734
Side	27	27	25	25	21.2		4.65	1	573
							6	1	485
							3.95	1	362
								1	290
Average Dry basis						24.78666667	%MC_{DRY}	1	251
Average Wet basis						19.86323325	%Mcwet	1	220
Fuel Load Mass lbs						24.9	lbs	Total Hours	7

Date: November 4 2019									
RND 6									
	Moisture Content dry basis						Mass	Time	Stack Temp
	Piece 1	Piece 2	Piece 3	Piece 4	Piece 5		lbs	Hours	˚F
Top	23.1	19	20	24.2	19		5	0	325
Bottom	28	24	21.5	28	19		3.85	1	864
Side	28	24	22.9	24	19		3.6	1	791
							5.7	0	
							2.3	0	
								0	
Average Dry basis						22.91333333	$\%MC_{DRY}$	0	
Average Wet basis						18.64186147	%Mcwet	0	
Fuel Load Mass lbs						20.45	lbs	Total Hours	2

Date: November 4 2019									
RND 7									
	Moisture Content dry basis						Mass	Time	Stack Temp
	Piece 1	Piece 2	Piece 3	Piece 4	Piece 5		lbs	Hours	˚F
Top	22.7	19.4	22.7	22.9	18		5.1	0	658
Bottom	25.4	23.5	22.7	26	21.4		5.25	1	601
Side	19.5	23.5	23.4	26	21.2		4.4	1	609
							6.2	1	349
							4.1	1	259
								1	253
Average Dry basis						22.55333333	$\%MC_{DRY}$	1	260
Average Wet basis						18.40287222	%Mcwet	1	251
Fuel Load Mass lbs						25.05	lbs	Total Hours	7

Date: Nov 4 2019									
R&D: 7 Continued									
	Moisture Content dry basis						Mass	Time	Stack Temp
	Piece 1	Piece 2	Piece 3	Piece 4	Piece 5		lbs	Hours	˚F
Top	22.7	19.4	22.7	22.9	18		5.1	0	251
Bottom	25.4	23.5	22.7	26	21.4		5.25	1	222
Side	19.5	23.5	23.4	26	21.2		4.4	1	190
							6.2	1	167
							4.1	0	
								0	
Average Dry basis						22.55333333	$\%MC_{DRY}$	0	
Average Wet basis						18.40287222	%Mcwet	0	
Fuel Load Mass lbs						25.05	lbs	Total Hours	3

Date: November 5 2019									
R&D: 8									
	Moisture Content dry basis						Mass	Time	Stack Temp
	Piece 1	Piece 2	Piece 3	Piece 4	Piece 5		lbs	Hours	˚F
Top	22.7	24.2	24.6	23.6	24.2		4.45	0	241
Bottom	22.5	21	23	21	25		4.55	1	948
Side	28	24.6	28	28	20.5		4.25	1	707
							4.00	1	602
							3.70	0	
								0	
Average Dry basis						24.06	$\%MC_{DRY}$	0	
Average Wet basis						19.39384169	%Mcwet	0	
Fuel Load Mass lbs						20.95	lbs	Total Hours	3

Date: November 2019									
R&D: 9									
	Moisture Content dry basis						Mass	Time	Stack Temp
	Piece 1	Piece 2	Piece 3	Piece 4	Piece 5		lbs	Hours	˚F
Top	22.1	20	18	22.4	18		5.35	0	545
Bottom	19.1	19.2	19.3	18	20		4.95	1	555
Side	22.3	20.6	22.9	27	20		4.80	1	575
							5.45	1	409
							3.55	1	211
								1	168
Average Dry basis						20.59333333	$\%MC_{DRY}$	1	146
Average Wet basis						17.07667643	%Mcwet	1	135
Fuel Load Mass lbs						24.1	lbs	Total Hours	7

Date: November 7 2019									
R&D: 10									
	Moisture Content dry basis						Mass	Time	Stack Temp
	Piece 1	Piece 2	Piece 3	Piece 4	Piece 5		lbs	Hours	˚F
Top	23	22.4	27	28	20.9		5.05	0	216
Bottom	27	19.1	28	20.6	19		4.50	1	860
Side	26	19.2	20	28	20.8		4.10	1	701
							5.65	0	
							2.15	0	
								0	
Average Dry basis						23.26666667	$\%MC_{DRY}$	0	
Average Wet basis						18.8750676	%Mcwet	0	
Fuel Load Mass lbs						21.45	lbs	Total Hours	2

Date: November 7 2019									
R&D: 11									
	Moisture Content dry basis						Mass	Time	Stack Temp
	Piece 1	Piece 2	Piece 3	Piece 4	Piece 5		lbs	Hours	˚F
Top	21.5	19.3	22.9	20.4	18		5.35	0	634
Bottom	28	28	26	18.2	26		4.95	1	627
Side	19.6	18	25.3	28	22		4.75	1	539
							5.45	1	373
							3.60	1	305
								1	271
Average Dry basis						22.74666667	%MC_{DRY}	1	232
Average Wet basis						18.53139257	%Mcwet	1	199
Fuel Load Mass lbs						24.1	lbs	Total Hours	7

Date: October 29 2019									
Seasoning									
	Moisture Content dry basis						Mass	Time	Stack Temp
	Piece 1	Piece 2	Piece 3	Piece 4	Piece 5		lbs	Hours	˚F
Top	24.6	24.6	24.6	24.6	24.6		6.3	0	204
Bottom	24.6	24.6	24.6	24.6	24.6		4.85	1	976
Side	24.6	24.6	24.6	24.6	24.6		3.95	1	703
							7.3	1	441
							3.8	1	359
								1	295
Average Dry basis						24.6	%MC_{DRY}	1	228
Average Wet basis						19.74317817	%Mcwet	0	
Fuel Load Mass lbs						26.2	lbs	Total Hours	6

Sample Calculations – ASTM E3053 & E2515

Client: Pacific Energy
Model: FP25
Run: 1

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

M_{Fldb} – Weight of test fuel load, dry basis, lb (kg)

M_{SUdb} – Weight of start-up fuel, dry basis, lb (kg)

M_{Kdb} - Weight of kindling, dry basis, lb (kg)

M_{FREHdb} - Total weight of all remaining fuel at end of high fire test run, lb (kg)

M_{TFBHdb} - Total weight of all fuel burned during high fire test run, lb (kg), dry basis

BR_H – Dry burn rate for high fire test run, from time when test fuel load is added to end of test run, lb/h (kg/h)

M_{TFBdb} - Total weight of fuel burned during low or medium fire test run, lb (kg), dry basis

BR - Dry burn rate for low and medium fire test runs, lb/h (kg/h)

V_s – Average gas velocity in the dilution tunnel, ft/sec

Q_{sd} – Average gas flow rate in dilution tunnel, dscf/hr

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

m_n – Total particulate matter collected, mg

C_s - Concentration of particulate matter in tunnel gas, dry basis, corrected to STP, g/dscf

E_T – Total particulate emissions, g

PR - Proportional rate variation

PM_{RH} - Particulate emission rate for high fire test run, g/hr

PM_{FH} - Particulate emission factor for high fire test run, g/dry kg of fuel burned

PM_R – Particulate emission rate for low or medium fire test run, g/hr

PM_F – Particulate emission factor for low or medium fire test run, g/dry kg of fuel burned

M_{Fldb} – Weight of test fuel load, dry basis, lb (kg)
ASTM E3053 equation (1)

$$M_{Fldb} = \Sigma((M_{FLnwb})(100/(100 + MC_{FLn})))$$

Where,

M_{FLnwb} = Weight of each test fuel piece, n, in test fuel load per 8.4.1, wet basis, lb (kg)
MC_{FLn} = Average fuel moisture of test fuel piece, n, in test fuel load, % dry basis
n = individual test fuel pieces that comprise the test fuel load, as applicable.

Sample Calculation:

n	M_{FLnwb}	MC_{FLn}	$(M_{FLnwb})(100/(100 + MC_{FLn}))$		
1	3.83	23.5	3.83 (100) / (100+ 23.5)) =	3.10	
2	4.47	19.7	4.47 (100) / (100+ 19.7)) =	3.74	
3	4.07	20.9	4.07 (100) / (100+ 20.9)) =	3.37	
4	4.67	22.4	4.67 (100) / (100+ 22.4)) =	3.82	
5	3.02	21.9	3.02 (100) / (100+ 21.9)) =	2.48	
6	0.00	NA	N/A	-	
7	N/A	N/A	N/A	-	
			SUM	16.50	lbs

M_{Fldb} = **16.50** lbs
M_{Fldb} = **7.48** kg

M_{SUdb} – Weight of start-up fuel, dry basis, lb (kg)
ASTM E3053 equation (2)

$$M_{SUdb} = (M_{SUwb})(100/(100 + MC_{SU}))$$

Where,

M_{SUwb} = Total weight of start-up fuel pieces, wet basis, lb (kg)

MC_{SU} = Average fuel moisture of the piece(s) from which start-up fuel was split, % dry basis

Sample Calculation:

M_{SUwb} = 4.19

MC_{SU} = 21.3

M_{SUdb} = 4.2 (100/(100+ 21.3)

M_{SUdb} = **3.46** lbs

= **1.57** kg

M_{Kdb} - Weight of kindling, dry basis, lb (kg)
ASTM E3053 equation (3)

$$M_{Kdb} = (M_{Kwb})(100/(100 + MC_K))$$

Where,

M_{Kwb} = Weight of kindling per 8.5.6, wet basis, lb (kg);

MC_K = Average moisture of kindling (may be assumed 10%), % dry basis.

Sample calculation:

M_{Kwb} = 2.98

MC_K = 10.0

M_{Kdb} = 2.98 (100/(100+ 10.0)

M_{Kdb} = **2.71** lbs

= **1.23** kgs

M_{FREHdb} - Total weight of all remaining fuel at end of high fire test run, lb (kg)
ASTM E3053 equation (4)

$$M_{FREHdb} = M_{RSUBdb} + M_{FLEHdb}$$

Where,

M_{RSUBdb} = Weight of residual start-up fuel bed when high fire test load added, lb (kg)

M_{FLEHdb} = Weight of unburned portion of test fuel load at the end of the high fire test run, lb (kg)

Sample calculation:

M_{RSUBdb} = 2.04

M_{FLEHdb} = 2.2

M_{FREHdb} = 2.04 + 2.2

M_{FREHdb} = **4.24** lbs

= **1.92** kg

M_{TFBHdb} - Total weight of all fuel burned during high fire test run, lb (kg), dry basis

ASTM E3053 equation (5)

$$M_{TFBHdb} = M_{Kdb} + M_{SUdb} + M_{FLdb} - M_{FREHdb}$$

Sample Calculation:

M_{Kdb} = 2.71

M_{SUdb} = 3.46

M_{FLdb} = 16.50

M_{FREHdb} = 4.24

M_{TFBHdb} = 2.71 + 3.46 + 16.50 - 4.24

= **18.42** lbs

= **8.36** kg

BR_H – Dry burn rate for high fire test run, from time when test fuel load is added to end of test run, lb/h (kg/h)

ASTM E3053 equation (6)

$$BR_H = 60\ (M_{FLdb} - M_{FLEHdb})/\theta_{H1}$$

Where,

θ_{H1} = Total duration of high fire test run, from time when test fuel load is added to end of test run, min.

Sample calculation:

M_{FLdb} = 16.50

M_{FLEHdb} = 2.20

θ_{H1} = 95

$$BR_H = \frac{60\ (\ 16.50\ -\ 2.20\ )}{95}$$

BR_H = **9.03** lb/hr

= **4.10** kg/hr

M_{TFBdb} - Total weight of fuel burned during low or medium fire test run, lb (kg), dry basis
ASTM E3053 equation (7)

$$M_{TFBdb} = M_{FLdb} - M_{FREdb}$$

Where,

M_{FLdb} = Total weight of fuel burned during low or medium fire test run, lb (kg), dry basis

M_{FREdb} = Weight of remaining fuel at end of low or medium fire test run, lb (kg)

Sample Calculation:

M_{FLdb} = N/A - Applicable to Low/Medium Fire Tests Only

M_{FREdb} = N/A - Applicable to Low/Medium Fire Tests Only

M_{TFBdb} = N/A - N/A

= **N/A** lbs

= **N/A** kg

BR - Dry burn rate for low and medium fire test runs, lb/h (kg/h)
ASTM E3053 equation (8)

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

Where,

θ = Total test run duration for low or medium fire test run, min.

Sample Calculation:

M_{TFBdb} = N/A - Applicable to Low/Medium Fire Tests Only

θ = N/A - Applicable to Low/Medium Fire Tests Only

$$BR = \frac{60 \times \text{N/A}}{\text{N/A}}$$

BR = **N/A** lb/hr

= **N/A** kg/hr

V_s – Average gas velocity in the dilution tunnel, ft/sec
ASTM E2515 equation (9)

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

Where:

F_p = Adjustment factor for pitot tube center point reading = $\frac{V_{strav}}{V_{scent}}$, ASTM E2515 Equation (1)

v_{scent} = Dilution tunnel velocity calculated after the multi-point pitot traverse at the center, ft/sec

v_{strav} = Dilution tunnel velocity calculated after the multi-point pitot traverse, ft/sec

k_p = Pitot tube constant, 85.49

C_p = Pitot tube coefficient: 0.99, unitless

ΔP* = Velocity pressure in the dilution tunnel, in H_2O

T_s = Absolute average gas temperature in the dilution tunnel, °R; (°R = °F + 460)

P_s = Absolute average gas static pressure in dilution tunnel, = P_{bar} + P_g , in Hg

P_{bar} = Barometric pressure at test site, in. Hg

P_g = Static pressure of tunnel, in. H_20; (in Hg = in H_20/13.6)

M_s = **The dilution tunnel wet molecular weight; M_s = 28.78 assuming a dry weight of 29 lb/lb-mole

Sample calculation:

$$Fp = \frac{15.83}{16.84} = 0.940$$

$$V_s = 0.940 \times 85.49 \times 0.99 \times 0.239 \times \left(\frac{114.1 + 460}{\left(30.07 + \frac{-0.14}{13.6}\right) \times 28.78} \right)^{1/2}$$

V_s = **15.48** ft/s

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

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

Q_{sd} – Average gas flow rate in dilution tunnel, dscf/hr
ASTM E2515 equation (3)

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

Where:

3600	=	Conversion from seconds to hours (ASTM method uses 60 to convert in minutes)
B_{ws}	=	Water vapor in gas stream, proportion by volume; assume 2%
A	=	Cross sectional area of dilution tunnel, ft^2
T_{std}	=	Standard absolute temperature, 528 °R
P_s	=	Absolute average gas static pressure in dilution tunnel, = P_{bar} + P_g , in Hg
$T_{s(avg)}$	=	Absolute average gas temperature in the dilution tunnel, °R; (°R = °F + 460)
P_{std}	=	Standard absolute pressure, 29.92 in Hg

Sample calculation:

$$Q_{sd} = 3600 \times (1 - 0.02) \times 15.48 \times 0.3491 \times \frac{528}{114.1 + 460} \times \frac{30.07 + \frac{-0.14}{13.6}}{29.92}$$

Q_{sd} = **17609.8** dscf/hr

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

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

Where:

K_1	=	17.64 °R/in. Hg
V_m	=	Volume of gas sample measured at the dry gas meter, dcf
Y	=	Dry gas meter calibration factor, dimensionless
P_{bar}	=	Barometric pressure at the testing site, in. Hg
ΔH	=	Average pressure differential across the orifice meter, in. H_2O
T_m	=	Absolute average dry gas meter temperature, °R

Sample Calculation:

Using equation for Train 1:

$$V_{m(std)} = 17.64 \times 19.636 \times 0.992 \times \frac{\left(30.07 + \frac{0.98}{13.6}\right)}{(78.6 + 460)}$$

$V_{m(std)}$ = **19.228** dscf

Using equation for Train 2:

$$V_{m(std)} = 17.64 \times 20.320 \times 1.002 \times \frac{\left(30.07 + \frac{1.11}{13.6}\right)}{(79.2 + 460)}$$

$V_{m(std)}$ = **20.080** dscf

Using equation for ambient train:

$$V_{m(std)} = 17.64 \times 0.00 \times 0 \times \frac{\left(30.07 + \frac{0.00}{13.6}\right)}{(65.8 + 460)}$$

$V_{m(std)}$ = **0** dscf

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

$$m_n = m_p + m_f + m_g$$

Where:

m_p = mass of particulate matter from probe, mg

m_f = mass of particulate matter from filters, mg

m_g = mass of particulate matter from filter seals, mg

Sample Calculation:

Using equation for Train A (first hour):

m_n = 0.0 + 2.9 + 0.0

m_n = 2.9 mg

Using equation for Train A (post-first hour):

m_n = 0.0 + 0.9 + 0.0

m_n = 0.9 mg

Train A aggregate:

m_n = 2.9 + 0.9

m_n = **3.8** mg

Using equation for Train B:

m_n = 0.2 + 2.9 + 1

m_n = **4.1** mg

C_s - Concentration of particulate matter in tunnel gas, dry basis, corrected to STP, g/dscf
ASTM E2515 equation (13)

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

Where:

K_2	=	Constant, 0.001 g/mg
m_n	=	Total mass of particulate matter collected in the sampling train, mg
$V_{m(std)}$	=	Volume of gas sampled corrected to dry standard conditions, dscf

Sample calculation:

For Train 1:

$$C_s = 0.001 \times \frac{3.8}{19.23}$$

C_s = **0.00020** g/dscf

For Train 2

$$C_s = 0.001 \times \frac{4.1}{20.08}$$

C_s = **0.00020** g/dscf

For Ambient Train

$$C_r = 0.001 \times \frac{}{0}$$

C_r = **0** g/dscf

E_T – Total Particulate Emissions, g
ASTM E2515 equation (15)

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

Where:

C_s	=	Concentration of particulate matter in tunnel gas, g/dscf
C_r	=	Concentration particulate matter room air, g/dscf
Q_{std}	=	Average dilution tunnel gas flow rate, dscf/hr
θ	=	Total time of test run, minutes

Sample calculation:

For Train 1

E_T = (0.000198 - 0) x 17609.8 x 130 /60

E_T = **7.54** g

For Train 2

E_T = (0.000204 - 0) x 17609.8 x 130 /60

E_T = **7.79** g

Average

E = **7.67** g

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

7.5% of the average =	0.57
Train 1 difference =	0.13
Train 2 difference =	0.13

PR - Proportional Rate Variation
ASTM E2515 equation (16)

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

Where:

θ = Total sampling time, min

θ_i = Length of recording interval, min

V_{mi} = Volume of gas sample measured by the dry gas meter during the “ith” time interval, dcf

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

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

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

T_{mi} = Absolute average dry gas meter temperature during the "ith" time interval, ^oR

T_m = Absolute average dry gas meter temperature, ^oR

T_{si} = Absolute average gas temperature in the dilution tunnel during the "ith" time interval, ^oR

T_s = Absolute average gas temperature in the dilution tunnel, ^oR

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

$$PR = \left(\frac{130 \times 0.127 \times 15.48 \times (70.0 + 460) \times (78.6 + 460)}{1 \times 19.636 \times 14.87 \times (114.1 + 460) \times (64.0 + 460)} \right) \times 100$$

PR = **83** %

PM_{RH} - Particulate emission rate for high fire test run, g/hr;
ASTM E3053 equation (9)

$$PM_{RH} = 60(E_{TH}/\theta_{H2})$$

Where,

E_{TH} = Total particulate emissions for high fire test run including kindling and start-up, g

θ_{H2} = Total duration of high fire test run, from ignition of kindling to end of test run, min.

Sample Calculation:

E_{TH} = 7.67

θ_{H2} = 130

PM_{RH} = 60(7.67 / 130)

PM_{RH} = **3.54** g/hr

PM_{FH} - Particulate emission factor for high fire test run, g/dry kg of fuel burned.

ASTM E3053 equation (10)

$$PM_{FH} = E_{TH}/M_{TFBHdb}$$

Sample Calculation:

E_{TH} = 7.67

M_{TFBHdb} = 8.36

PM_{FH} = 7.67 / 8.36

= **0.92** g/kg

PM_R - Particulate emission rate for low or medium fire test runs, g/hr
ASTM E3053 equation (12)

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

Where,

E_T = Total particulate emissions for low or medium fire test runs from Test Method E2515, g

Sample Calculation:

E_T = N/A - Applicable to Low/Medium Fire Tests Only
θ = N/A - Applicable to Low/Medium Fire Tests Only

PM_R = 60(N/A / N/A)

PM_{RH} = **N/A** g/hr

PM_{FH} - Particulate emission factor for high fire test run, g/dry kg of fuel burned.
ASTM E3053 equation (13)

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

Sample Calculation:

E_T = N/A - Applicable to Low/Medium Fire Tests Only
M_{TFBdb} = N/A - Applicable to Low/Medium Fire Tests Only

PM_{FH} = N/A / N/A
= **N/A** g/kg

Sample Calculations – ASTM E3053 & E2515

Client: Pacific Energy
Model: FP25
Run: 2

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

M_{Fldb} – Weight of test fuel load, dry basis, lb (kg)

M_{SUdb} – Weight of start-up fuel, dry basis, lb (kg)

M_{Kdb} - Weight of kindling, dry basis, lb (kg)

M_{FREHdb} - Total weight of all remaining fuel at end of high fire test run, lb (kg)

M_{TFBHdb} - Total weight of all fuel burned during high fire test run, lb (kg), dry basis

BR_H – Dry burn rate for high fire test run, from time when test fuel load is added to end of test run, lb/h (kg/h)

M_{TFBdb} - Total weight of fuel burned during low or medium fire test run, lb (kg), dry basis

BR - Dry burn rate for low and medium fire test runs, lb/h (kg/h)

V_s – Average gas velocity in the dilution tunnel, ft/sec

Q_{sd} – Average gas flow rate in dilution tunnel, dscf/hr

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

m_n – Total particulate matter collected, mg

C_s - Concentration of particulate matter in tunnel gas, dry basis, corrected to STP, g/dscf

E_T – Total particulate emissions, g

PR - Proportional rate variation

PM_{RH} - Particulate emission rate for high fire test run, g/hr

PM_{FH} - Particulate emission factor for high fire test run, g/dry kg of fuel burned

PM_R – Particulate emission rate for low or medium fire test run, g/hr

PM_F – Particulate emission factor for low or medium fire test run, g/dry kg of fuel burned

M_{Fldb} – Weight of test fuel load, dry basis, lb (kg)
ASTM E3053 equation (1)

$$M_{Fldb} = \Sigma((M_{FLnwb})(100/(100 + MC_{FLn})))$$

Where,

M_{FLnwb} = Weight of each test fuel piece, n, in test fuel load per 8.4.1, wet basis, lb (kg)
MC_{FLn} = Average fuel moisture of test fuel piece, n, in test fuel load, % dry basis
n = individual test fuel pieces that comprise the test fuel load, as applicable.

Sample Calculation:

n	M_{FLnwb}	MC_{FLn}	$(M_{FLnwb})(100/(100 + MC_{FLn}))$		
1	5.36	20.0	5.36 (100) / (100+ 20)) =	4.47	
2	4.65	20.8	4.65 (100) / (100+ 20.8)) =	3.85	
3	4.70	21.0	4.7 (100) / (100+ 21)) =	3.88	
4	6.42	23.2	6.42 (100) / (100+ 23.2)) =	5.21	
5	3.21	21.1	3.21 (100) / (100+ 21.1)) =	2.65	
6	0.00	NA	N/A	-	
7	0.00		N/A	-	
			SUM	20.06	lbs

M_{Fldb} = **20.06** lbs
M_{Fldb} = **9.10** kg

M_{SUdb} – Weight of start-up fuel, dry basis, lb (kg)
ASTM E3053 equation (2)

$$M_{SUdb} = (M_{SUwb})(100/(100 + MC_{SU}))$$

Where,

M_{SUwb} = Total weight of start-up fuel pieces, wet basis, lb (kg)

MC_{SU} = Average fuel moisture of the piece(s) from which start-up fuel was split, % dry basis

Sample Calculation:

M_{SUwb} = N/A - Applicable to High Fire Tests Only

MC_{SU} = N/A - Applicable to High Fire Tests Only

M_{SUdb} = N/A (100/(100+ N/A)

M_{SUdb} = **N/A** lbs

= **N/A** kg

M_{Kdb} - Weight of kindling, dry basis, lb (kg)
ASTM E3053 equation (3)

$$M_{Kdb} = (M_{Kwb})(100/(100 + MC_K))$$

Where,

M_{Kwb} = Weight of kindling per 8.5.6, wet basis, lb (kg);

MC_K = Average moisture of kindling (may be assumed 10%), % dry basis.

Sample calculation:

M_{Kwb} = N/A - Applicable to High Fire Tests Only

MC_K = N/A - Applicable to High Fire Tests Only

M_{Kdb} = N/A (100/(100+ N/A)

M_{Kdb} = **N/A** lbs

= **N/A** kgs

M_{FREHdb} - Total weight of all remaining fuel at end of high fire test run, lb (kg)
ASTM E3053 equation (4)

$$M_{FREHdb} = M_{RSUBdb} + M_{FLEHdb}$$

Where,

M_{RSUBdb} = Weight of residual start-up fuel bed when high fire test load added, lb (kg)

M_{FLEHdb} = Weight of unburned portion of test fuel load at the end of the high fire test run, lb (kg)

Sample calculation:

M_{RSUBdb} = N/A - Applicable to High Fire Tests Only

M_{FLEHdb} = N/A - Applicable to High Fire Tests Only

M_{FREHdb} = N/A + N/A

M_{FREHdb} = **N/A** lbs

= **N/A** kg

M_{TFBHdb} - Total weight of all fuel burned during high fire test run, lb (kg), dry basis

ASTM E3053 equation (5)

$$M_{TFBHdb} = M_{Kdb} + M_{SUdb} + M_{FLdb} - M_{FREHdb}$$

Sample Calculation:

M_{Kdb} = N/A

M_{SUdb} = N/A

M_{FLdb} = N/A

M_{FREHdb} = N/A

M_{TFBHdb} = N/A + N/A + N/A - N/A

= **N/A** lbs

= **N/A** kg

BR_H – Dry burn rate for high fire test run, from time when test fuel load is added to end of test run, lb/h (kg/h)

ASTM E3053 equation (6)

$$BR_H = 60 (M_{FLdb} - M_{FLEHdb})/\theta_{H1}$$

Where,

θ_{H1} = Total duration of high fire test run, from time when test fuel load is added to end of test run, min.

Sample calculation:

M_{FLdb} = N/A - Applicable to High Fire Tests Only

M_{FLEHdb} = N/A - Applicable to High Fire Tests Only

θ_{H1} = N/A - Applicable to High Fire Tests Only

$$BR_H = \frac{60 (\text{N/A} - \text{N/A})}{\text{N/A}}$$

BR_H = **N/A** lb/hr

= **N/A** kg/hr

M_{TFBdb} - Total weight of fuel burned during low or medium fire test run, lb (kg), dry basis
ASTM E3053 equation (7)

$$M_{TFBdb} = M_{FLdb} - M_{FREdb}$$

Where,

M_{FLdb} = Total weight of fuel burned during low or medium fire test run, lb (kg), dry basis

M_{FREdb} = Weight of remaining fuel at end of low or medium fire test run, lb (kg)

Sample Calculation:

M_{FLdb} = 20.06

M_{FREdb} = 0.00

M_{TFBdb} = 20.06 - 0.00

= **20.06** lbs

= **9.10** kg

BR - Dry burn rate for low and medium fire test runs, lb/h (kg/h)
ASTM E3053 equation (8)

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

Where,

θ = Total test run duration for low or medium fire test run, min.

Sample Calculation:

M_{TFBdb} = 20.06

θ = 648

$$BR = \frac{60 \times 20.06}{648}$$

BR = **1.86** lb/hr

= **0.84** kg/hr

V_s – Average gas velocity in the dilution tunnel, ft/sec
ASTM E2515 equation (9)

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

Where:

F_p = Adjustment factor for pitot tube center point reading = $\frac{V_{strav}}{V_{scent}}$, ASTM E2515 Equation (1)

v_{scent} = Dilution tunnel velocity calculated after the multi-point pitot traverse at the center, ft/sec

v_{strav} = Dilution tunnel velocity calculated after the multi-point pitot traverse, ft/sec

k_p = Pitot tube constant, 85.49

C_p = Pitot tube coefficient: 0.99, unitless

ΔP* = Velocity pressure in the dilution tunnel, in H_2O

T_s = Absolute average gas temperature in the dilution tunnel, °R; (°R = °F + 460)

P_s = Absolute average gas static pressure in dilution tunnel, = P_{bar} + P_g , in Hg

P_{bar} = Barometric pressure at test site, in. Hg

P_g = Static pressure of tunnel, in. H_20; (in Hg = in H_20/13.6)

M_s = **The dilution tunnel wet molecular weight; M_s = 28.78 assuming a dry weight of 29 lb/lb-mole

Sample calculation:

$$Fp = \frac{15.84}{16.85} = 0.940$$

$$V_s = 0.940 \times 85.49 \times 0.99 \times 0.251 \times \left(\frac{78.1 + 460}{\left(30.03 + \frac{-0.14}{13.6}\right) \times 28.78} \right)^{1/2}$$

V_s = **15.76** ft/s

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

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

Q_{sd} – Average gas flow rate in dilution tunnel, dscf/hr
ASTM E2515 equation (3)

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

Where:

3600	=	Conversion from seconds to hours (ASTM method uses 60 to convert in minutes)
B_{ws}	=	Water vapor in gas stream, proportion by volume; assume 2%
A	=	Cross sectional area of dilution tunnel, ft^2
T_{std}	=	Standard absolute temperature, 528 °R
P_s	=	Absolute average gas static pressure in dilution tunnel, = P_{bar} + P_g , in Hg
$T_{s(avg)}$	=	Absolute average gas temperature in the dilution tunnel, °R; (°R = °F + 460)
P_{std}	=	Standard absolute pressure, 29.92 in Hg

Sample calculation:

$$Q_{sd} = 3600 \times (1 - 0.02) \times 15.76 \times 0.3491 \times \frac{528}{78.1 + 460} \times \frac{30.03 + \frac{-0.14}{13.6}}{29.92}$$

Q_{sd} = **19110.4** dscf/hr

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

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

Where:

K_1	=	17.64 °R/in. Hg
V_m	=	Volume of gas sample measured at the dry gas meter, dcf
Y	=	Dry gas meter calibration factor, dimensionless
P_{bar}	=	Barometric pressure at the testing site, in. Hg
ΔH	=	Average pressure differential across the orifice meter, in. H_2O
T_m	=	Absolute average dry gas meter temperature, °R

Sample Calculation:

Using equation for Train 1:

$$V_{m(std)} = 17.64 \times 101.494 \times 0.992 \times \frac{\left(30.03 + \frac{1.03}{13.6}\right)}{(92.8 + 460)}$$

$V_{m(std)}$ = **96.712** dscf

Using equation for Train 2:

$$V_{m(std)} = 17.64 \times 103.518 \times 1.002 \times \frac{\left(30.03 + \frac{1.13}{13.6}\right)}{(94.0 + 460)}$$

$V_{m(std)}$ = **99.440** dscf

Using equation for ambient train:

$$V_{m(std)} = 17.64 \times 0.00 \times 0 \times \frac{\left(\underline{30.03} + \frac{0.00}{13.6}\right)}{(67.0 + 460)}$$

$V_{m(std)}$ = **0** dscf

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

$$m_n = m_p + m_f + m_g$$

Where:

m_p = mass of particulate matter from probe, mg

m_f = mass of particulate matter from filters, mg

m_g = mass of particulate matter from filter seals, mg

Sample Calculation:

Using equation for Train A (first hour):

m_n = 0.0 + 1.3 + 0.0

m_n = 1.3 mg

Using equation for Train A (post-first hour):

m_n = 0.2 + 1.1 + 1.0

m_n = 2.3 mg

Train A aggregate:

m_n = 1.3 + 2.3

m_n = **3.6** mg

Using equation for Train B:

m_n = 0.4 + 3.3 + 0

m_n = **3.7** mg

C_s - Concentration of particulate matter in tunnel gas, dry basis, corrected to STP, g/dscf
ASTM E2515 equation (13)

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

Where:

K_2	=	Constant, 0.001 g/mg
m_n	=	Total mass of particulate matter collected in the sampling train, mg
$V_{m(std)}$	=	Volume of gas sampled corrected to dry standard conditions, dscf

Sample calculation:

For Train 1:

$$C_s = 0.001 \times \frac{3.6}{96.71}$$

C_s = **0.00004** g/dscf

For Train 2

$$C_s = 0.001 \times \frac{3.7}{99.44}$$

C_s = **0.00004** g/dscf

For Ambient Train

$$C_r = 0.001 \times \frac{}{0}$$

C_r = **0** g/dscf

E_T – Total Particulate Emissions, g
ASTM E2515 equation (15)

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

Where:

C_s	=	Concentration of particulate matter in tunnel gas, g/dscf
C_r	=	Concentration particulate matter room air, g/dscf
Q_{std}	=	Average dilution tunnel gas flow rate, dscf/hr
θ	=	Total time of test run, minutes

Sample calculation:

For Train 1

E_T = (0.000037 - 0) x 19110.4 x 648 /60

E_T = **7.68** g

For Train 2

E_T = (0.000037 - 0) x 19110.4 x 648 /60

E_T = **7.68** g

Average

E = **7.68** g

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

7.5% of the average =	0.58
Train 1 difference =	0.00
Train 2 difference =	0.00

PR - Proportional Rate Variation
ASTM E2515 equation (16)

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

Where:

θ = Total sampling time, min

θ_i = Length of recording interval, min

V_{mi} = Volume of gas sample measured by the dry gas meter during the “ith” time interval, dcf

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

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

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

T_{mi} = Absolute average dry gas meter temperature during the "ith" time interval, ^oR

T_m = Absolute average dry gas meter temperature, ^oR

T_{si} = Absolute average gas temperature in the dilution tunnel during the "ith" time interval, ^oR

T_s = Absolute average gas temperature in the dilution tunnel, ^oR

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

$$PR = \left(\frac{648 \times 0.15 \times 15.76 \times (135.0 + 460) \times (92.8 + 460)}{1 \times 101.49 \times 16.58 \times (78.1 + 460) \times (90.0 + 460)} \right) \times 100$$

PR = **101** %

PM_{RH} - Particulate emission rate for high fire test run, g/hr;
ASTM E3053 equation (9)

$$PM_{RH} = 60(E_{TH}/\theta_{H2})$$

Where,

E_{TH} = Total particulate emissions for high fire test run including kindling and start-up, g

θ_{H2} = Total duration of high fire test run, from ignition of kindling to end of test run, min.

Sample Calculation:

E_{TH} = N/A - Applicable to High Fire Tests Only

θ_{H2} = N/A - Applicable to High Fire Tests Only

PM_{RH} = 60(N/A / N/A)

PM_{RH} = **N/A** g/hr

PM_{FH} - Particulate emission factor for high fire test run, g/dry kg of fuel burned.

ASTM E3053 equation (10)

$$PM_{FH} = E_{TH}/M_{TFBHdb}$$

Sample Calculation:

E_{TH} = N/A - Applicable to High Fire Tests Only

M_{TFBHdb} = N/A - Applicable to High Fire Tests Only

PM_{FH} = N/A / N/A

= **N/A** g/kg

PM_R - Particulate emission rate for low or medium fire test runs, g/hr
ASTM E3053 equation (12)

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

Where,

E_T = Total particulate emissions for low or medium fire test runs from Test Method E2515, g

Sample Calculation:

E_T = 7.68
θ = 648

PM_R = 60(7.68 / 648)

PM_{RH} = **0.71** g/hr

PM_{FH} - Particulate emission factor for high fire test run, g/dry kg of fuel burned.
ASTM E3053 equation (13)

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

Sample Calculation:

E_T = 7.68
M_{TFBdb} = 9.10

PM_{FH} = 7.68 / 9.10
= **0.84** g/kg

PACIFIC ENERGY
FIREPLACE PRODUCTS LTD.

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November 14, 2019

Mr. John Steinert
PFS TECO Laboratories.
11785 SE Highway 212 - Suite 305
Clackamas, OR 97015
RE: OPERATING INSTRUCTIONS FOR THE NEO FP25 LE WOODSTOVE

John: The operating instructions for the FP 25 LE are as follows:

PRIMARY AIR CONTROL (PAC):
To open the primary air inlet orifice and increase the amount of air entering the stove, push the end of the handle underneath the ash lip to the left. To close the primary air inlet orifice and decrease the amount of air entering the stove, pull the end of the handle underneath the ash lip to the right.

BURN CATEGORY	Primary Air Control (PAC)
Low:	Set control at the stop. At the stop the primary air inlet orifice should be closed with a set hole diameter of 0.694" (34/49"). Be certain to check this.
Medium:	Set PAC at (stop) to 0.6250" (5/8") open.
High:	Wide Open. Push the handle all the way to the left.

START-UP:
Load kindling and ignite, crack the door open about 1" to 4" until kindling is fully ignited. When kindling is burnt down, load remaining kindling and 2 to 3 small pieces of start-up fuel, crack the door open about 1" to 2" until kindling and start-up fuel is ignited. When kindling and start-up fuel is burnt down, load remaining start-up fuel, crack the door open about 1" to 2" until start-up fuel is ignited.

FUEL LOAD:
As soon as the fuel is loaded, close the door. If the fuel load is slow to ignite, crack the door open about 1" to 2". Monitor and adjust the door so that the impact of the air flow into the stove is maximized, i.e., watch the hot coals in the coal bed and adjust the door so that they become as bright as possible. Close the door as soon as the fuel load ignites. If the flames falter or go out, crack the door open again until the fuel reignites, then close the door.

FAN:
Operate the fan as follows:

Low: Turn fan on High within 10 minutes.
Medium: Turn fan on High within 10 minutes.
High: Turn fan on High within 5 minutes.

LOWER PRIMARY AIR ORIFICE (LPAO):
Clear the coals away from in front of the LPAO on all runs.

Direct line: (250) 715-2398
Email: jbain@pacificenergy.net
Web: www.pacificenergy.net

If you require any additional information, please feel free to contact me at your convenience.

Yours truly,

Jeff Bain
New Product Development Manager – Solid Fuels

WOOD STOVE TEST DATA PACKET
ASTM E3053/E2515

Run 1 Data Summary

Client: Pacific Energy
Model: FP25
Job #: 19-537
Tracking #: 0048
Test Date: 11/25/2019

12/2/2019

Techician Signature — Date

TEST RESULTS - ASTM E3053 / ASTM E2515

Client: Pacific Energy
Model: FP25
Run #: 1

Job #: 19-537
Tracking #: 0048
Technician: SJB
Date: 11/25/2019

Burn Rate (kg/hr):	4.10

	Ambient Sample	Sample Train A	Sample Train B	1st Hour Filter
Total Sample Volume (ft^3)	0.000	19.636	20.320	9.041
Average Gas Velocity in Dilution Tunnel (ft/sec)	15.48			
Average Gas Flow Rate in Dilution Tunnel (dscf/hr)	17609.8			
Average Gas Meter Temperature (°F)	65.8	78.6	79.2	70.7
Total Sample Volume (dscf)	0.000	19.228	20.080	8.985
Average Tunnel Temperature (°F)	114.1			
Total Time of Test (min)	130			
Total Particulate Catch (mg)	0.0	3.8	4.1	2.9
Particulate Concentration, dry-standard (g/dscf)	0.0000000	0.0001976	0.0002042	0.0003228
Total PM Emissions (g)	0.00	7.54	7.79	5.68
Particulate Emission Rate (g/hr)	0.00	3.48	3.60	5.68
Emissions Factor (g/kg)	-	0.90	0.93	-
Difference from Average Total Particulate Emissions (g)	-	0.13	0.13	-
Difference from Average Emissions Factor (g/kg)	-	0.01	0.01	-

Final Average Results	
Total Particulate Emissions (g)	7.67
Particulate Emission Rate (g/hr)	3.54
Emissions Factor (g/kg)	0.92
HHV Efficiency (%)	62.8%
LHV Efficiency (%)	67.1%
CO Emissions (g/min)	2.01

Quality Checks	Requirement	Observed	Result
Dual Train Precision	Each train within 7.5% of average emissions (in grams), or emission factors within 0.5 g/kg	See Above	OK
Filter Temps	>80 °F, <90 °F	Min: 80 / Max: 88	OK
Face Velocity	< 30 ft/min	8.9	OK
Leakage Rate	Less than 4% of average sample rate	0 cfm	OK
Ambient Temp	55-90 °F	Min: 62 / Max: 69	OK
Negative Probe Weight Evaluation	<5% of Total Catch	Probe Catch Not Negative	OK
Pro-Rate Variation	90% of readings between 90-110%; none greater than 120% or less than 80%	See Data Tabs	OK

B415.1 Efficiency Results

Manufacturer:	Pacific Energy
Model:	FP25
Date:	11/25/19
Run:	1
Control #:	19-537
Test Duration:	95
Output Category:	High

Test Results in Accordance with CSA B415.1-09

	HHV Basis	LHV Basis
Overall Efficiency	62.8%	67.1%
Combustion Efficiency	98.1%	98.1%
Heat Transfer Efficiency	64.0%	68.4%

Output Rate (kJ/h)	54,322	51,530	**(Btu/h)**
Burn Rate (kg/h)	4.34	9.56	**(lb/h)**
Input (kJ/h)	86,544	82,096	**(Btu/h)**

Test Load Weight (dry kg)	6.87	15.13	**dry lb**
MC wet (%)	17.77		
MC dry (%)	21.61		
Particulate (g)	7.67		
CO (g)	191		
Test Duration (h)	1.58		

Emissions	**Particulate**	**CO**
g/MJ Output	0.09	2.22
g/kg Dry Fuel	1.12	27.76
g/h	4.84	120.34
g/min	0.08	2.01
lb/MM Btu Output	0.21	5.15

Air/Fuel Ratio (A/F)	8.88

VERSION: **2.2** **12/14/2009**

HIGH FIRE FUEL LOAD DATA - ASTM E3053

Client: Pacific Energy | Job #: 19-537
Model: FP25 | Tracking #: 0048
Run #: 1 | Technician: SJB
Date: 11/25/2019

Nominal Loading Density (lbs/ft^3, wet basis):	10		
Usable Firebox Volume (ft^3):	2.10		
Target Load Weight (lbs):	21.00		
Total Load Weight Range (lbs):	20.00	to	22.10
Core Load Weight Range (lbs):	9.50	to	13.70
Remainder Load Weight Range (lbs):	7.40	to	11.60
Core Load Piece Range (lbs):	3.20	to	5.30
Remainder Load Piece Range (lbs):	2.10	to	11.60
Max Allowable Kindling Weight (lbs):	4.01		
Max Allowable Start-up Fuel Weight (lbs):	6.02		

CORE LOAD DATA

				Fuel Piece Moisture Readings (%DB)					Dry Weight	
Piece #	Length (in)	Weight (lbs)	Within Spec?	1	2	3	Ave.	Within Spec?	lbs	kg
1	16.00	3.83	In Range	24.7	23.6	22.1	23.5	In Range	3.10	1.41
2	16.00	4.47	In Range	19.7	18.6	20.7	19.7	In Range	3.74	1.69
3	16.00	4.07	In Range	19.4	24.7	18.7	20.9	In Range	3.37	1.53
Core Load Wt. (lbs)		12.37	In Range							

REMAINDER LOAD DATA (1 to 3 Pieces)

				Fuel Piece Moisture Readings (%DB)					Dry Weight	
Piece #	Length (in)	Weight (lbs)	Within Spec?	1	2	3	Ave.	Within Spec?	lbs	kg
1	16.00	4.67	In Range	20.2	22.1	24.9	22.4	In Range	3.82	1.73
2	16.00	3.02	In Range	19.6	22.7	23.4	21.9	In Range	2.48	1.12
3			NA				NA	NA	NA	NA
Remainder Load (lbs)		7.69	In Range							

Total Load Weight (lbs):	20.06	In Range	
Core Load % of Total Weight:	62%	In Range	45-65%
Remainder % of Total Weight:	38%	In Range	35-55%
Total Load % of Target Weight:	96%	In Range	95-105%
Actual Fuel Loading Density (lb/ft3):	9.6		
Total Load Average Moisture Content (%DB):	21.6	In Range	19-25%
Total Load Average Moisture Content (%WB):	17.8		
Total Test Load Weight (dry basis):	16.50 lbs	7.48 kg	

KINDLING AND START-UP FUEL

		Kindling Moisture Readings (%DB)					Dry Weight	
Kindling Weight (lbs)	Within Spec?	1	2	3	Avg.	Within Spec?	lbs	kg
2.98	In Range	10	10	10	10.0	In Range	2.71	1.23

		Start-up Moisture Readings (%DB)					Dry Weight	
Start-up Fuel Wt. (lb)	Within Spec?	1	2	3	Avg.	Within Spec?	lbs	kg
4.19	In Range	19.7	22.4	21.7	21.3	In Range	3.46	1.57

TEST FUEL LOADING RANGE

Allowable Residual Start-up Fuel Range (lb):	2.0	to	4.0	
Actual Residual Start-up Fuel Weight (lb):		2.0		In Range

TEST END POINT

High Fire Test Run End Point Range:	1.8	to	2.2	lb
Actual Fuel Load Ending Weight (lb):		2.2		In Range

Total Weight All Fuel Added: 27.23 lbs, wet basis
22.66 lbs, dry basis
10.28 kg, dry basis

Total Weight All Fuel Burned (dry basis): 18.42 lbs
8.36 kg

DILUTION TUNNEL & MISC. DATA - ASTM E3053 / E2515

Client:	Pacific Energy	Job #:	19-537
Model:	FP25	Tracking #:	0048
Run #:	1	Technician:	SJB
Test Start Time:	10:04	Date:	11/25/2019
Test Type:	High Fire		

Recording Interval (min):	1
Total Sampling Time (min):	130
High Fire Test Load Time (min):	35

Meter Box γ Factor:	0.992	(A)
Meter Box γ Factor:	1.002	(B)
Meter Box γ Factor:		(Ambient)

	Pre-Test	Post Test	Avg.
Barometric Pressure (in. Hg)	30.08	30.05	30.07
Relative Humidity (%)	39.1	34.3	
Room Air Velocity (ft/min)	0	0	
Scale Audit (lbs)	10.0	10.0	
Ambient Sample Volume:			ft^3

Induced Draft Check (in. H_2O):	0
Smoke Capture Check (%):	100%
Date Flue Pipe Last Cleaned:	11/22/2019

Sample Train Post-Test Leak Checks

(A)	0.000	cfm @	-5	in. Hg
(B)	0.000	cfm @	-5	in. Hg
(Ambient)		cfm @		in. Hg

DILUTION TUNNEL FLOW

Traverse Data

Point	dP (in H_2O)	Temp (°F)
1	0.054	67
2	0.062	67
3	0.064	67
4	0.050	67
5	0.048	67
6	0.066	67
7	0.060	67
8	0.050	67
Center	0.065	67

Static Pressure: -0.140 in. H_2O

Dilution Tunnel H_2O:	2.00	percent
Tunnel Diameter:	8	inches
Pitot Tube Cp:	0.99	[unitless]
Dilution Tunnel MW(dry):	29.00	lb/lb-mole
Dilution Tunnel MW(wet):	28.78	lb/lb-mole
Tunnel Area:	0.3491	ft^2
V_{strav}:	15.83	ft/sec
V_{scent}:	16.84	ft/sec
F_p:	0.940	[ratio]
Initial Tunnel Flow:	324.5	scf/min

TEST FUEL PROPERTIES

ASTM 3053-17 - Table A1.1 Fuel Properties by Fuel Species

Select Fuel Type	Species	%C	%H	%O	%Ash	MJ/kg	BTU/lb
	Ash, White	49.70	6.90	43.00	0.30	20.75	8927
	Beech	48.70	5.80	44.70	0.60	18.80	8088
	Birch, Sweet	49.80	6.50	43.40	0.30	20.12	8656
	Birch, Yellow	49.80	6.50	43.40	0.30	20.12	8656
	Doug Fir (Coast, Interior West/North)	48.73	6.87	43.90	0.50	19.81	8522
	Doug Fir (Interioir South)	48.73	6.87	43.90	0.50	19.81	8522
	Elm, Rock	50.40	6.60	42.30	0.70	20.49	8815
	Elm, Soft	50.40	6.60	42.30	0.70	20.49	8815
	Gum, Red	50.88	6.06	41.57	1.28	19.72	8478
	Larch, Western	50.54	6.36	42.40	0.70	17.58	7558
X	Maple, Hard	50.64	6.02	41.74	1.35	19.96	8587
	Maple, Sugar	50.64	6.02	41.74	1.35	19.96	8587
	Oak, Red	49.50	6.62	43.70	0.20	20.20	8690
	Oak, White	50.40	6.59	42.70	0.20	20.50	8819
	Pine, Southern	52.60	7.00	40.10	1.31	22.30	9587
	Pine, Southern Long Leaf	52.60	7.02	40.10	1.30	22.30	9594

WOODSTOVE PREBURN DATA

Client:	Pacific Energy	Job #:	19-537
Model:	FP25	Tracking #:	0048
Run #:	1	Technician:	SJB
		Date:	11/25/2019

High Fire Test Begins from Cold Start, No Preburn is Performed

BOX A TEST DATA - ASTM E3053 / ASTM E2515

Client: Pacific Energy
Model: FP25
Run #: 1

Job #: 19-537
Tracking #: 0048
Technician: SJB
Date: 11/25/2019

	Particulate Sampling Data							Fuel Weight (lb)		Temperature Data (°F)			
Elapsed Time (min)	Gas Meter (ft^3)	Sample Rate (cfm)	Dilution Tunnel dP (in H_2O)	Orifice dH (in H_2O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Scale Reading	Weight Change	Dilution Tunnel	Flue	Filter	Ambient
0	0.000		0.057	0.05	64	2		2.1		70	65	85	62
1	0.127	0.127	0.057	1.03	64	2	83	2.0	-0.1	70	72	84	62
2	0.279	0.152	0.057	1.01	64	2	100	1.9	-0.1	78	217	85	62
3	0.431	0.152	0.057	1.00	64	2	101	1.8	-0.1	85	299	86	62
4	0.578	0.147	0.057	0.96	64	2	97	1.7	-0.1	80	348	86	62
5	0.733	0.155	0.057	1.04	64	2	102	1.5	-0.2	79	357	83	62
6	0.885	0.152	0.057	1.05	64	2	100	1.5	0	79	355	82	62
7	1.037	0.152	0.057	1.05	65	2	100	1.3	-0.2	79	340	80	62
8	1.191	0.154	0.057	1.03	65	2	101	1.3	0	79	348	80	63
9	1.344	0.153	0.057	1.02	65	2	101	1.1	-0.2	79	354	80	63
10	1.496	0.152	0.057	1.03	65	2	100	1.1	0	79	350	81	63
11	1.648	0.152	0.057	1.03	65	2	100	0.9	-0.2	79	360	82	63
12	1.800	0.152	0.057	1.03	65	2	100	0.9	0	78	358	83	63
13	1.953	0.153	0.057	1.01	66	2	102	3.4	2.5	93	354	85	63
14	2.104	0.151	0.057	1.04	66	2	99	3.1	-0.3	82	356	86	63
15	2.256	0.152	0.057	1.01	66	2	100	3.1	0	82	381	85	63
16	2.411	0.155	0.057	1.01	66	2	102	2.7	-0.4	85	441	83	63
17	2.562	0.151	0.057	1.00	67	2	100	2.7	0	86	456	82	63
18	2.713	0.151	0.057	1.02	67	2	100	2.6	-0.1	87	472	81	63
19	2.864	0.151	0.057	1.02	67	2	100	2.4	-0.2	88	496	81	63
20	3.017	0.153	0.057	1.00	67	2	101	2.2	-0.2	88	510	82	63
21	3.168	0.151	0.057	0.99	68	2	100	2.1	-0.1	88	511	83	63
22	3.318	0.150	0.057	1.01	68	2	99	1.9	-0.2	89	530	85	63
23	3.470	0.152	0.057	1.00	68	2	101	1.8	-0.1	91	551	86	63
24	3.620	0.150	0.057	0.99	69	2	99	1.6	-0.2	92	553	86	63
25	3.771	0.151	0.057	1.01	69	2	100	1.5	-0.1	92	574	84	63
26	3.920	0.149	0.057	1.00	69	2	99	1.4	-0.1	93	583	82	63
27	4.069	0.149	0.057	0.98	70	2	99	3.7	2.3	100	623	81	63
28	4.219	0.150	0.057	0.99	70	2	100	3.6	-0.1	99	648	81	63
29	4.368	0.149	0.057	0.97	70	2	99	3.4	-0.2	100	680	82	63
30	4.518	0.150	0.057	1.02	70	2	100	3.1	-0.3	102	722	84	63
31	4.673	0.155	0.057	1.02	71	2	103	2.8	-0.3	104	756	86	64
32	4.826	0.153	0.057	0.99	71	2	102	2.6	-0.2	106	781	87	64

BOX A TEST DATA - ASTM E3053 / ASTM E2515

Client: Pacific Energy
Model: FP25
Run #: 1

Job #: 19-537
Tracking #: 0048
Technician: SJB
Date: 11/25/2019

	Particulate Sampling Data							Fuel Weight (lb)		Temperature Data (°F)			
Elapsed Time (min)	Gas Meter (ft^3)	Sample Rate (cfm)	Dilution Tunnel dP (in H_2O)	Orifice dH (in H_2O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Scale Reading	Weight Change	Dilution Tunnel	Flue	Filter	Ambient
33	4.976	0.150	0.057	0.97	71	2	100	2.4	-0.2	108	803	86	64
34	5.121	0.145	0.057	1.03	72	2	97	2.0	-0.4	110	821	84	64
35	5.270	0.149	0.057	0.99	72	2	101	22.6	20.6	127	754	83	64
36	5.417	0.147	0.057	0.96	72	2	98	22.5	-0.1	112	751	81	64
37	5.568	0.151	0.057	1.02	73	2	101	22.2	-0.3	112	771	81	64
38	5.717	0.149	0.057	0.98	73	2	99	21.9	-0.3	112	786	82	64
39	5.866	0.149	0.057	1.03	73	2	100	21.7	-0.2	113	804	84	64
40	6.017	0.151	0.057	0.98	73	2	101	21.6	-0.1	113	811	85	64
41	6.167	0.150	0.057	0.97	74	2	100	21.3	-0.3	114	816	86	64
42	6.312	0.145	0.057	0.94	74	2	97	21.0	-0.3	115	824	86	64
43	6.461	0.149	0.057	0.95	74	2	100	20.8	-0.2	115	828	84	64
44	6.609	0.148	0.057	0.98	75	2	99	20.6	-0.2	116	843	83	65
45	6.755	0.146	0.057	0.89	75	2	98	20.4	-0.2	118	861	81	65
46	6.911	0.156	0.057	0.90	75	2	104	20.1	-0.3	120	868	80	65
47	7.064	0.153	0.057	1.00	76	2	102	19.8	-0.3	121	876	82	65
48	7.218	0.154	0.057	1.01	76	2	103	19.5	-0.3	122	892	84	65
49	7.371	0.153	0.057	1.02	76	2	103	19.3	-0.2	123	902	85	65
50	7.522	0.151	0.057	1.00	76	2	101	19.1	-0.2	123	909	86	65
51	7.672	0.150	0.057	0.99	77	2	100	18.8	-0.3	124	920	86	65
52	7.822	0.150	0.057	0.99	77	2	101	18.5	-0.3	125	927	85	65
53	7.970	0.148	0.057	0.98	77	2	99	18.3	-0.2	126	930	84	65
54	8.118	0.148	0.057	0.96	77	2	99	18.0	-0.3	126	932	83	65
55	8.267	0.149	0.057	1.06	78	2	100	17.7	-0.3	126	933	83	65
56	8.422	0.155	0.057	1.05	78	2	104	17.5	-0.2	126	932	83	65
57	8.577	0.155	0.057	1.01	78	2	104	17.3	-0.2	127	932	84	66
58	8.732	0.155	0.057	1.02	78	2	104	17.0	-0.3	127	930	86	66
59	8.886	0.154	0.057	1.00	79	2	103	16.8	-0.2	128	928	87	66
60	9.041	0.155	0.057	1.05	79	2	104	16.6	-0.2	128	927	86	66
61	9.203	0.162	0.057	0.92	79	2	108	16.3	-0.3	128	927	83	66
62	9.356	0.153	0.057	1.01	79	2	103	16.1	-0.2	129	929	83	66
63	9.511	0.155	0.057	1.04	80	2	104	15.8	-0.3	128	931	83	66
64	9.664	0.153	0.057	1.02	80	2	102	15.6	-0.2	129	929	84	66
65	9.817	0.153	0.057	1.04	80	2	102	15.4	-0.2	129	926	85	66

BOX A TEST DATA - ASTM E3053 / ASTM E2515

Client: Pacific Energy
Model: FP25
Run #: 1

Job #: 19-537
Tracking #: 0048
Technician: SJB
Date: 11/25/2019

	Particulate Sampling Data							Fuel Weight (lb)		Temperature Data (°F)			
Elapsed Time (min)	Gas Meter (ft^3)	Sample Rate (cfm)	Dilution Tunnel dP (in H_2O)	Orifice dH (in H_2O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Scale Reading	Weight Change	Dilution Tunnel	Flue	Filter	Ambient
66	9.968	0.151	0.057	0.99	80	2	101	15.2	-0.2	127	926	87	66
67	10.120	0.152	0.057	1.01	81	2	101	14.9	-0.3	128	922	87	66
68	10.272	0.152	0.057	1.00	81	2	101	14.6	-0.3	128	919	85	66
69	10.422	0.150	0.057	0.99	81	2	100	14.5	-0.1	129	915	84	66
70	10.573	0.151	0.057	0.96	81	2	101	14.2	-0.3	129	912	82	66
71	10.724	0.151	0.057	0.97	82	2	101	14.2	0	129	908	82	67
72	10.874	0.150	0.057	1.00	82	2	100	13.8	-0.4	128	906	83	67
73	11.023	0.149	0.057	0.99	82	2	99	13.6	-0.2	127	902	84	67
74	11.174	0.151	0.057	0.98	82	2	100	13.3	-0.3	127	896	86	67
75	11.323	0.149	0.057	1.00	82	2	99	13.2	-0.1	127	891	87	67
76	11.472	0.149	0.057	0.98	83	2	99	13.0	-0.2	127	887	86	67
77	11.621	0.149	0.057	0.97	83	2	99	12.7	-0.3	127	885	85	67
78	11.770	0.149	0.057	0.99	83	2	99	12.5	-0.2	126	884	83	67
79	11.917	0.147	0.057	0.96	83	2	98	12.4	-0.1	126	884	82	67
80	12.067	0.150	0.057	0.95	83	2	99	12.2	-0.2	125	884	83	67
81	12.215	0.148	0.057	0.94	84	2	98	11.9	-0.3	126	883	84	67
82	12.364	0.149	0.057	0.96	84	2	99	11.7	-0.2	126	882	86	67
83	12.513	0.149	0.057	0.96	84	2	99	11.4	-0.3	125	882	87	67
84	12.662	0.149	0.057	1.00	84	2	99	11.2	-0.2	125	882	87	67
85	12.815	0.153	0.057	1.01	84	2	101	11.1	-0.1	125	880	85	67
86	12.968	0.153	0.057	0.99	84	2	101	11.0	-0.1	125	877	83	67
87	13.121	0.153	0.057	1.01	85	2	101	10.6	-0.4	124	876	83	67
88	13.274	0.153	0.057	1.03	85	2	101	10.5	-0.1	125	878	83	67
89	13.426	0.152	0.057	0.99	85	2	100	10.4	-0.1	125	882	84	68
90	13.579	0.153	0.057	0.99	85	2	101	10.2	-0.2	125	890	86	67
91	13.731	0.152	0.057	0.99	85	2	100	9.8	-0.4	126	894	87	67
92	13.882	0.151	0.057	0.97	85	2	100	9.8	0	126	896	87	68
93	14.032	0.150	0.057	0.99	86	2	99	9.6	-0.2	126	897	85	67
94	14.184	0.152	0.057	0.99	86	2	100	9.2	-0.4	126	895	83	68
95	14.335	0.151	0.057	0.99	86	2	100	9.2	0	125	894	82	68
96	14.486	0.151	0.057	0.99	86	2	100	9.0	-0.2	125	892	82	68
97	14.638	0.152	0.057	0.99	86	2	100	8.8	-0.2	124	891	83	68
98	14.790	0.152	0.057	0.99	86	2	100	8.6	-0.2	124	888	85	68

BOX A TEST DATA - ASTM E3053 / ASTM E2515

Client: Pacific Energy
Model: FP25
Run #: 1

Job #: 19-537
Tracking #: 0048
Technician: SJB
Date: 11/25/2019

	Particulate Sampling Data							Fuel Weight (lb)		Temperature Data (°F)			
Elapsed Time (min)	Gas Meter (ft^3)	Sample Rate (cfm)	Dilution Tunnel dP (in H_2O)	Orifice dH (in H_2O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Scale Reading	Weight Change	Dilution Tunnel	Flue	Filter	Ambient
99	14.942	0.152	0.057	0.99	86	2	100	8.4	-0.2	124	886	87	68
100	15.093	0.151	0.057	0.96	87	2	99	8.2	-0.2	125	899	87	68
101	15.243	0.150	0.057	0.96	87	2	99	8.0	-0.2	125	897	86	68
102	15.396	0.153	0.057	0.96	87	2	101	7.8	-0.2	124	888	85	68
103	15.547	0.151	0.057	0.98	87	2	99	7.8	0	123	880	83	68
104	15.698	0.151	0.057	0.97	87	2	99	7.6	-0.2	123	874	82	68
105	15.849	0.151	0.057	0.95	87	2	99	7.4	-0.2	123	869	83	68
106	16.000	0.151	0.057	0.99	87	2	99	7.3	-0.1	123	864	84	68
107	16.151	0.151	0.057	0.96	87	2	99	7.2	-0.1	122	860	85	68
108	16.302	0.151	0.057	0.97	88	2	99	7.1	-0.1	122	858	87	68
109	16.452	0.150	0.057	0.99	88	2	98	7.0	-0.1	122	859	87	68
110	16.605	0.153	0.057	0.98	88	2	100	6.8	-0.2	122	857	86	68
111	16.756	0.151	0.057	0.97	88	2	99	6.7	-0.1	122	858	84	69
112	16.907	0.151	0.057	0.95	88	2	99	6.5	-0.2	122	861	83	69
113	17.057	0.150	0.057	0.97	88	2	98	6.3	-0.2	122	866	82	69
114	17.208	0.151	0.057	0.96	88	2	99	6.1	-0.2	123	873	83	68
115	17.359	0.151	0.057	0.98	88	2	99	6.1	0	123	885	84	68
116	17.510	0.151	0.057	0.98	88	2	99	6.0	-0.1	124	898	86	69
117	17.660	0.150	0.057	0.98	89	2	98	5.7	-0.3	123	909	87	69
118	17.810	0.150	0.057	0.97	89	2	98	5.6	-0.1	124	918	87	69
119	17.961	0.151	0.057	0.96	89	2	99	5.4	-0.2	124	921	85	69
120	18.112	0.151	0.057	0.95	89	2	99	5.2	-0.2	124	909	84	69
121	18.262	0.150	0.057	0.98	89	2	98	5.1	-0.1	124	893	83	69
122	18.411	0.149	0.057	0.95	89	2	98	5.0	-0.1	123	886	82	69
123	18.562	0.151	0.057	0.99	89	2	99	4.8	-0.2	123	880	83	69
124	18.711	0.149	0.057	0.97	89	2	98	4.8	0	123	874	85	68
125	18.861	0.150	0.057	0.95	89	2	98	4.7	-0.1	122	868	86	69
126	19.014	0.153	0.057	1.03	89	2	100	4.5	-0.2	122	860	87	69
127	19.169	0.155	0.057	1.00	89	2	101	4.5	0	121	847	86	68
128	19.326	0.157	0.057	1.06	90	2	102	4.3	-0.2	120	834	84	69
129	19.481	0.155	0.057	1.02	90	2	101	4.3	0	119	824	83	69
130	19.636	0.155	0.057	1.03	90	2	101	4.2	-0.1	118	811	82	68
Avg/Tot	19.636	0.151	0.057	0.98	79	2.00	100			114	772	84	65.8

BOX A TEST DATA - ASTM E3053 / ASTM E2515

Client: Pacific Energy
Model: FP25
Run #: 1

Job #: 19-537
Tracking #: 0048
Technician: SJB
Date: 11/25/2019

	Particulate Sampling Data							Fuel Weight (lb)		Temperature Data (°F)			
Elapsed Time (min)	Gas Meter (ft^3)	Sample Rate (cfm)	Dilution Tunnel dP (in H_2O)	Orifice dH (in H_2O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Scale Reading	Weight Change	Dilution Tunnel	Flue	Filter	Ambient

BOX B TEST DATA - ASTM E3053 / ASTM E2515

Client: Pacific Energy
Model: FP25
Run #: 1

Job #: 19-537
Tracking #: 0048
Technician: SJB
Date: 11/25/2019

	Particulate Sampling Data							Flue Gas Data		
Elapsed Time (min)	Gas Meter (ft^3)	Sample Rate (cfm)	Orifice dH (in H_2O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Filter (°F)	Flue Draft (in H_2O)	CO_2 (%)	CO (%)
0	0.000		0.00	64	2		84	0.000	0.09	0.00
1	0.135	0.135	1.15	64	2	85	83	0.000	0.05	0.00
2	0.294	0.159	1.15	64	2	101	85	-0.040	0.10	0.00
3	0.449	0.155	1.10	64	2	99	87	-0.040	0.23	0.01
4	0.602	0.153	1.08	64	2	98	87	-0.040	1.82	0.03
5	0.755	0.153	1.07	64	2	98	84	-0.040	3.26	0.04
6	0.907	0.152	1.07	64	2	97	82	-0.040	4.87	0.07
7	1.059	0.152	1.06	64	2	97	80	-0.040	7.52	0.16
8	1.211	0.152	1.14	65	2	97	80	-0.050	7.54	0.20
9	1.365	0.154	1.13	65	2	98	81	-0.050	7.17	0.29
10	1.523	0.158	1.13	65	2	101	82	-0.050	6.88	0.35
11	1.681	0.158	1.13	65	2	101	84	-0.050	6.77	0.38
12	1.837	0.156	1.12	65	2	99	85	-0.050	6.67	0.40
13	1.993	0.156	1.12	66	2	100	88	-0.060	6.82	0.34
14	2.147	0.154	1.11	66	2	98	87	-0.050	6.14	0.29
15	2.302	0.155	1.12	66	2	99	84	-0.050	4.85	0.24
16	2.457	0.155	1.11	66	2	99	82	-0.060	5.23	0.53
17	2.611	0.154	1.11	67	2	98	81	-0.060	6.41	0.67
18	2.765	0.154	1.11	67	2	98	81	-0.060	8.59	0.60
19	2.920	0.155	1.10	67	2	99	82	-0.060	9.10	0.60
20	3.073	0.153	1.09	67	2	98	84	-0.070	9.61	0.48
21	3.226	0.153	1.10	68	2	98	87	-0.070	10.15	0.47
22	3.377	0.151	1.08	68	2	96	88	-0.070	10.61	0.42
23	3.529	0.152	1.09	68	2	97	86	-0.070	10.17	0.37
24	3.684	0.155	1.08	69	2	99	83	-0.070	10.04	0.32
25	3.839	0.155	1.09	69	2	99	81	-0.070	10.19	0.21
26	3.992	0.153	1.08	69	2	98	80	-0.070	10.18	0.21
27	4.144	0.152	1.08	70	2	98	81	-0.070	10.25	0.14
28	4.296	0.152	1.05	70	2	98	83	-0.070	9.98	0.12
29	4.446	0.150	1.06	70	2	96	85	-0.080	10.78	0.37
30	4.599	0.153	1.09	71	2	98	87	-0.080	11.96	0.47
31	4.752	0.153	1.08	71	2	99	87	-0.080	13.21	0.47

BOX B TEST DATA - ASTM E3053 / ASTM E2515

Client: Pacific Energy
Model: FP25
Run #: 1

Job #: 19-537
Tracking #: 0048
Technician: SJB
Date: 11/25/2019

	Particulate Sampling Data							Flue Gas Data		
Elapsed Time (min)	Gas Meter (ft^3)	Sample Rate (cfm)	Orifice dH (in H_2O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Filter (°F)	Flue Draft (in H_2O)	CO_2 (%)	CO (%)
32	4.906	0.154	1.07	71	2	99	85	-0.080	14.68	0.61
33	5.057	0.151	1.03	72	2	97	82	-0.080	15.64	0.74
34	5.202	0.145	1.14	72	2	94	81	-0.080	16.09	0.80
35	5.356	0.154	1.20	72	2	101	81	-0.080	16.32	0.77
36	5.514	0.158	1.11	73	2	102	82	-0.080	15.59	0.67
37	5.665	0.151	1.09	73	2	98	84	-0.080	11.93	0.65
38	5.817	0.152	1.04	73	2	98	86	-0.090	10.36	0.61
39	5.967	0.150	1.11	74	2	97	87	-0.080	10.60	0.48
40	6.117	0.150	1.02	74	2	97	86	-0.090	11.19	0.37
41	6.268	0.151	1.01	74	2	98	83	-0.090	12.09	0.29
42	6.417	0.149	1.12	74	2	96	81	-0.080	12.48	0.28
43	6.577	0.160	1.15	75	2	103	81	-0.090	12.36	0.27
44	6.736	0.159	1.14	75	2	103	82	-0.080	12.41	0.30
45	6.892	0.156	1.14	75	2	101	85	-0.080	12.50	0.32
46	7.050	0.158	1.12	76	2	102	87	-0.080	12.78	0.36
47	7.207	0.157	1.12	76	2	102	88	-0.090	13.17	0.40
48	7.363	0.156	1.11	76	2	101	86	-0.090	13.92	0.66
49	7.517	0.154	1.11	77	2	100	83	-0.090	14.17	0.81
50	7.672	0.155	1.10	77	2	100	82	-0.090	15.02	0.81
51	7.829	0.157	1.09	77	2	102	82	-0.090	15.08	0.76
52	7.984	0.155	1.08	77	2	101	83	-0.090	14.94	0.79
53	8.138	0.154	1.07	78	2	100	85	-0.090	15.07	0.77
54	8.292	0.154	1.06	78	2	100	87	-0.090	15.28	0.75
55	8.443	0.151	1.12	78	2	98	87	-0.090	15.26	0.73
56	8.599	0.156	1.13	79	2	101	85	-0.090	15.31	0.67
57	8.756	0.157	1.12	79	2	102	83	-0.090	15.19	0.59
58	8.914	0.158	1.12	79	2	102	82	-0.090	15.09	0.49
59	9.070	0.156	1.11	79	2	101	82	-0.090	14.89	0.43
60	9.226	0.156	1.11	80	2	101	84	-0.090	14.70	0.37
61	9.383	0.157	1.13	80	2	102	86	-0.090	14.63	0.32
62	9.541	0.158	1.11	80	2	102	88	-0.090	14.55	0.29
63	9.697	0.156	1.11	80	2	101	87	-0.090	14.54	0.28

BOX B TEST DATA - ASTM E3053 / ASTM E2515

Client: Pacific Energy
Model: FP25
Run #: 1

Job #: 19-537
Tracking #: 0048
Technician: SJB
Date: 11/25/2019

	Particulate Sampling Data							Flue Gas Data		
Elapsed Time (min)	Gas Meter (ft^3)	Sample Rate (cfm)	Orifice dH (in H_2O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Filter (°F)	Flue Draft (in H_2O)	CO_2 (%)	CO (%)
64	9.854	0.157	1.11	81	2	101	85	-0.090	14.61	0.29
65	10.011	0.157	1.12	81	2	101	83	-0.090	14.79	0.30
66	10.167	0.156	1.11	81	2	101	82	-0.090	14.80	0.28
67	10.322	0.155	1.11	81	2	100	83	-0.090	14.67	0.25
68	10.479	0.157	1.10	82	2	101	84	-0.090	14.50	0.23
69	10.635	0.156	1.12	82	2	101	86	-0.090	14.35	0.22
70	10.793	0.158	1.08	82	2	102	88	-0.090	14.20	0.22
71	10.946	0.153	1.11	82	2	99	87	-0.080	13.99	0.23
72	11.100	0.154	1.11	83	2	99	85	-0.090	13.98	0.20
73	11.256	0.156	1.11	83	2	100	83	-0.090	13.87	0.20
74	11.413	0.157	1.11	83	2	101	82	-0.090	13.89	0.18
75	11.567	0.154	1.10	83	2	99	83	-0.090	14.04	0.17
76	11.721	0.154	1.10	83	2	99	85	-0.090	13.99	0.15
77	11.876	0.155	1.10	84	2	99	87	-0.090	13.80	0.14
78	12.032	0.156	1.10	84	2	100	88	-0.090	13.62	0.13
79	12.188	0.156	1.10	84	2	100	86	-0.090	13.59	0.13
80	12.344	0.156	1.10	84	2	100	84	-0.080	13.64	0.11
81	12.499	0.155	1.09	84	2	99	83	-0.090	13.69	0.13
82	12.655	0.156	1.09	85	2	100	82	-0.080	13.79	0.12
83	12.813	0.158	1.09	85	2	101	83	-0.080	13.78	0.12
84	12.969	0.156	1.08	85	2	100	85	-0.090	13.82	0.11
85	13.125	0.156	1.10	85	2	100	87	-0.090	13.80	0.11
86	13.278	0.153	1.09	85	2	98	87	-0.090	13.75	0.09
87	13.433	0.155	1.09	85	2	99	86	-0.080	13.64	0.09
88	13.589	0.156	1.09	86	2	99	84	-0.080	13.49	0.08
89	13.746	0.157	1.09	86	2	100	82	-0.090	13.43	0.08
90	13.903	0.157	1.08	86	2	100	82	-0.090	13.47	0.09
91	14.057	0.154	1.08	86	2	98	84	-0.090	13.67	0.11
92	14.216	0.159	1.21	86	2	101	86	-0.090	13.90	0.15
93	14.382	0.166	1.20	87	2	106	87	-0.090	14.10	0.17
94	14.547	0.165	1.20	87	2	105	87	-0.090	14.12	0.16
95	14.710	0.163	1.20	87	2	104	85	-0.080	14.03	0.15

BOX B TEST DATA - ASTM E3053 / ASTM E2515

Client: Pacific Energy
Model: FP25
Run #: 1

Job #: 19-537
Tracking #: 0048
Technician: SJB
Date: 11/25/2019

	Particulate Sampling Data							Flue Gas Data		
Elapsed Time (min)	Gas Meter (ft^3)	Sample Rate (cfm)	Orifice dH (in H_2O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Filter (°F)	Flue Draft (in H_2O)	CO_2 (%)	CO (%)
96	14.876	0.166	1.20	87	2	106	83	-0.090	13.91	0.14
97	15.039	0.163	1.20	87	2	104	83	-0.080	13.72	0.14
98	15.205	0.166	1.19	87	2	106	83	-0.090	13.61	0.13
99	15.369	0.164	1.21	87	2	104	85	-0.080	13.54	0.15
100	15.531	0.162	1.15	88	2	103	87	-0.090	13.52	0.14
101	15.692	0.161	1.15	88	2	102	87	-0.090	13.40	0.14
102	15.855	0.163	1.15	88	2	103	85	-0.090	13.27	0.15
103	16.015	0.160	1.16	88	2	101	84	-0.090	12.93	0.14
104	16.176	0.161	1.16	88	2	102	83	-0.080	12.59	0.13
105	16.335	0.159	1.16	88	2	101	83	-0.080	12.28	0.13
106	16.495	0.160	1.15	88	2	101	85	-0.090	11.99	0.15
107	16.657	0.162	1.16	89	2	102	87	-0.090	11.91	0.19
108	16.817	0.160	1.15	89	2	101	87	-0.080	11.83	0.23
109	16.979	0.162	1.16	89	2	102	86	-0.080	11.84	0.24
110	17.138	0.159	1.15	89	2	101	83	-0.080	11.92	0.24
111	17.301	0.163	1.15	89	2	103	82	-0.080	12.01	0.22
112	17.461	0.160	1.15	89	2	101	82	-0.080	12.05	0.25
113	17.621	0.160	1.14	89	2	101	84	-0.080	12.16	0.28
114	17.783	0.162	1.13	89	2	103	86	-0.090	12.35	0.29
115	17.940	0.157	1.15	90	2	99	88	-0.080	12.68	0.34
116	18.101	0.161	1.14	90	2	102	87	-0.090	13.19	0.42
117	18.262	0.161	1.14	90	2	102	84	-0.090	13.71	0.46
118	18.419	0.157	1.16	90	2	99	83	-0.090	14.10	0.47
119	18.580	0.161	1.14	90	2	102	82	-0.080	14.37	0.47
120	18.737	0.157	1.14	90	2	99	82	-0.080	14.45	0.49
121	18.897	0.160	1.14	90	2	101	84	-0.080	14.11	0.45
122	19.058	0.161	1.13	90	2	102	87	-0.080	13.36	0.34
123	19.216	0.158	1.11	90	2	100	88	-0.090	12.69	0.28
124	19.374	0.158	1.13	91	2	100	86	-0.080	12.29	0.27
125	19.532	0.158	1.12	91	2	100	84	-0.080	12.06	0.27
126	19.689	0.157	1.15	91	2	99	82	-0.080	11.90	0.27
127	19.848	0.159	1.14	91	2	100	82	-0.080	11.67	0.27

BOX B TEST DATA - ASTM E3053 / ASTM E2515

Client: Pacific Energy
Model: FP25
Run #: 1

Job #: 19-537
Tracking #: 0048
Technician: SJB
Date: 11/25/2019

	Particulate Sampling Data							Flue Gas Data		
Elapsed Time (min)	Gas Meter (ft^3)	Sample Rate (cfm)	Orifice dH (in H_2O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Filter (°F)	Flue Draft (in H_2O)	CO_2 (%)	CO (%)
128	20.005	0.157	1.13	91	2	99	83	-0.080	11.39	0.26
129	20.162	0.157	1.13	91	2	99	85	-0.080	10.90	0.24
130	20.320	0.158	1.14	91	2	99	87	-0.080	10.41	0.25
Avg/Tot	20.320	0.156	1.11	79	2.00	100	84	-0.078	11.95	0.31

WOODSTOVE SURFACE TEMPERATURE DATA

Client: Pacific Energy
Model: FP25
Run #: 1

Job #: 19-537
Tracking #: 0048
Technician: SJB
Date: 11/25/2019

	Temperature Data (°F)						
Elapsed Time (min)	FB Left	FB Right	FB Back	FB Top	FB Bottom	Stove Surface Average	Catalyst Exit
0	61	61	61	61	61	61.0	N/A
1	61	61	61	61	61	61.0	N/A
2	63	64	62	63	61	62.6	N/A
3	68	70	64	69	61	66.4	N/A
4	76	79	69	79	61	72.8	N/A
5	82	85	74	92	61	78.8	N/A
6	88	90	82	106	62	85.6	N/A
7	93	96	89	120	62	92.0	N/A
8	97	100	96	133	64	98.0	N/A
9	102	104	102	145	65	103.6	N/A
10	107	107	108	156	67	109.0	N/A
11	112	111	113	166	69	114.2	N/A
12	117	114	118	176	72	119.4	N/A
13	120	115	122	186	76	123.8	N/A
14	125	120	128	195	80	129.6	N/A
15	130	126	134	203	85	135.6	N/A
16	135	131	140	212	90	141.6	N/A
17	139	136	147	224	95	148.2	N/A
18	145	141	153	237	100	155.2	N/A
19	151	145	161	251	106	162.8	N/A
20	157	149	171	267	111	171.0	N/A
21	164	154	180	284	117	179.8	N/A
22	172	160	190	300	122	188.8	N/A
23	180	167	201	316	128	198.4	N/A
24	188	174	212	332	134	208.0	N/A
25	196	180	225	349	140	218.0	N/A
26	205	187	235	365	146	227.6	N/A
27	214	196	247	383	152	238.4	N/A
28	224	204	258	402	158	249.2	N/A
29	233	212	270	423	163	260.2	N/A
30	242	220	283	448	169	272.4	N/A
31	252	228	296	476	175	285.4	N/A
32	261	237	311	508	181	299.6	N/A
33	271	245	326	540	187	313.8	N/A
34	280	255	342	573	194	328.8	N/A
35	290	264	357	603	200	342.8	N/A
36	300	274	371	619	207	354.2	N/A
37	309	282	380	629	214	362.8	N/A
38	317	290	387	637	221	370.4	N/A
39	325	297	393	646	227	377.6	N/A
40	333	304	398	656	233	384.8	N/A
41	334	304	395	659	239	386.2	N/A
42	331	301	389	658	245	384.8	N/A
43	329	298	383	656	250	383.2	N/A
44	327	296	377	655	255	382.0	N/A
45	326	294	372	654	260	381.2	N/A
46	326	293	368	655	264	381.2	N/A
47	326	293	364	657	269	381.8	N/A

WOODSTOVE SURFACE TEMPERATURE DATA

Client: Pacific Energy
Model: FP25
Run #: 1

Job #: 19-537
Tracking #: 0048
Technician: SJB
Date: 11/25/2019

	Temperature Data (°F)						
Elapsed Time (min)	FB Left	FB Right	FB Back	FB Top	FB Bottom	Stove Surface Average	Catalyst Exit
48	327	293	362	660	273	383.0	N/A
49	327	291	360	664	276	383.6	N/A
50	329	292	359	670	280	386.0	N/A
51	331	293	358	675	283	388.0	N/A
52	332	293	358	682	286	390.2	N/A
53	335	295	359	687	289	393.0	N/A
54	337	296	361	692	292	395.6	N/A
55	339	298	363	697	295	398.4	N/A
56	342	300	365	701	297	401.0	N/A
57	344	303	367	704	300	403.6	N/A
58	346	304	370	707	302	405.8	N/A
59	349	307	373	708	304	408.2	N/A
60	352	309	375	710	306	410.4	N/A
61	354	310	378	711	308	412.2	N/A
62	356	312	381	711	310	414.0	N/A
63	358	314	384	713	312	416.2	N/A
64	360	315	387	714	314	418.0	N/A
65	363	317	391	716	316	420.6	N/A
66	365	319	394	716	318	422.4	N/A
67	366	320	397	717	320	424.0	N/A
68	368	322	400	717	322	425.8	N/A
69	370	324	403	716	324	427.4	N/A
70	372	324	406	716	326	428.8	N/A
71	373	326	409	714	328	430.0	N/A
72	375	327	412	713	331	431.6	N/A
73	376	329	415	711	333	432.8	N/A
74	378	330	418	710	335	434.2	N/A
75	379	331	421	708	337	435.2	N/A
76	380	333	424	707	340	436.8	N/A
77	381	335	426	704	342	437.6	N/A
78	383	336	429	702	345	439.0	N/A
79	383	338	432	701	347	440.2	N/A
80	384	340	434	700	350	441.6	N/A
81	386	342	437	699	352	443.2	N/A
82	387	343	439	699	355	444.6	N/A
83	388	345	442	699	358	446.4	N/A
84	388	347	444	700	361	448.0	N/A
85	390	349	447	700	364	450.0	N/A
86	391	351	450	701	367	452.0	N/A
87	392	352	453	701	370	453.6	N/A
88	393	354	455	701	374	455.4	N/A
89	394	355	458	702	377	457.2	N/A
90	395	356	461	703	380	459.0	N/A
91	397	358	463	705	383	461.2	N/A
92	399	359	466	708	387	463.8	N/A
93	400	361	469	712	390	466.4	N/A
94	401	362	472	715	394	468.8	N/A
95	402	363	475	718	397	471.0	N/A

WOODSTOVE SURFACE TEMPERATURE DATA

Client: Pacific Energy
Model: FP25
Run #: 1

Job #: 19-537
Tracking #: 0048
Technician: SJB
Date: 11/25/2019

	Temperature Data (°F)						
Elapsed Time (min)	FB Left	FB Right	FB Back	FB Top	FB Bottom	Stove Surface Average	Catalyst Exit
96	404	366	478	720	401	473.8	N/A
97	405	367	481	721	404	475.6	N/A
98	407	369	484	722	408	478.0	N/A
99	408	370	487	723	412	480.0	N/A
100	409	371	489	723	416	481.6	N/A
101	412	374	490	725	421	484.4	N/A
102	413	375	490	725	425	485.6	N/A
103	415	377	489	725	429	487.0	N/A
104	416	378	488	722	433	487.4	N/A
105	418	379	487	719	437	488.0	N/A
106	419	379	486	715	442	488.2	N/A
107	421	380	485	711	446	488.6	N/A
108	422	381	484	707	450	488.8	N/A
109	423	381	483	704	454	489.0	N/A
110	423	381	481	701	458	488.8	N/A
111	423	381	480	699	462	489.0	N/A
112	423	381	479	697	467	489.4	N/A
113	424	381	479	696	471	490.2	N/A
114	424	381	478	696	476	491.0	N/A
115	424	380	479	698	480	492.2	N/A
116	424	381	479	702	485	494.2	N/A
117	424	381	479	709	489	496.4	N/A
118	426	381	480	717	494	499.6	N/A
119	426	382	481	725	498	502.4	N/A
120	427	382	482	732	503	505.2	N/A
121	428	383	484	734	508	507.4	N/A
122	428	383	485	732	513	508.2	N/A
123	429	384	487	729	518	509.4	N/A
124	430	385	488	725	523	510.2	N/A
125	430	385	490	720	527	510.4	N/A
126	431	385	491	715	532	510.8	N/A
127	431	385	493	710	536	511.0	N/A
128	431	386	494	704	541	511.2	N/A
129	431	386	495	696	545	510.6	N/A
130	430	386	495	688	549	509.6	N/A
Average	320	288	362	580	300	370	N/A

LAB SAMPLE DATA - ASTM E2515

Client: Pacific Energy
Model: FP25
Run #: 1

Job #: 19-537
Tracking #: 0048
Technician: SJB
Date: 11/25/2019

	Sample ID	Tare, mg	Total, mg	Final, mg	Catch, mg
Train A Filters - First Hour	T367	87.2	174.0	176.9	2.9
	T368	86.8			
Train A Filters - Remainder	T378	86.8	173.9	174.8	0.9
	T369	87.1			
Train A Probe	14A	116818.0	116818.0	116818.0	0.0
Train A O-Rings	14A	3367.7	3367.7	3367.7	0.0
Train B Filters	T370	86.6	260.0	262.9	2.9
	T371	86.6			
	T377	86.8			
Train B Probe	14B	116771.6	116771.6	116771.8	0.2
Train B O-Rings	14B	3341.9	3341.9	3342.9	1.0
Background Filter			0.0	0.0	

Placed in Dessicator on:	11/25 - 12:45

Train A Filters - First Hour	176.9	11/27 13:12	176.9	12/2 8:07				
Train A Filters - Remainder	174.8	11/27 13:12	174.8	12/2 8:07				
Train A Probe	116818.6	11/27 13:12	116817.9	12/2 8:08	116818.0	12/2 15:20		
Train A O-Rings	3368.1	11/27 13:12	3367.6	12/2 8:08	3367.7	12/2 15:20		
Train B Filters	263.1	11/27 13:12	262.9	12/2 8:08				
Train B Probe	116772.6	11/27 13:13	116771.9	12/2 8:08	116771.8	12/2 15:20		
Train B O-Rings	3343.4	11/27 13:13	3342.8	12/2 8:08	3342.9	12/2 15:21		
Background Filter								

1st hour Sub-Total, mg:	2.9
Remainder Sub-Total, mg:	0.9
Train 1 Aggregate, mg:	**3.8**
Train 2 Aggregate, mg:	**4.1**
Ambient Aggregate, mg:	0.0

ASTM E3053 Wood Heater Run Sheets

Client: Pacific Energy | Job Number: 19-537 | Tracking #: 0048
Model: FP25 | Run Number: 1 | Test Date: 11/25/2019

Wood Heater Run Notes

Pre-Test Notes
Pre-Test Start Time: N/A
Air Control Setting: N/A

Time	Notes
N/A	High fire test starts from cold start per ASTM E3053

Test Notes
Test Burn Start Time: 10:04
Air Control Setting: Fully Open

Time	Notes
0 min	Started with 2.0 lbs of kindling, ignited with propane torch for 60 seconds. Door left cracked open ~4".
2 min	Closed door to 1" open.
3.5 min	Closed door.
12 min	@0.9 lbs, added remaining kindling pieces (1.0 lbs) and a couple start-up fuel pieces (1.4 lbs), door cracked open 1".
13 min	Door closed.
26 min	@1.4 lbs, loaded remaining start-up fuel pieces, door closed within 1 min
35 min	@2.0 lbs, leveled coal bed and loaded high fire fuel load, door closed within 60 seconds
40 min	Fan turned on.
41 min	Changed Train B Front filter due to clogging
45 min	Changed Train A Front Filter due to clogging
60 min	Changed 1-hr filter
130 min	End of Test

Test Burn End Time: 12:14

Flue Gas Concentration Measurement

Calibration Gas Values: Span Gas CO_2 (%): 16.93 CO (%): 4.330
Mid Gas CO_2 (%): 10.00 CO (%): 2.51

Calibration Results:

	Pre Test			Post Test		
	Zero	Mid	Span	Zero	Mid	Span
Time	8:19	8:23	8:21	11/26 - 6:46	11/26 - 6:49	11/26 - 6:47
CO_2	0.00	10.03	16.99	0.00	9.84	16.80
CO	0.000	2.502	4.303	0.002	2.465	4.238

Flue Gas Probe Leak Check: Initial: No Leakage Final: No Leakage

Technician Signature: Date: 11/26/2019

ASTM E3053 Wood Heater Run Sheets

Client: Pacific Energy | Job Number: 19-537 | Tracking #: 0048
Model: FP25 | Run Number: 1 | Test Date: 11/25/2019

Test Photos

Kindling Fuel Load

Start-up Fuel Load

High Fire Fuel Load

Residual Start-up Fuel Coal Bed

Technician Signature: _____ Date: 11/26/2019

ASTM E3053 Wood Heater Run Sheets

Client: Pacific Energy | Job Number: 19-537 | Tracking #: 0048
Model: FP25 | Run Number: 1 | Test Date: 11/25/2019

High Fire Fuel Loaded

Residual High Fire Load Coal Bed

N/A

Low Fire Fuel Load

N/A

Low Fire Fuel Loaded

Technician Signature: _____ Date: 11/26/2019

WOOD STOVE TEST DATA PACKET
ASTM E3053/E2515

Run 2 Data Summary

Client: Pacific Energy
Model: FP25
Job #: 19-537
Tracking #: 0048
Test Date: 11/25/2019

12/2/2019

Techician Signature | Date

TEST RESULTS - ASTM E3053 / ASTM E2515

Client: Pacific Energy
Model: FP25
Run #: 2

Job #: 19-537
Tracking #: 0048
Technician: SJB
Date: 11/25/2019

Burn Rate (kg/hr):	0.84

	Ambient Sample	Sample Train A	Sample Train B	1st Hour Filter
Total Sample Volume (ft^3)	0.000	101.494	103.518	9.140
Average Gas Velocity in Dilution Tunnel (ft/sec)	15.76			
Average Gas Flow Rate in Dilution Tunnel (dscf/hr)	19110.4			
Average Gas Meter Temperature (°F)	67.0	92.8	94.0	90.9
Total Sample Volume (dscf)	0.000	96.712	99.440	8.737
Average Tunnel Temperature (°F)	78.1			
Total Time of Test (min)	648			
Total Particulate Catch (mg)	0.0	3.6	3.7	1.3
Particulate Concentration, dry-standard (g/dscf)	0.0000000	0.0000372	0.0000372	0.0001488
Total PM Emissions (g)	0.00	7.68	7.68	2.84
Particulate Emission Rate (g/hr)	0.00	0.71	0.71	2.84
Emissions Factor (g/kg)	-	0.84	0.84	-
Difference from Average Total Particulate Emissions (g)	-	0.00	0.00	-
Difference from Average Emissions Factor (g/kg)	-	0.00	0.00	-

Final Average Results	
Total Particulate Emissions (g)	7.68
Particulate Emission Rate (g/hr)	0.71
Emissions Factor (g/kg)	0.84
HHV Efficiency (%)	69.1%
LHV Efficiency (%)	73.9%
CO Emissions (g/min)	1.13

Quality Checks	Requirement	Observed	Result
Dual Train Precision	Each train within 7.5% of average emissions (in grams), or emission factors within 0.5 g/kg	See Above	OK
Filter Temps	>80 °F, <90 °F	Min: 80 / Max: 90	OK
Face Velocity	< 30 ft/min	10.0	OK
Leakage Rate	Less than 4% of average sample rate	0 cfm	OK
Ambient Temp	55-90 °F	Min: 65 / Max: 75	OK
Negative Probe Weight Evaluation	<5% of Total Catch	Probe Catch Not Negative	OK
Pro-Rate Variation	90% of readings between 90-110%; none greater than 120% or less than 80%	See Data Tabs	CHECK 10 MIN. INTERVAL PRO-RATES

B415.1 Efficiency Results

Manufacturer:	Pacific Energy
Model:	FP25
Date:	11/25/19
Run:	2
Control #:	19-537
Test Duration:	648
Output Category:	Low

Test Results in Accordance with CSA B415.1-09

	HHV Basis	LHV Basis
Overall Efficiency	69.1%	73.9%
Combustion Efficiency	94.3%	94.3%
Heat Transfer Efficiency	73.2%	78.3%

Output Rate (kJ/h)	11,601	11,005	**(Btu/h)**
Burn Rate (kg/h)	0.84	1.85	**(lb/h)**
Input (kJ/h)	16,794	15,931	**(Btu/h)**

Test Load Weight (dry kg)	9.09	20.03	**dry lb**
MC wet (%)	17.58		
MC dry (%)	21.33		
Particulate (g)	7.68		
CO (g)	734		
Test Duration (h)	10.80		

Emissions	**Particulate**	**CO**
g/MJ Output	0.06	5.86
g/kg Dry Fuel	0.85	80.79
g/h	0.71	67.98
g/min	0.01	1.13
lb/MM Btu Output	0.14	13.62

Air/Fuel Ratio (A/F)	11.56

VERSION: **2.2** **12/14/2009**

HIGH FIRE FUEL LOAD DATA - ASTM E3053

Client: Pacific Energy
Job #: 19-537
Model: FP25
Tracking #: 0048
Run #: 2
Technician: SJB
Date: 11/25/2019

Nominal Loading Density (lbs/ft^3, wet basis):	10		
Usable Firebox Volume (ft^3):	2.10		
Target Load Weight (lbs):	21.00		
Total Load Weight Range (lbs):	20.00	to	22.10
Core Load Weight Range (lbs):	9.50	to	13.70
Remainder Load Weight Range (lbs):	7.40	to	11.60
Core Load Piece Range (lbs):	3.20	to	5.30
Remainder Load Piece Range (lbs):	2.10	to	11.60
Max Allowable Kindling Weight (lbs):	4.01		
Max Allowable Start-up Fuel Weight (lbs):	6.02		

CORE LOAD DATA

				Fuel Piece Moisture Readings (%DB)					Dry Weight	
Piece #	Length (in)	Weight (lbs)	Within Spec?	1	2	3	Ave.	Within Spec?	lbs	kg
1	16.00	3.83	In Range	24.7	23.6	22.1	23.5	In Range	3.10	1.41
2	16.00	4.47	In Range	19.7	18.6	20.7	19.7	In Range	3.74	1.69
3	16.00	4.07	In Range	19.4	24.7	18.7	20.9	In Range	3.37	1.53
Core Load Wt. (lbs)		12.37	In Range							

REMAINDER LOAD DATA (1 to 3 Pieces)

				Fuel Piece Moisture Readings (%DB)					Dry Weight	
Piece #	Length (in)	Weight (lbs)	Within Spec?	1	2	3	Ave.	Within Spec?	lbs	kg
1	16.00	4.67	In Range	20.2	22.1	24.9	22.4	In Range	3.82	1.73
2	16.00	3.02	In Range	19.6	22.7	23.4	21.9	In Range	2.48	1.12
3			NA				NA	NA	NA	NA
Remainder Load (lbs)		7.69	In Range							

Total Load Weight (lbs):	20.06	In Range	
Core Load % of Total Weight:	62%	In Range	45-65%
Remainder % of Total Weight:	38%	In Range	35-55%
Total Load % of Target Weight:	96%	In Range	95-105%
Actual Fuel Loading Density (lb/ft3):	9.6		
Total Load Average Moisture Content (%DB):	21.6	In Range	19-25%
Total Load Average Moisture Content (%WB):	17.8		
Total Test Load Weight (dry basis):	16.50 lbs	7.48 kg	

KINDLING AND START-UP FUEL

		Kindling Moisture Readings (%DB)					Dry Weight	
Kindling Weight (lbs)	Within Spec?	1	2	3	Avg.	Within Spec?	lbs	kg
2.98	In Range	10	10	10	10.0	In Range	2.71	1.23

		Start-up Moisture Readings (%DB)					Dry Weight	
Start-up Fuel Wt. (lb)	Within Spec?	1	2	3	Avg.	Within Spec?	lbs	kg
4.19	In Range	19.7	22.4	21.7	21.3	In Range	3.46	1.57

TEST FUEL LOADING RANGE

Allowable Residual Start-up Fuel Range (lb):	2.0	to	4.0	
Actual Residual Start-up Fuel Weight (lb):	2.0			In Range

LOW & MEDIUM FIRE FUEL LOAD DATA - ASTM E3053

Client: Pacific Energy
Job #: 19-537
Model: FP25
Tracking #: 0048
Run #: 2
Technician: SJB
Date: 11/25/2019

Nominal Loading Density (lbs/ft^3, wet basis):	12		
Usable Firebox Volume (ft^3):	2.10		
Target Load Weight (lbs):	25.20		
Total Load Weight Range (lbs):	23.94	to	26.46
Core Load Weight Range (lbs):	11.34	to	16.38
Remainder Load Weight Range (lbs):	8.82	to	13.86
Core Load Piece Range (lbs):	3.78	to	6.30
Remainder Load Piece Range (lbs):	2.52	to	7.56

CORE LOAD DATA

				Fuel Piece Moisture Readings (%DB)					Dry Weight	
Piece #	Length (in)	Weight (lbs)	Within Spec?	1	2	3	Ave.	Within Spec?	lbs	kg
1	16.00	5.36	In Range	20.9	18.4	20.6	20.0	In Range	4.47	2.03
2	16.00	4.65	In Range	19.7	20.1	22.7	20.8	In Range	3.85	1.75
3	16.00	4.70	In Range	24.2	20.2	18.7	21.0	In Range	3.88	1.76
Core Load Wt. (lbs)		14.71	In Range							

REMAINDER LOAD DATA (2 to 3 Pieces)

				Fuel Piece Moisture Readings (%DB)					Dry Weight	
Piece #	Length (in)	Weight (lbs)	Within Spec?	1	2	3	Ave.	Within Spec?	lbs	kg
1	16.00	6.42	In Range	25.2	19.8	24.7	23.2	In Range	5.21	2.36
2	16.00	3.21	In Range	21.9	19.6	21.7	21.1	In Range	2.65	1.20
3			NA				NA	NA	NA	NA
Remainder Load (lbs)		9.63	In Range							

Remainder Load Small/Large Piece Weight Ratio:	50%	In Range	≤ 67%
Total Load Weight (lbs):	24.34	In Range	
Core Load % of Total Weight:	60%	In Range	45-65%
Remainder % of Total Weight:	40%	In Range	35-55%
Total Load % of Target Weight:	97%	In Range	95-105%
Actual Fuel Loading Density (lb/ft3):	11.6		
Total Load Average Moisture Content (%DB):	21.3	In Range	19-25%
Total Load Average Moisture Content (%WB):	17.6		
Total Test Load Weight (dry basis):	20.06 lbs	9.10 kg	

TEST FUEL LOADING RANGE

Allowable Charcoal Bed Weight Range (lb):	2.5	to	4.8	
Actual Charcoal Bed Wt. (lb):	3.9			In Range

TEST END POINT

Actual Fuel Load Ending Weight (lb): 0.0 Valid Test (≥90%)

Total Fuel Burned During Test Run:
24.3 lbs, wet basis
20.1 lbs, dry basis
9.10 kg, dry basis

DILUTION TUNNEL & MISC. DATA - ASTM E3053 / E2515

Client:	Pacific Energy	Job #:	19-537
Model:	FP25	Tracking #:	0048
Run #:	2	Technician:	SJB
Test Start Time:	12:18	Date:	11/25/2019
Test Type:	Low Fire		

Recording Interval (min):	1
Total Sampling Time (min):	648

	Pre-Test	Post Test	Avg.
Barometric Pressure (in. Hg)	30.05	30	30.03
Relative Humidity (%)	34.3	40.7	
Room Air Velocity (ft/min)	0	0	
Scale Audit (lbs)	10.0	10.0	
Ambient Sample Volume:			ft^3

Meter Box γ Factor:	0.992	(A)
Meter Box γ Factor:	1.002	(B)
Meter Box γ Factor:		(Ambient)

Induced Draft Check (in. H_2O):	0
Smoke Capture Check (%):	100%
Date Flue Pipe Last Cleaned:	11/22/2019

Sample Train Post-Test Leak Checks

(A)	0.000	cfm @	-4	in. Hg
(B)	0.000	cfm @	-5	in. Hg
(Ambient)		cfm @		in. Hg

DILUTION TUNNEL FLOW

Traverse Data

Point	dP (in H_2O)	Temp (°F)
1	0.054	67
2	0.062	67
3	0.064	67
4	0.050	67
5	0.048	67
6	0.066	67
7	0.060	67
8	0.050	67
Center	0.065	67

Static Pressure: -0.140 in. H_2O

Dilution Tunnel H_2O:	2.00	percent
Tunnel Diameter:	8	inches
Pitot Tube Cp:	0.99	[unitless]
Dilution Tunnel MW(dry):	29.00	lb/lb-mole
Dilution Tunnel MW(wet):	28.78	lb/lb-mole
Tunnel Area:	0.3491	ft^2
V_{strav}:	15.84	ft/sec
V_{scent}:	16.85	ft/sec
F_p:	0.940	[ratio]
Initial Tunnel Flow:	324.3	scf/min

TEST FUEL PROPERTIES

ASTM 3053-17 - Table A1.1 Fuel Properties by Fuel Species

Select Fuel Type	Species	%C	%H	%O	%Ash	MJ/kg	BTU/lb
	Ash, White	49.70	6.90	43.00	0.30	20.75	8927
	Beech	48.70	5.80	44.70	0.60	18.80	8088
	Birch, Sweet	49.80	6.50	43.40	0.30	20.12	8656
	Birch, Yellow	49.80	6.50	43.40	0.30	20.12	8656
	Doug Fir (Coast, Interior West/North)	48.73	6.87	43.90	0.50	19.81	8522
	Doug Fir (Interioir South)	48.73	6.87	43.90	0.50	19.81	8522
	Elm, Rock	50.40	6.60	42.30	0.70	20.49	8815
	Elm, Soft	50.40	6.60	42.30	0.70	20.49	8815
	Gum, Red	50.88	6.06	41.57	1.28	19.72	8478
	Larch, Western	50.54	6.36	42.40	0.70	17.58	7558
X	Maple, Hard	50.64	6.02	41.74	1.35	19.96	8587
	Maple, Sugar	50.64	6.02	41.74	1.35	19.96	8587
	Oak, Red	49.50	6.62	43.70	0.20	20.20	8690
	Oak, White	50.40	6.59	42.70	0.20	20.50	8819
	Pine, Southern	52.60	7.00	40.10	1.31	22.30	9587
	Pine, Southern Long Leaf	52.60	7.02	40.10	1.30	22.30	9594

WOODSTOVE PREBURN DATA

Client:	Pacific Energy	Job #:	19-537
Model:	FP25	Tracking #:	0048
Run #:	2	Technician:	SJB
		Date:	11/25/2019

Low Fire performed as a continuation of High Fire Test, see Run 1 test data for details

BOX A TEST DATA - ASTM E3053 / ASTM E2515

Client: Pacific Energy
Model: FP25
Run #: 2

Job #: 19-537
Tracking #: 0048
Technician: SJB
Date: 11/25/2019

	Particulate Sampling Data							Fuel Weight (lb)		Temperature Data (°F)			
Elapsed Time (min)	Gas Meter (ft^3)	Sample Rate (cfm)	Dilution Tunnel dP (in H_2O)	Orifice dH (in H_2O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Scale Reading	Weight Change	Dilution Tunnel	Flue	Filter	Ambient
0	0.000		0.063	0.06	90	2		24.3		117	737	81	69
1	0.150	0.150	0.063	1.06	90	2	101	24.2	-0.1	135	640	81	69
2	0.310	0.160	0.063	1.03	90	2	107	23.9	-0.3	124	903	84	69
3	0.468	0.158	0.063	1.03	90	2	106	23.7	-0.2	129	1,023	87	69
4	0.621	0.153	0.063	1.02	90	2	103	23.3	-0.4	132	1,057	87	69
5	0.778	0.157	0.063	0.98	90	2	106	23.0	-0.3	134	1,114	86	68
6	0.931	0.153	0.063	1.00	90	2	102	22.6	-0.4	124	1,033	83	69
7	1.085	0.154	0.063	1.01	90	2	102	22.4	-0.2	112	940	81	69
8	1.238	0.153	0.063	1.01	90	2	101	22.2	-0.2	109	919	81	69
9	1.389	0.151	0.063	1.00	90	2	99	22.0	-0.2	107	898	81	69
10	1.542	0.153	0.063	1.01	90	2	101	21.8	-0.2	105	878	83	69
11	1.696	0.154	0.063	0.98	90	2	101	21.6	-0.2	106	870	85	69
12	1.848	0.152	0.063	1.01	90	2	100	21.4	-0.2	106	852	87	69
13	2.001	0.153	0.063	0.98	90	2	101	21.3	-0.1	106	832	86	69
14	2.154	0.153	0.063	1.00	90	2	101	21.2	-0.1	106	818	84	68
15	2.307	0.153	0.063	0.98	90	2	101	21.0	-0.2	106	804	82	69
16	2.460	0.153	0.063	1.01	90	2	101	20.9	-0.1	105	790	81	69
17	2.611	0.151	0.063	1.01	90	2	99	20.7	-0.2	104	782	81	69
18	2.763	0.152	0.063	1.01	90	2	100	20.6	-0.1	104	779	83	69
19	2.916	0.153	0.063	0.98	90	2	101	20.4	-0.2	104	773	85	69
20	3.068	0.152	0.063	0.99	90	2	100	20.3	-0.1	104	768	87	69
21	3.224	0.156	0.063	0.97	90	2	102	20.1	-0.2	103	764	86	69
22	3.376	0.152	0.063	0.97	91	2	100	19.9	-0.2	103	761	84	69
23	3.527	0.151	0.063	0.99	91	2	99	19.8	-0.1	103	760	82	69
24	3.680	0.153	0.063	1.01	91	2	100	19.6	-0.2	103	751	81	69
25	3.832	0.152	0.063	0.97	91	2	100	19.5	-0.1	103	745	81	69
26	3.983	0.151	0.063	1.01	91	2	99	19.3	-0.2	102	743	83	68
27	4.135	0.152	0.063	0.96	91	2	99	19.2	-0.1	102	747	85	69
28	4.288	0.153	0.063	0.98	91	2	100	18.9	-0.3	102	747	86	69
29	4.440	0.152	0.063	0.97	91	2	99	18.7	-0.2	102	745	86	69
30	4.592	0.152	0.063	0.96	91	2	99	18.6	-0.1	102	746	84	69
31	4.745	0.153	0.063	0.96	91	2	100	18.4	-0.2	102	750	82	69
32	4.897	0.152	0.063	0.97	91	2	99	18.3	-0.1	102	746	81	69

BOX A TEST DATA - ASTM E3053 / ASTM E2515

Client: Pacific Energy
Model: FP25
Run #: 2

Job #: 19-537
Tracking #: 0048
Technician: SJB
Date: 11/25/2019

	Particulate Sampling Data							Fuel Weight (lb)		Temperature Data (°F)			
Elapsed Time (min)	Gas Meter (ft^3)	Sample Rate (cfm)	Dilution Tunnel dP (in H_2O)	Orifice dH (in H_2O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Scale Reading	Weight Change	Dilution Tunnel	Flue	Filter	Ambient
33	5.048	0.151	0.063	0.98	91	2	99	18.1	-0.2	102	745	82	69
34	5.199	0.151	0.063	0.98	91	2	99	18.0	-0.1	101	743	83	69
35	5.352	0.153	0.063	0.95	91	2	100	17.8	-0.2	101	741	85	68
36	5.502	0.150	0.063	0.94	91	2	98	17.6	-0.2	101	739	87	69
37	5.655	0.153	0.063	1.00	91	2	100	17.4	-0.2	101	730	86	69
38	5.807	0.152	0.063	0.99	91	2	99	17.3	-0.1	100	721	84	69
39	5.959	0.152	0.063	0.97	91	2	99	17.3	0	100	720	82	69
40	6.112	0.153	0.063	1.00	91	2	100	17.2	-0.1	100	714	81	69
41	6.265	0.153	0.063	1.00	91	2	100	16.9	-0.3	100	710	82	69
42	6.418	0.153	0.063	0.97	91	2	100	16.7	-0.2	100	705	83	69
43	6.569	0.151	0.063	1.01	92	2	98	16.8	0.1	100	700	85	69
44	6.720	0.151	0.063	0.97	92	2	98	16.4	-0.4	99	697	87	69
45	6.871	0.151	0.063	0.99	92	2	98	16.4	0	99	694	86	69
46	7.022	0.151	0.063	0.97	92	2	98	16.1	-0.3	99	696	84	69
47	7.173	0.151	0.063	0.96	92	2	98	15.9	-0.2	98	694	82	69
48	7.324	0.151	0.063	1.00	92	2	98	15.8	-0.1	98	688	81	69
49	7.474	0.150	0.063	0.99	92	2	98	15.7	-0.1	98	683	81	69
50	7.623	0.149	0.063	0.95	92	2	97	15.5	-0.2	98	679	83	69
51	7.775	0.152	0.063	0.98	92	2	99	15.5	0	98	674	85	69
52	7.927	0.152	0.063	0.98	92	2	99	15.2	-0.3	97	671	87	69
53	8.080	0.153	0.063	0.98	92	2	100	15.1	-0.1	97	670	86	69
54	8.231	0.151	0.063	0.94	92	2	98	15.0	-0.1	97	666	84	69
55	8.385	0.154	0.063	0.95	92	2	100	14.9	-0.1	97	664	82	69
56	8.536	0.151	0.063	0.98	92	2	98	14.7	-0.2	97	662	81	69
57	8.686	0.150	0.063	0.96	92	2	98	14.5	-0.2	97	661	81	69
58	8.837	0.151	0.063	0.95	92	2	98	14.5	0	97	660	83	69
59	8.989	0.152	0.063	0.98	92	2	99	14.3	-0.2	97	660	85	69
60	9.140	0.151	0.063	0.95	92	2	98	14.1	-0.2	96	659	86	69
61	9.314	0.174	0.063	1.08	92	2	113	13.9	-0.2	96	659	85	69
62	9.470	0.156	0.063	1.00	92	2	101	13.9	0	96	656	83	69
63	9.625	0.155	0.063	1.00	92	2	101	13.6	-0.3	96	654	82	69
64	9.779	0.154	0.063	0.98	92	2	100	13.5	-0.1	96	653	82	69
65	9.933	0.154	0.063	1.00	92	2	100	13.4	-0.1	95	650	83	69

BOX A TEST DATA - ASTM E3053 / ASTM E2515

Client: Pacific Energy
Model: FP25
Run #: 2

Job #: 19-537
Tracking #: 0048
Technician: SJB
Date: 11/25/2019

	Particulate Sampling Data							Fuel Weight (lb)		Temperature Data (°F)			
Elapsed Time (min)	Gas Meter (ft^3)	Sample Rate (cfm)	Dilution Tunnel dP (in H_2O)	Orifice dH (in H_2O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Scale Reading	Weight Change	Dilution Tunnel	Flue	Filter	Ambient
66	10.086	0.153	0.063	0.99	92	2	99	13.4	0	95	645	84	69
67	10.239	0.153	0.063	0.99	92	2	99	13.1	-0.3	95	640	86	69
68	10.393	0.154	0.063	1.01	92	2	100	13.1	0	95	638	86	69
69	10.547	0.154	0.063	1.00	92	2	100	13.0	-0.1	95	637	84	69
70	10.703	0.156	0.063	1.00	93	2	101	12.7	-0.3	94	637	82	69
71	10.856	0.153	0.063	1.02	93	2	99	12.6	-0.1	95	637	81	69
72	11.009	0.153	0.063	0.99	93	2	99	12.5	-0.1	95	633	81	69
73	11.163	0.154	0.063	1.01	93	2	100	12.4	-0.1	94	637	83	69
74	11.318	0.155	0.063	1.00	93	2	100	12.2	-0.2	94	634	85	69
75	11.474	0.156	0.063	1.00	93	2	101	12.2	0	94	635	87	69
76	11.629	0.155	0.063	1.02	93	2	100	12.0	-0.2	94	635	85	69
77	11.781	0.152	0.063	1.02	93	2	98	12.0	0	94	639	83	69
78	11.933	0.152	0.063	0.97	93	2	98	11.8	-0.2	94	635	82	69
79	12.085	0.152	0.063	0.98	93	2	98	11.6	-0.2	94	635	81	69
80	12.238	0.153	0.063	0.97	93	2	99	11.5	-0.1	94	633	82	69
81	12.393	0.155	0.063	0.99	93	2	100	11.5	0	94	635	83	69
82	12.548	0.155	0.063	1.01	93	2	100	11.3	-0.2	94	641	85	68
83	12.701	0.153	0.063	1.00	93	2	99	11.2	-0.1	94	644	86	68
84	12.853	0.152	0.063	0.98	93	2	98	11.1	-0.1	94	647	85	68
85	13.007	0.154	0.063	1.00	93	2	100	11.0	-0.1	94	646	83	68
86	13.158	0.151	0.063	0.98	93	2	98	10.7	-0.3	94	643	81	68
87	13.310	0.152	0.063	1.00	93	2	98	10.6	-0.1	93	645	81	68
88	13.463	0.153	0.063	0.99	93	2	99	10.5	-0.1	93	643	82	67
89	13.616	0.153	0.063	0.96	93	2	99	10.4	-0.1	93	641	83	67
90	13.770	0.154	0.063	0.98	93	2	100	10.2	-0.2	94	639	86	67
91	13.922	0.152	0.063	1.00	93	2	98	10.2	0	93	642	86	67
92	14.075	0.153	0.063	0.97	93	2	99	10.0	-0.2	94	643	85	67
93	14.228	0.153	0.063	0.97	93	2	99	9.9	-0.1	94	642	83	67
94	14.379	0.151	0.063	0.97	93	2	98	9.7	-0.2	93	639	81	67
95	14.530	0.151	0.063	0.97	93	2	98	9.7	0	93	640	80	67
96	14.683	0.153	0.063	0.97	93	2	99	9.5	-0.2	93	637	81	67
97	14.837	0.154	0.063	0.96	93	2	100	9.4	-0.1	93	636	83	67
98	14.990	0.153	0.063	0.97	93	2	99	9.4	0	93	634	85	67

BOX A TEST DATA - ASTM E3053 / ASTM E2515

Client: Pacific Energy
Model: FP25
Run #: 2

Job #: 19-537
Tracking #: 0048
Technician: SJB
Date: 11/25/2019

	Particulate Sampling Data							Fuel Weight (lb)		Temperature Data (°F)			
Elapsed Time (min)	Gas Meter (ft^3)	Sample Rate (cfm)	Dilution Tunnel dP (in H_2O)	Orifice dH (in H_2O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Scale Reading	Weight Change	Dilution Tunnel	Flue	Filter	Ambient
99	15.143	0.153	0.063	0.99	93	2	99	9.2	-0.2	92	637	86	67
100	15.295	0.152	0.063	0.97	93	2	98	9.1	-0.1	93	637	85	67
101	15.447	0.152	0.063	0.96	93	2	98	9.2	0.1	92	638	83	66
102	15.600	0.153	0.063	0.96	93	2	99	8.9	-0.3	92	634	81	66
103	15.752	0.152	0.063	0.98	93	2	98	8.9	0	92	635	80	67
104	15.902	0.150	0.063	0.98	93	2	97	8.7	-0.2	92	632	81	67
105	16.054	0.152	0.063	0.96	93	2	98	8.6	-0.1	92	628	83	67
106	16.204	0.150	0.063	0.94	93	2	97	8.5	-0.1	91	627	85	67
107	16.355	0.151	0.063	0.97	93	2	98	8.4	-0.1	91	621	86	67
108	16.506	0.151	0.063	1.00	93	2	98	8.3	-0.1	91	617	85	67
109	16.656	0.150	0.063	0.97	93	2	97	8.3	0	91	614	83	68
110	16.807	0.151	0.063	0.95	93	2	98	8.2	-0.1	91	611	82	68
111	16.957	0.150	0.063	0.96	93	2	97	8.0	-0.2	91	606	81	68
112	17.107	0.150	0.063	0.96	93	2	97	8.1	0.1	91	604	81	68
113	17.259	0.152	0.063	0.96	93	2	98	7.9	-0.2	90	600	83	68
114	17.408	0.149	0.063	0.95	93	2	96	8.0	0.1	90	594	86	68
115	17.559	0.151	0.063	0.96	93	2	97	7.9	-0.1	90	589	86	68
116	17.710	0.151	0.063	0.98	93	2	97	7.8	-0.1	90	585	85	68
117	17.862	0.152	0.063	0.95	93	2	98	7.7	-0.1	90	581	83	68
118	18.013	0.151	0.063	0.96	93	2	97	7.8	0.1	90	580	81	68
119	18.163	0.150	0.063	0.97	93	2	97	7.6	-0.2	89	577	81	68
120	18.314	0.151	0.063	0.95	93	2	97	7.5	-0.1	89	574	82	68
121	18.467	0.153	0.063	1.01	93	2	99	7.5	0	89	570	84	68
122	18.623	0.156	0.063	1.00	93	2	101	7.6	0.1	89	566	86	68
123	18.779	0.156	0.063	1.05	93	2	101	7.4	-0.2	89	564	87	68
124	18.936	0.157	0.063	1.04	93	2	101	7.4	0	89	560	85	68
125	19.092	0.156	0.063	1.02	93	2	100	7.4	0	88	556	83	69
126	19.245	0.153	0.063	1.01	93	2	99	7.4	0	88	550	81	69
127	19.402	0.157	0.063	1.05	93	2	101	7.2	-0.2	88	546	81	69
128	19.559	0.157	0.063	1.02	93	2	101	7.2	0	88	541	82	69
129	19.713	0.154	0.063	1.03	93	2	99	7.2	0	88	540	83	68
130	19.868	0.155	0.063	1.02	93	2	100	7.1	-0.1	87	537	86	68
131	20.024	0.156	0.063	1.01	93	2	100	7.2	0.1	87	534	86	69

BOX A TEST DATA - ASTM E3053 / ASTM E2515

Client: Pacific Energy
Model: FP25
Run #: 2

Job #: 19-537
Tracking #: 0048
Technician: SJB
Date: 11/25/2019

	Particulate Sampling Data							Fuel Weight (lb)		Temperature Data (°F)			
Elapsed Time (min)	Gas Meter (ft^3)	Sample Rate (cfm)	Dilution Tunnel dP (in H_2O)	Orifice dH (in H_2O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Scale Reading	Weight Change	Dilution Tunnel	Flue	Filter	Ambient
132	20.183	0.159	0.063	1.03	93	2	102	7.0	-0.2	87	532	85	69
133	20.338	0.155	0.063	1.01	93	2	100	7.1	0.1	87	533	83	69
134	20.496	0.158	0.063	1.02	93	2	102	7.0	-0.1	87	532	81	69
135	20.652	0.156	0.063	1.03	93	2	100	7.0	0	87	528	81	69
136	20.810	0.158	0.063	1.01	93	2	102	6.9	-0.1	87	529	82	69
137	20.965	0.155	0.063	1.04	93	2	100	6.8	-0.1	87	528	84	69
138	21.121	0.156	0.063	1.03	93	2	100	6.8	0	87	524	86	68
139	21.279	0.158	0.063	1.01	93	2	102	6.8	0	87	522	87	69
140	21.434	0.155	0.063	0.99	93	2	100	6.7	-0.1	86	518	85	69
141	21.589	0.155	0.063	1.03	93	2	100	6.7	0	86	514	83	69
142	21.747	0.158	0.063	0.98	93	2	102	6.6	-0.1	86	513	81	69
143	21.902	0.155	0.063	1.03	93	2	100	6.6	0	86	510	81	69
144	22.057	0.155	0.063	0.99	93	2	100	6.5	-0.1	86	506	82	69
145	22.213	0.156	0.063	1.02	93	2	100	6.5	0	86	502	84	68
146	22.370	0.157	0.063	1.03	93	2	101	6.4	-0.1	85	499	86	69
147	22.527	0.157	0.063	1.01	93	2	101	6.3	-0.1	85	500	87	69
148	22.682	0.155	0.063	1.00	94	2	99	6.4	0.1	85	500	85	69
149	22.837	0.155	0.063	1.00	94	2	99	6.2	-0.2	85	499	83	69
150	22.994	0.157	0.063	1.02	94	2	101	6.2	0	85	497	81	69
151	23.148	0.154	0.063	1.00	94	2	99	6.3	0.1	85	492	81	69
152	23.304	0.156	0.063	1.02	94	2	100	6.2	-0.1	85	487	82	69
153	23.457	0.153	0.063	0.98	94	2	98	6.1	-0.1	85	487	84	69
154	23.612	0.155	0.063	0.98	94	2	99	6.1	0	85	483	86	68
155	23.767	0.155	0.063	1.01	94	2	99	6.0	-0.1	84	479	86	69
156	23.923	0.156	0.063	1.05	94	2	100	5.9	-0.1	84	477	85	69
157	24.075	0.152	0.063	0.99	94	2	97	6.0	0.1	84	470	82	68
158	24.231	0.156	0.063	1.01	94	2	100	5.9	-0.1	84	465	81	69
159	24.387	0.156	0.063	1.00	94	2	100	6.0	0.1	84	462	80	69
160	24.544	0.157	0.063	1.02	94	2	101	5.8	-0.2	84	461	82	69
161	24.697	0.153	0.063	1.01	94	2	98	5.9	0.1	83	459	84	68
162	24.853	0.156	0.063	1.04	94	2	100	5.8	-0.1	83	456	86	68
163	25.008	0.155	0.063	1.04	94	2	99	5.8	0	83	452	86	68
164	25.164	0.156	0.063	0.99	94	2	100	5.8	0	83	452	85	69

BOX A TEST DATA - ASTM E3053 / ASTM E2515

Client: Pacific Energy
Model: FP25
Run #: 2

Job #: 19-537
Tracking #: 0048
Technician: SJB
Date: 11/25/2019

	Particulate Sampling Data							Fuel Weight (lb)		Temperature Data (°F)			
Elapsed Time (min)	Gas Meter (ft^3)	Sample Rate (cfm)	Dilution Tunnel dP (in H_2O)	Orifice dH (in H_2O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Scale Reading	Weight Change	Dilution Tunnel	Flue	Filter	Ambient
165	25.317	0.153	0.063	1.03	94	2	98	5.6	-0.2	83	448	82	68
166	25.472	0.155	0.063	1.03	94	2	99	5.6	0	83	449	81	68
167	25.627	0.155	0.063	1.00	94	2	99	5.5	-0.1	83	448	80	68
168	25.784	0.157	0.063	0.99	94	2	100	5.6	0.1	83	448	81	68
169	25.937	0.153	0.063	1.00	94	2	98	5.6	0	83	449	83	68
170	26.091	0.154	0.063	1.01	94	2	99	5.5	-0.1	83	447	85	68
171	26.246	0.155	0.063	1.04	94	2	99	5.5	0	83	445	86	68
172	26.401	0.155	0.063	0.97	94	2	99	5.3	-0.2	83	446	85	68
173	26.556	0.155	0.063	1.03	94	2	99	5.4	0.1	82	443	83	68
174	26.710	0.154	0.063	0.98	94	2	98	5.3	-0.1	82	439	81	68
175	26.864	0.154	0.063	1.01	94	2	98	5.3	0	82	433	81	68
176	27.020	0.156	0.063	1.02	94	2	100	5.1	-0.2	82	428	81	68
177	27.174	0.154	0.063	1.01	94	2	98	5.2	0.1	82	424	83	68
178	27.329	0.155	0.063	1.01	94	2	99	5.1	-0.1	82	421	85	68
179	27.484	0.155	0.063	1.00	98	2	99	5.1	0	85	420	90	71
180	27.643	0.159	0.063	1.04	97	2	101	5.2	0.1	84	414	88	71
181	27.801	0.158	0.063	1.05	97	2	101	5.1	-0.1	84	410	86	71
182	27.957	0.156	0.063	1.03	97	2	99	5.1	0	83	407	84	70
183	28.116	0.159	0.063	1.05	98	2	101	5.0	-0.1	83	404	83	71
184	28.274	0.158	0.063	1.04	96	2	101	5.0	0	82	402	83	70
185	28.430	0.156	0.063	1.02	97	2	99	5.0	0	82	396	85	69
186	28.588	0.158	0.063	1.04	98	2	100	4.9	-0.1	82	394	87	69
187	28.745	0.157	0.063	1.06	98	2	100	5.0	0.1	83	391	89	72
188	28.902	0.157	0.063	1.03	98	2	100	4.8	-0.2	81	387	88	69
189	29.062	0.160	0.063	1.06	99	2	101	4.9	0.1	83	383	84	70
190	29.220	0.158	0.063	1.02	99	2	100	4.9	0	81	379	83	71
191	29.377	0.157	0.063	1.03	101	2	99	4.9	0	82	377	82	70
192	29.536	0.159	0.063	1.04	99	2	101	4.9	0	82	373	82	69
193	29.691	0.155	0.063	1.02	98	2	98	4.9	0	80	372	84	69
194	29.850	0.159	0.063	1.04	94	2	101	4.7	-0.2	80	369	87	69
195	30.007	0.157	0.063	1.05	95	2	100	4.9	0.2	80	366	87	69
196	30.163	0.156	0.063	1.05	95	2	100	4.8	-0.1	83	366	86	69
197	30.322	0.159	0.063	1.06	97	2	101	4.8	0	82	359	85	70

BOX A TEST DATA - ASTM E3053 / ASTM E2515

Client: Pacific Energy
Model: FP25
Run #: 2

Job #: 19-537
Tracking #: 0048
Technician: SJB
Date: 11/25/2019

	Particulate Sampling Data							Fuel Weight (lb)		Temperature Data (°F)			
Elapsed Time (min)	Gas Meter (ft^3)	Sample Rate (cfm)	Dilution Tunnel dP (in H_2O)	Orifice dH (in H_2O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Scale Reading	Weight Change	Dilution Tunnel	Flue	Filter	Ambient
198	30.480	0.158	0.063	1.07	97	2	100	4.7	-0.1	79	355	82	73
199	30.636	0.156	0.063	1.03	97	2	99	4.7	0	80	351	82	70
200	30.795	0.159	0.063	1.01	96	2	101	4.8	0.1	79	351	85	69
201	30.954	0.159	0.063	1.03	94	2	101	4.7	-0.1	80	349	86	68
202	31.110	0.156	0.063	1.05	95	2	99	4.7	0	81	348	86	68
203	31.269	0.159	0.063	1.02	98	2	101	4.7	0	80	348	87	68
204	31.424	0.155	0.063	1.05	102	2	97	4.7	0	79	343	88	70
205	31.582	0.158	0.063	1.03	96	2	100	4.6	-0.1	78	340	85	69
206	31.741	0.159	0.063	1.05	96	2	101	4.7	0.1	78	338	84	69
207	31.899	0.158	0.063	1.05	95	2	101	4.7	0	87	332	85	71
208	32.058	0.159	0.063	1.08	94	2	101	4.5	-0.2	80	330	84	70
209	32.215	0.157	0.063	1.06	97	2	99	4.5	0	78	328	83	70
210	32.371	0.156	0.063	1.03	99	2	98	4.6	0.1	78	328	86	68
211	32.531	0.160	0.063	1.07	98	2	101	4.5	-0.1	78	331	86	68
212	32.689	0.158	0.063	1.03	96	2	100	4.5	0	79	332	86	69
213	32.845	0.156	0.063	1.05	96	2	100	4.6	0.1	84	319	84	69
214	33.005	0.160	0.063	1.06	98	2	101	4.6	0	79	317	83	70
215	33.162	0.157	0.063	1.05	95	2	100	4.4	-0.2	78	314	83	75
216	33.320	0.158	0.063	1.05	96	2	100	4.5	0.1	79	313	83	69
217	33.479	0.159	0.063	1.07	97	2	101	4.5	0	77	314	85	68
218	33.636	0.157	0.063	1.03	95	2	100	4.5	0	79	314	86	68
219	33.795	0.159	0.063	1.07	104	2	99	4.4	-0.1	77	309	86	69
220	33.955	0.160	0.063	1.04	96	2	101	4.5	0.1	77	310	90	75
221	34.109	0.154	0.063	1.02	94	2	98	4.4	-0.1	78	304	86	69
222	34.268	0.159	0.063	1.04	96	2	101	4.4	0	79	304	84	68
223	34.426	0.158	0.063	1.06	95	2	101	4.3	-0.1	80	302	83	69
224	34.585	0.159	0.063	1.06	97	2	101	4.5	0.2	79	299	82	69
225	34.743	0.158	0.063	1.06	103	2	99	4.3	-0.2	77	298	83	71
226	34.902	0.159	0.063	1.03	95	2	101	4.3	0	77	299	86	71
227	35.060	0.158	0.063	1.06	94	2	100	4.3	0	76	294	86	69
228	35.220	0.160	0.063	1.02	96	2	102	4.4	0.1	79	294	88	70
229	35.376	0.156	0.063	1.05	94	2	99	4.3	-0.1	76	289	84	68
230	35.537	0.161	0.063	1.09	94	2	102	4.3	0	76	288	82	68

BOX A TEST DATA - ASTM E3053 / ASTM E2515

Client: Pacific Energy
Model: FP25
Run #: 2

Job #: 19-537
Tracking #: 0048
Technician: SJB
Date: 11/25/2019

	Particulate Sampling Data							Fuel Weight (lb)		Temperature Data (°F)			
Elapsed Time (min)	Gas Meter (ft^3)	Sample Rate (cfm)	Dilution Tunnel dP (in H_2O)	Orifice dH (in H_2O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Scale Reading	Weight Change	Dilution Tunnel	Flue	Filter	Ambient
231	35.695	0.158	0.063	1.04	94	2	100	4.2	-0.1	75	287	80	68
232	35.852	0.157	0.063	1.05	94	2	100	4.2	0	75	286	80	68
233	36.012	0.160	0.063	1.04	94	2	102	4.3	0.1	75	284	81	68
234	36.169	0.157	0.063	1.06	94	2	100	4.3	0	75	283	83	68
235	36.328	0.159	0.063	1.04	94	2	101	4.2	-0.1	75	282	85	68
236	36.487	0.159	0.063	1.03	94	2	101	4.3	0.1	75	281	86	68
237	36.644	0.157	0.063	1.07	94	2	100	4.3	0	75	280	85	68
238	36.803	0.159	0.063	1.05	94	2	101	4.2	-0.1	75	278	83	68
239	36.961	0.158	0.063	1.07	94	2	100	4.2	0	75	277	81	68
240	37.118	0.157	0.063	1.05	94	2	100	4.1	-0.1	75	276	80	68
241	37.278	0.160	0.063	1.08	94	2	102	4.2	0.1	75	275	81	68
242	37.435	0.157	0.063	1.08	94	2	100	4.1	-0.1	75	274	82	68
243	37.593	0.158	0.063	1.07	94	2	100	4.2	0.1	75	272	85	68
244	37.751	0.158	0.063	1.01	94	2	100	4.2	0	75	271	86	68
245	37.908	0.157	0.063	1.08	94	2	100	4.1	-0.1	75	270	86	68
246	38.068	0.160	0.063	1.07	94	2	102	4.0	-0.1	75	269	83	68
247	38.227	0.159	0.063	1.04	94	2	101	4.1	0.1	75	268	81	68
248	38.383	0.156	0.063	1.06	94	2	99	4.0	-0.1	75	268	80	68
249	38.542	0.159	0.063	1.06	94	2	101	4.1	0.1	74	266	80	68
250	38.698	0.156	0.063	1.03	94	2	99	4.1	0	74	265	82	68
251	38.856	0.158	0.063	1.02	94	2	100	4.0	-0.1	74	264	84	68
252	39.016	0.160	0.063	1.04	94	2	102	4.0	0	74	263	86	67
253	39.173	0.157	0.063	1.02	94	2	100	4.1	0.1	74	263	86	67
254	39.332	0.159	0.063	1.03	94	2	101	4.1	0	74	262	84	67
255	39.493	0.161	0.063	1.03	94	2	102	3.9	-0.2	74	261	82	67
256	39.651	0.158	0.063	1.05	93	2	100	4.0	0.1	74	260	80	67
257	39.811	0.160	0.063	1.06	93	2	102	3.9	-0.1	74	259	80	67
258	39.968	0.157	0.063	1.05	93	2	100	4.0	0.1	74	259	81	67
259	40.128	0.160	0.063	1.08	93	2	102	4.0	0	74	258	83	67
260	40.288	0.160	0.063	1.01	93	2	102	3.9	-0.1	74	257	86	67
261	40.446	0.158	0.063	1.04	93	2	100	4.0	0.1	74	257	86	67
262	40.605	0.159	0.063	1.03	93	2	101	4.0	0	74	256	84	67
263	40.764	0.159	0.063	1.05	93	2	101	4.0	0	74	255	82	67

BOX A TEST DATA - ASTM E3053 / ASTM E2515

Client: Pacific Energy
Model: FP25
Run #: 2

Job #: 19-537
Tracking #: 0048
Technician: SJB
Date: 11/25/2019

	Particulate Sampling Data							Fuel Weight (lb)		Temperature Data (°F)			
Elapsed Time (min)	Gas Meter (ft^3)	Sample Rate (cfm)	Dilution Tunnel dP (in H_2O)	Orifice dH (in H_2O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Scale Reading	Weight Change	Dilution Tunnel	Flue	Filter	Ambient
264	40.921	0.157	0.063	1.04	93	2	100	4.0	0	74	254	80	67
265	41.080	0.159	0.063	1.06	93	2	101	4.0	0	74	253	80	67
266	41.236	0.156	0.063	1.03	93	2	99	3.9	-0.1	73	253	81	67
267	41.395	0.159	0.063	1.06	93	2	101	3.9	0	73	252	83	67
268	41.554	0.159	0.063	1.06	93	2	101	3.9	0	73	252	85	67
269	41.710	0.156	0.063	1.06	93	2	99	3.8	-0.1	73	251	86	67
270	41.871	0.161	0.063	1.06	93	2	102	3.8	0	73	251	85	67
271	42.027	0.156	0.063	1.04	93	2	99	3.8	0	73	250	83	67
272	42.186	0.159	0.063	1.04	93	2	101	3.9	0.1	73	251	80	67
273	42.346	0.160	0.063	1.02	93	2	102	3.8	-0.1	73	250	80	67
274	42.502	0.156	0.063	1.05	93	2	99	3.7	-0.1	73	249	80	67
275	42.660	0.158	0.063	1.07	93	2	100	3.9	0.2	73	248	82	67
276	42.819	0.159	0.063	1.06	93	2	101	3.8	-0.1	73	248	84	67
277	42.975	0.156	0.063	1.07	93	2	99	3.8	0	73	249	86	67
278	43.134	0.159	0.063	1.05	93	2	101	3.8	0	73	248	85	67
279	43.292	0.158	0.063	1.06	93	2	100	3.7	-0.1	73	248	83	67
280	43.451	0.159	0.063	1.02	93	2	101	3.8	0.1	73	247	81	67
281	43.611	0.160	0.063	1.05	93	2	102	3.8	0	73	247	80	67
282	43.766	0.155	0.063	1.05	93	2	98	3.8	0	73	247	80	67
283	43.924	0.158	0.063	1.03	93	2	100	3.8	0	73	246	81	67
284	44.083	0.159	0.063	1.07	93	2	101	3.6	-0.2	73	246	83	67
285	44.239	0.156	0.063	1.04	93	2	99	3.6	0	73	245	86	67
286	44.398	0.159	0.063	1.06	93	2	101	3.6	0	73	245	86	67
287	44.555	0.157	0.063	1.06	93	2	100	3.7	0.1	73	245	84	67
288	44.713	0.158	0.063	1.04	93	2	100	3.7	0	73	246	82	67
289	44.872	0.159	0.063	1.06	93	2	101	3.7	0	73	245	80	67
290	45.029	0.157	0.063	1.05	93	2	100	3.7	0	72	244	80	67
291	45.189	0.160	0.063	1.05	93	2	102	3.6	-0.1	73	244	81	67
292	45.347	0.158	0.063	1.04	93	2	100	3.6	0	72	243	82	67
293	45.504	0.157	0.063	1.03	93	2	100	3.5	-0.1	72	243	85	67
294	45.663	0.159	0.063	1.03	93	2	101	3.6	0.1	72	243	86	67
295	45.819	0.156	0.063	1.03	93	2	99	3.6	0	72	242	85	67
296	45.978	0.159	0.063	1.05	93	2	101	3.6	0	72	242	83	67

BOX A TEST DATA - ASTM E3053 / ASTM E2515

Client: Pacific Energy
Model: FP25
Run #: 2

Job #: 19-537
Tracking #: 0048
Technician: SJB
Date: 11/25/2019

	Particulate Sampling Data							Fuel Weight (lb)		Temperature Data (°F)			
Elapsed Time (min)	Gas Meter (ft^3)	Sample Rate (cfm)	Dilution Tunnel dP (in H_2O)	Orifice dH (in H_2O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Scale Reading	Weight Change	Dilution Tunnel	Flue	Filter	Ambient
297	46.137	0.159	0.063	1.04	93	2	101	3.6	0	72	242	81	67
298	46.291	0.154	0.063	1.07	93	2	98	3.5	-0.1	72	242	80	67
299	46.452	0.161	0.063	1.07	93	2	102	3.5	0	72	241	80	67
300	46.609	0.157	0.063	1.04	93	2	100	3.4	-0.1	72	241	82	67
301	46.767	0.158	0.063	1.04	93	2	100	3.5	0.1	72	240	84	67
302	46.928	0.161	0.063	1.08	93	2	102	3.5	0	72	240	86	67
303	47.085	0.157	0.063	1.05	93	2	100	3.5	0	72	240	86	67
304	47.244	0.159	0.063	1.03	93	2	101	3.4	-0.1	72	239	84	67
305	47.402	0.158	0.063	1.04	93	2	100	3.4	0	72	240	81	67
306	47.558	0.156	0.063	1.03	93	2	99	3.5	0.1	72	240	80	67
307	47.717	0.159	0.063	1.06	93	2	101	3.5	0	72	239	80	67
308	47.874	0.157	0.063	1.03	93	2	100	3.4	-0.1	72	239	81	67
309	48.033	0.159	0.063	1.05	93	2	101	3.3	-0.1	72	239	83	67
310	48.190	0.157	0.063	1.05	93	2	100	3.3	0	72	238	86	67
311	48.347	0.157	0.063	1.05	93	2	100	3.4	0.1	72	238	86	67
312	48.507	0.160	0.063	1.06	93	2	102	3.3	-0.1	72	238	85	67
313	48.666	0.159	0.063	1.06	93	2	101	3.3	0	72	237	82	66
314	48.823	0.157	0.063	1.07	93	2	100	3.4	0.1	72	238	80	66
315	48.983	0.160	0.063	1.06	93	2	102	3.3	-0.1	72	237	80	67
316	49.140	0.157	0.063	1.05	93	2	100	3.3	0	72	237	80	67
317	49.301	0.161	0.063	1.05	93	2	102	3.3	0	72	236	82	67
318	49.460	0.159	0.063	1.04	93	2	101	3.2	-0.1	72	236	85	66
319	49.616	0.156	0.063	1.05	93	2	99	3.3	0.1	72	236	86	67
320	49.775	0.159	0.063	1.07	93	2	101	3.3	0	72	234	85	66
321	49.932	0.157	0.063	1.05	93	2	100	3.4	0.1	72	235	83	66
322	50.091	0.159	0.063	1.03	93	2	101	3.2	-0.2	72	234	81	66
323	50.250	0.159	0.063	1.08	93	2	101	3.3	0.1	72	234	80	66
324	50.406	0.156	0.063	1.06	93	2	99	3.3	0	72	234	80	66
325	50.564	0.158	0.063	1.03	93	2	100	3.3	0	72	233	82	66
326	50.723	0.159	0.063	1.05	93	2	101	3.3	0	72	232	84	66
327	50.880	0.157	0.063	1.04	93	2	100	3.2	-0.1	71	233	86	66
328	51.039	0.159	0.063	1.02	93	2	101	3.2	0	71	232	86	66
329	51.196	0.157	0.063	1.05	93	2	100	3.2	0	71	231	84	66

BOX A TEST DATA - ASTM E3053 / ASTM E2515

Client: Pacific Energy
Model: FP25
Run #: 2

Job #: 19-537
Tracking #: 0048
Technician: SJB
Date: 11/25/2019

	Particulate Sampling Data							Fuel Weight (lb)		Temperature Data (°F)			
Elapsed Time (min)	Gas Meter (ft^3)	Sample Rate (cfm)	Dilution Tunnel dP (in H_2O)	Orifice dH (in H_2O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Scale Reading	Weight Change	Dilution Tunnel	Flue	Filter	Ambient
330	51.353	0.157	0.063	1.05	93	2	100	3.2	0	71	231	81	66
331	51.513	0.160	0.063	1.05	93	2	101	3.2	0	71	231	80	66
332	51.669	0.156	0.063	1.02	93	2	99	3.1	-0.1	71	231	80	66
333	51.828	0.159	0.063	1.06	93	2	101	3.1	0	71	230	81	66
334	51.985	0.157	0.063	1.05	93	2	100	3.2	0.1	71	230	83	66
335	52.143	0.158	0.063	1.09	93	2	100	3.1	-0.1	71	230	86	66
336	52.302	0.159	0.063	1.04	93	2	101	3.0	-0.1	71	229	86	66
337	52.458	0.156	0.063	1.05	93	2	99	3.1	0.1	71	229	85	66
338	52.617	0.159	0.063	1.07	93	2	101	3.1	0	71	228	82	66
339	52.774	0.157	0.063	1.03	93	2	100	3.1	0	71	227	80	66
340	52.932	0.158	0.063	1.03	93	2	100	3.1	0	71	227	80	66
341	53.090	0.158	0.063	1.05	93	2	100	3.1	0	71	227	81	66
342	53.246	0.156	0.063	1.04	93	2	99	3.1	0	71	227	82	66
343	53.406	0.160	0.063	1.06	93	2	101	3.1	0	71	227	85	66
344	53.564	0.158	0.063	1.04	93	2	100	3.1	0	71	226	87	66
345	53.720	0.156	0.063	1.06	93	2	99	3.1	0	71	226	85	66
346	53.879	0.159	0.063	1.07	93	2	101	3.1	0	71	226	83	66
347	54.038	0.159	0.063	1.04	93	2	101	3.1	0	71	225	81	66
348	54.196	0.158	0.063	1.06	93	2	100	2.9	-0.2	71	224	80	66
349	54.357	0.161	0.063	1.05	93	2	102	3.0	0.1	71	224	80	66
350	54.514	0.157	0.063	1.06	93	2	100	3.0	0	71	225	81	66
351	54.672	0.158	0.063	1.09	93	2	100	3.0	0	71	224	84	66
352	54.830	0.158	0.063	1.03	93	2	100	2.9	-0.1	71	223	86	66
353	54.987	0.157	0.063	1.05	93	2	100	3.0	0.1	71	223	86	66
354	55.148	0.161	0.063	1.07	93	2	102	2.9	-0.1	71	223	84	66
355	55.304	0.156	0.063	1.08	93	2	99	2.9	0	71	222	82	66
356	55.463	0.159	0.063	1.05	93	2	101	2.9	0	71	222	80	66
357	55.621	0.158	0.063	1.09	93	2	100	3.0	0.1	71	222	80	66
358	55.777	0.156	0.063	1.06	93	2	99	3.0	0	71	222	81	66
359	55.936	0.159	0.063	1.04	93	2	101	2.8	-0.2	71	221	83	66
360	56.091	0.155	0.063	1.05	93	2	98	2.8	0	70	220	85	66
361	56.249	0.158	0.063	1.07	93	2	100	2.9	0.1	70	220	86	66
362	56.407	0.158	0.063	1.06	93	2	100	2.9	0	70	220	85	66

BOX A TEST DATA - ASTM E3053 / ASTM E2515

Client: Pacific Energy
Model: FP25
Run #: 2

Job #: 19-537
Tracking #: 0048
Technician: SJB
Date: 11/25/2019

	Particulate Sampling Data							Fuel Weight (lb)		Temperature Data (°F)			
Elapsed Time (min)	Gas Meter (ft^3)	Sample Rate (cfm)	Dilution Tunnel dP (in H_2O)	Orifice dH (in H_2O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Scale Reading	Weight Change	Dilution Tunnel	Flue	Filter	Ambient
363	56.564	0.157	0.063	1.03	93	2	99	2.8	-0.1	70	220	82	66
364	56.723	0.159	0.063	1.05	93	2	101	2.9	0.1	70	219	80	66
365	56.880	0.157	0.063	1.06	93	2	99	2.9	0	70	219	80	66
366	57.038	0.158	0.063	1.05	93	2	100	2.9	0	70	219	81	66
367	57.197	0.159	0.063	1.06	93	2	101	2.9	0	70	218	82	66
368	57.354	0.157	0.063	1.05	93	2	99	2.8	-0.1	70	218	85	66
369	57.514	0.160	0.063	1.08	93	2	101	2.8	0	70	218	86	66
370	57.671	0.157	0.063	1.07	93	2	99	2.8	0	70	217	85	66
371	57.829	0.158	0.063	1.06	93	2	100	2.7	-0.1	70	217	83	66
372	57.987	0.158	0.063	1.05	93	2	100	2.7	0	70	216	81	66
373	58.143	0.156	0.063	1.02	93	2	99	2.7	0	70	215	80	66
374	58.301	0.158	0.063	1.04	93	2	100	2.7	0	70	215	80	66
375	58.459	0.158	0.063	1.05	93	2	100	2.7	0	70	215	82	66
376	58.617	0.158	0.063	1.08	93	2	100	2.8	0.1	70	214	84	66
377	58.775	0.158	0.063	1.05	93	2	100	2.8	0	70	214	86	66
378	58.931	0.156	0.063	1.03	93	2	99	2.8	0	70	214	86	66
379	59.090	0.159	0.063	1.04	93	2	101	2.8	0	70	214	84	66
380	59.249	0.159	0.063	1.05	93	2	101	2.8	0	70	214	81	66
381	59.404	0.155	0.063	1.03	93	2	98	2.6	-0.2	70	214	80	66
382	59.563	0.159	0.063	1.08	92	2	101	2.6	0	70	213	80	66
383	59.720	0.157	0.063	1.05	93	2	99	2.7	0.1	70	213	81	66
384	59.878	0.158	0.063	1.07	93	2	100	2.7	0	70	212	83	66
385	60.037	0.159	0.063	1.07	92	2	101	2.7	0	70	213	86	66
386	60.194	0.157	0.063	1.08	92	2	100	2.6	-0.1	70	212	86	66
387	60.353	0.159	0.063	1.06	92	2	101	2.7	0.1	70	212	84	66
388	60.510	0.157	0.063	1.04	92	2	100	2.7	0	70	211	82	66
389	60.667	0.157	0.063	1.04	92	2	100	2.5	-0.2	70	212	80	66
390	60.827	0.160	0.063	1.05	92	2	102	2.6	0.1	70	211	80	66
391	60.983	0.156	0.063	1.04	92	2	99	2.5	-0.1	70	211	81	65
392	61.143	0.160	0.063	1.04	92	2	102	2.6	0.1	70	211	83	66
393	61.302	0.159	0.063	1.05	92	2	101	2.6	0	70	210	85	66
394	61.458	0.156	0.063	1.04	92	2	99	2.6	0	70	210	86	66
395	61.616	0.158	0.063	1.07	92	2	100	2.6	0	70	210	85	66

BOX A TEST DATA - ASTM E3053 / ASTM E2515

Client: Pacific Energy
Model: FP25
Run #: 2

Job #: 19-537
Tracking #: 0048
Technician: SJB
Date: 11/25/2019

	Particulate Sampling Data							Fuel Weight (lb)		Temperature Data (°F)			
Elapsed Time (min)	Gas Meter (ft^3)	Sample Rate (cfm)	Dilution Tunnel dP (in H_2O)	Orifice dH (in H_2O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Scale Reading	Weight Change	Dilution Tunnel	Flue	Filter	Ambient
396	61.774	0.158	0.063	1.06	92	2	100	2.6	0	70	210	82	66
397	61.931	0.157	0.063	1.06	92	2	100	2.5	-0.1	70	210	80	66
398	62.089	0.158	0.063	1.05	92	2	100	2.5	0	70	210	80	66
399	62.245	0.156	0.063	1.05	92	2	99	2.6	0.1	70	209	80	66
400	62.404	0.159	0.063	1.04	92	2	101	2.6	0	70	209	82	66
401	62.561	0.157	0.063	1.05	92	2	100	2.5	-0.1	70	208	84	66
402	62.719	0.158	0.063	1.04	92	2	100	2.5	0	70	208	86	66
403	62.878	0.159	0.063	1.08	92	2	101	2.5	0	70	208	85	66
404	63.034	0.156	0.063	1.05	92	2	99	2.5	0	70	208	83	66
405	63.193	0.159	0.063	1.08	92	2	101	2.5	0	70	208	81	66
406	63.350	0.157	0.063	1.07	92	2	100	2.5	0	70	208	80	66
407	63.509	0.159	0.063	1.04	92	2	101	2.4	-0.1	70	207	80	66
408	63.666	0.157	0.063	1.05	92	2	100	2.5	0.1	70	207	81	66
409	63.821	0.155	0.063	1.08	92	2	98	2.4	-0.1	70	207	84	65
410	63.981	0.160	0.063	1.05	92	2	102	2.4	0	70	206	86	65
411	64.139	0.158	0.063	1.07	92	2	100	2.4	0	69	206	86	66
412	64.296	0.157	0.063	1.04	92	2	100	2.4	0	69	206	84	66
413	64.455	0.159	0.063	1.06	92	2	101	2.4	0	70	206	82	65
414	64.612	0.157	0.063	1.06	92	2	100	2.4	0	70	206	80	65
415	64.770	0.158	0.063	1.05	92	2	100	2.4	0	70	206	80	65
416	64.929	0.159	0.063	1.05	92	2	101	2.4	0	69	206	81	65
417	65.087	0.158	0.063	1.05	92	2	100	2.3	-0.1	70	205	83	66
418	65.247	0.160	0.063	1.05	92	2	101	2.3	0	69	205	85	66
419	65.404	0.157	0.063	1.08	92	2	100	2.3	0	69	204	86	65
420	65.562	0.158	0.063	1.05	92	2	100	2.4	0.1	69	205	85	65
421	65.721	0.159	0.063	1.04	92	2	101	2.2	-0.2	69	205	82	65
422	65.878	0.157	0.063	1.07	92	2	100	2.2	0	69	205	80	65
423	66.036	0.158	0.063	1.05	92	2	100	2.3	0.1	69	205	80	65
424	66.193	0.157	0.063	1.03	92	2	100	2.3	0	69	204	80	65
425	66.351	0.158	0.063	1.05	92	2	100	2.2	-0.1	69	204	82	65
426	66.511	0.160	0.063	1.06	92	2	101	2.3	0.1	69	204	84	65
427	66.666	0.155	0.063	1.07	92	2	98	2.2	-0.1	69	204	86	65
428	66.823	0.157	0.063	1.06	92	2	100	2.3	0.1	69	204	86	66

BOX A TEST DATA - ASTM E3053 / ASTM E2515

Client: Pacific Energy
Model: FP25
Run #: 2

Job #: 19-537
Tracking #: 0048
Technician: SJB
Date: 11/25/2019

	Particulate Sampling Data							Fuel Weight (lb)		Temperature Data (°F)			
Elapsed Time (min)	Gas Meter (ft^3)	Sample Rate (cfm)	Dilution Tunnel dP (in H_2O)	Orifice dH (in H_2O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Scale Reading	Weight Change	Dilution Tunnel	Flue	Filter	Ambient
429	66.980	0.157	0.063	1.05	92	2	100	2.2	-0.1	69	204	83	65
430	67.137	0.157	0.063	1.05	92	2	100	2.3	0.1	69	203	81	65
431	67.297	0.160	0.063	1.06	92	2	101	2.1	-0.2	69	203	80	65
432	67.453	0.156	0.063	1.06	92	2	99	2.1	0	69	202	80	65
433	67.612	0.159	0.063	1.05	92	2	101	2.2	0.1	69	203	81	65
434	67.768	0.156	0.063	1.05	92	2	99	2.2	0	69	203	83	65
435	67.926	0.158	0.063	1.05	92	2	100	2.2	0	69	203	86	65
436	68.084	0.158	0.063	1.08	92	2	100	2.2	0	69	204	86	65
437	68.241	0.157	0.063	1.04	92	2	100	2.2	0	69	203	85	65
438	68.399	0.158	0.063	1.04	92	2	100	2.2	0	69	204	82	65
439	68.557	0.158	0.063	1.06	92	2	100	2.2	0	69	204	80	65
440	68.713	0.156	0.063	1.05	92	2	99	2.2	0	69	203	80	65
441	68.871	0.158	0.063	1.05	92	2	100	2.1	-0.1	69	204	81	65
442	69.026	0.155	0.063	1.05	92	2	98	2.1	0	69	203	82	65
443	69.184	0.158	0.063	1.03	92	2	100	2.1	0	69	203	85	65
444	69.342	0.158	0.063	1.05	92	2	100	2.1	0	69	204	86	65
445	69.498	0.156	0.063	1.03	92	2	99	2.1	0	69	203	85	65
446	69.657	0.159	0.063	1.05	92	2	101	2.1	0	69	203	83	65
447	69.814	0.157	0.063	1.06	92	2	100	2.1	0	69	203	81	65
448	69.972	0.158	0.063	1.06	92	2	100	2.1	0	69	204	80	65
449	70.131	0.159	0.063	1.07	92	2	101	2.0	-0.1	69	203	81	65
450	70.287	0.156	0.063	1.05	92	2	99	2.1	0.1	69	204	82	65
451	70.446	0.159	0.063	1.05	92	2	101	2.0	-0.1	69	203	84	65
452	70.603	0.157	0.063	1.08	92	2	100	2.0	0	69	204	86	65
453	70.761	0.158	0.063	1.05	92	2	100	2.0	0	69	204	85	65
454	70.918	0.157	0.063	1.05	92	2	100	2.0	0	69	204	83	65
455	71.075	0.157	0.063	1.04	92	2	100	2.0	0	69	204	81	65
456	71.233	0.158	0.063	1.05	92	2	100	1.9	-0.1	69	203	80	65
457	71.390	0.157	0.063	1.04	92	2	100	2.0	0.1	69	204	80	65
458	71.547	0.157	0.063	1.07	92	2	100	1.9	-0.1	69	204	82	65
459	71.705	0.158	0.063	1.05	92	2	100	2.0	0.1	69	204	84	65
460	71.861	0.156	0.063	1.08	92	2	99	1.9	-0.1	69	204	86	65
461	72.020	0.159	0.063	1.07	92	2	101	1.9	0	69	204	85	65

BOX A TEST DATA - ASTM E3053 / ASTM E2515

Client: Pacific Energy
Model: FP25
Run #: 2

Job #: 19-537
Tracking #: 0048
Technician: SJB
Date: 11/25/2019

	Particulate Sampling Data							Fuel Weight (lb)		Temperature Data (°F)			
Elapsed Time (min)	Gas Meter (ft^3)	Sample Rate (cfm)	Dilution Tunnel dP (in H_2O)	Orifice dH (in H_2O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Scale Reading	Weight Change	Dilution Tunnel	Flue	Filter	Ambient
462	72.177	0.157	0.063	1.07	92	2	100	1.9	0	69	204	83	65
463	72.335	0.158	0.063	1.04	92	2	100	1.9	0	69	204	81	65
464	72.493	0.158	0.063	1.05	92	2	100	1.9	0	69	204	80	65
465	72.650	0.157	0.063	1.04	92	2	100	1.8	-0.1	69	204	80	65
466	72.808	0.158	0.063	1.07	92	2	100	1.9	0.1	69	204	81	65
467	72.965	0.157	0.063	1.06	92	2	100	1.8	-0.1	69	203	83	65
468	73.124	0.159	0.063	1.04	92	2	101	1.9	0.1	69	203	85	65
469	73.281	0.157	0.063	1.06	92	2	100	1.8	-0.1	69	203	86	65
470	73.438	0.157	0.063	1.05	92	2	100	1.8	0	69	203	84	65
471	73.597	0.159	0.063	1.04	92	2	101	1.8	0	69	203	82	65
472	73.756	0.159	0.063	1.07	92	2	101	1.8	0	69	203	80	65
473	73.913	0.157	0.063	1.04	92	2	100	1.8	0	69	203	80	65
474	74.073	0.160	0.063	1.02	92	2	101	1.8	0	69	203	80	65
475	74.231	0.158	0.063	1.04	92	2	100	1.7	-0.1	69	203	82	65
476	74.389	0.158	0.063	1.07	92	2	100	1.8	0.1	69	203	85	65
477	74.548	0.159	0.063	1.04	92	2	101	1.7	-0.1	69	202	86	65
478	74.705	0.157	0.063	1.07	92	2	100	1.8	0.1	69	202	85	65
479	74.864	0.159	0.063	1.07	92	2	101	1.8	0	69	202	83	65
480	75.020	0.156	0.063	1.07	92	2	99	1.7	-0.1	69	202	81	65
481	75.178	0.158	0.063	1.05	92	2	100	1.6	-0.1	69	202	80	65
482	75.337	0.159	0.063	1.05	92	2	101	1.7	0.1	69	202	80	65
483	75.493	0.156	0.063	1.07	92	2	99	1.7	0	69	202	82	65
484	75.652	0.159	0.063	1.04	92	2	101	1.7	0	69	202	84	65
485	75.808	0.156	0.063	1.06	92	2	99	1.7	0	69	202	86	65
486	75.965	0.157	0.063	1.08	92	2	100	1.7	0	69	202	86	65
487	76.125	0.160	0.063	1.05	92	2	101	1.6	-0.1	69	202	84	65
488	76.282	0.157	0.063	1.05	92	2	100	1.7	0.1	69	201	81	65
489	76.440	0.158	0.063	1.04	92	2	100	1.6	-0.1	69	201	80	65
490	76.598	0.158	0.063	1.03	92	2	100	1.6	0	69	200	80	65
491	76.755	0.157	0.063	1.06	92	2	100	1.5	-0.1	69	201	81	65
492	76.915	0.160	0.063	1.06	92	2	101	1.6	0.1	69	201	83	65
493	77.071	0.156	0.063	1.08	92	2	99	1.5	-0.1	69	201	85	65
494	77.230	0.159	0.063	1.07	92	2	101	1.6	0.1	69	201	86	65

BOX A TEST DATA - ASTM E3053 / ASTM E2515

Client: Pacific Energy
Model: FP25
Run #: 2

Job #: 19-537
Tracking #: 0048
Technician: SJB
Date: 11/25/2019

	Particulate Sampling Data							Fuel Weight (lb)		Temperature Data (°F)			
Elapsed Time (min)	Gas Meter (ft^3)	Sample Rate (cfm)	Dilution Tunnel dP (in H_2O)	Orifice dH (in H_2O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Scale Reading	Weight Change	Dilution Tunnel	Flue	Filter	Ambient
495	77.388	0.158	0.063	1.04	92	2	100	1.5	-0.1	69	201	85	65
496	77.544	0.156	0.063	1.07	92	2	99	1.6	0.1	69	201	82	65
497	77.702	0.158	0.063	1.07	92	2	100	1.6	0	69	201	80	65
498	77.858	0.156	0.063	1.06	92	2	99	1.5	-0.1	69	200	80	65
499	78.016	0.158	0.063	1.07	92	2	100	1.4	-0.1	70	201	80	65
500	78.175	0.159	0.063	1.07	92	2	101	1.6	0.2	71	200	82	65
501	78.329	0.154	0.063	1.06	92	2	98	1.5	-0.1	71	201	84	65
502	78.489	0.160	0.063	1.06	92	2	102	1.4	-0.1	71	200	86	65
503	78.645	0.156	0.063	1.05	92	2	99	1.5	0.1	71	200	85	65
504	78.804	0.159	0.063	1.04	92	2	101	1.4	-0.1	70	200	83	65
505	78.962	0.158	0.063	1.05	92	2	100	1.5	0.1	70	200	81	65
506	79.118	0.156	0.063	1.03	92	2	99	1.5	0	70	200	80	65
507	79.278	0.160	0.063	1.08	92	2	102	1.5	0	70	200	80	65
508	79.434	0.156	0.063	1.05	92	2	99	1.5	0	70	201	81	65
509	79.592	0.158	0.063	1.08	92	2	100	1.4	-0.1	71	200	83	65
510	79.750	0.158	0.063	1.05	92	2	100	1.4	0	71	200	85	65
511	79.906	0.156	0.063	1.06	92	2	99	1.4	0	71	200	85	65
512	80.065	0.159	0.063	1.07	92	2	101	1.3	-0.1	71	200	83	65
513	80.221	0.156	0.063	1.07	92	2	99	1.4	0.1	71	200	81	65
514	80.380	0.159	0.063	1.05	92	2	101	1.4	0	71	200	80	65
515	80.539	0.159	0.063	1.06	92	2	101	1.4	0	70	200	80	65
516	80.695	0.156	0.063	1.05	92	2	99	1.4	0	70	200	81	65
517	80.853	0.158	0.063	1.06	92	2	100	1.3	-0.1	70	200	83	65
518	81.011	0.158	0.063	1.06	92	2	100	1.3	0	70	200	85	65
519	81.167	0.156	0.063	1.05	92	2	99	1.4	0.1	70	200	86	65
520	81.325	0.158	0.063	1.05	92	2	100	1.3	-0.1	71	200	84	65
521	81.482	0.157	0.063	1.06	92	2	100	1.3	0	71	200	82	66
522	81.640	0.158	0.063	1.04	92	2	100	1.2	-0.1	71	199	80	65
523	81.798	0.158	0.063	1.03	92	2	100	1.3	0.1	71	200	80	65
524	81.954	0.156	0.063	1.05	92	2	99	1.3	0	71	200	81	65
525	82.113	0.159	0.063	1.07	92	2	101	1.3	0	71	200	82	65
526	82.268	0.155	0.063	1.04	92	2	98	1.2	-0.1	71	201	85	65
527	82.427	0.159	0.063	1.08	92	2	101	1.2	0	71	199	86	66

BOX A TEST DATA - ASTM E3053 / ASTM E2515

Client: Pacific Energy
Model: FP25
Run #: 2

Job #: 19-537
Tracking #: 0048
Technician: SJB
Date: 11/25/2019

	Particulate Sampling Data							Fuel Weight (lb)		Temperature Data (°F)			
Elapsed Time (min)	Gas Meter (ft^3)	Sample Rate (cfm)	Dilution Tunnel dP (in H_2O)	Orifice dH (in H_2O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Scale Reading	Weight Change	Dilution Tunnel	Flue	Filter	Ambient
528	82.586	0.159	0.063	1.05	92	2	101	1.3	0.1	70	200	85	66
529	82.742	0.156	0.063	1.04	92	2	99	1.2	-0.1	70	200	83	66
530	82.900	0.158	0.063	1.04	92	2	100	1.3	0.1	70	200	80	65
531	83.057	0.157	0.063	1.05	92	2	100	1.1	-0.2	71	200	80	66
532	83.215	0.158	0.063	1.07	92	2	100	1.1	0	72	200	80	66
533	83.373	0.158	0.063	1.05	92	2	100	1.2	0.1	71	200	82	66
534	83.530	0.157	0.063	1.07	92	2	100	1.2	0	71	200	84	66
535	83.689	0.159	0.063	1.08	92	2	101	1.2	0	71	199	86	66
536	83.847	0.158	0.063	1.08	92	2	100	1.2	0	71	200	85	66
537	84.005	0.158	0.063	1.06	92	2	100	1.2	0	71	200	83	66
538	84.165	0.160	0.063	1.06	92	2	102	1.1	-0.1	71	200	81	66
539	84.322	0.157	0.063	1.02	92	2	100	1.1	0	71	200	80	66
540	84.481	0.159	0.063	1.05	92	2	101	1.1	0	70	201	80	66
541	84.639	0.158	0.063	1.05	92	2	100	1.2	0.1	70	201	81	66
542	84.797	0.158	0.063	1.05	92	2	100	1.1	-0.1	70	201	83	66
543	84.955	0.158	0.063	1.06	92	2	100	1.1	0	70	201	85	65
544	85.112	0.157	0.063	1.07	92	2	100	1.1	0	71	200	86	66
545	85.271	0.159	0.063	1.06	92	2	101	1.1	0	72	201	84	66
546	85.428	0.157	0.063	1.04	92	2	100	1.0	-0.1	72	200	82	66
547	85.585	0.157	0.063	1.07	92	2	100	1.1	0.1	71	200	80	66
548	85.744	0.159	0.063	1.05	92	2	101	1.0	-0.1	71	201	80	66
549	85.900	0.156	0.063	1.05	92	2	99	1.1	0.1	71	201	80	66
550	86.059	0.159	0.063	1.04	92	2	101	1.1	0	71	200	82	66
551	86.218	0.159	0.063	1.07	92	2	101	1.0	-0.1	71	200	84	66
552	86.375	0.157	0.063	1.07	92	2	100	1.0	0	71	200	86	66
553	86.533	0.158	0.063	1.06	92	2	100	1.0	0	71	200	85	66
554	86.689	0.156	0.063	1.05	92	2	99	1.0	0	70	200	83	66
555	86.847	0.158	0.063	1.06	92	2	100	1.0	0	71	200	81	66
556	87.005	0.158	0.063	1.05	92	2	100	1.0	0	72	200	80	66
557	87.162	0.157	0.063	1.05	92	2	100	1.0	0	71	199	80	66
558	87.320	0.158	0.063	1.05	92	2	100	1.0	0	71	199	81	66
559	87.475	0.155	0.063	1.08	92	2	98	0.9	-0.1	71	199	83	66
560	87.633	0.158	0.063	1.03	92	2	100	0.9	0	71	200	85	66

BOX A TEST DATA - ASTM E3053 / ASTM E2515

Client: Pacific Energy
Model: FP25
Run #: 2

Job #: 19-537
Tracking #: 0048
Technician: SJB
Date: 11/25/2019

	Particulate Sampling Data							Fuel Weight (lb)		Temperature Data (°F)			
Elapsed Time (min)	Gas Meter (ft^3)	Sample Rate (cfm)	Dilution Tunnel dP (in H_2O)	Orifice dH (in H_2O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Scale Reading	Weight Change	Dilution Tunnel	Flue	Filter	Ambient
561	87.791	0.158	0.063	1.08	92	2	100	0.9	0	71	200	86	66
562	87.948	0.157	0.063	1.06	92	2	100	0.9	0	71	200	84	66
563	88.106	0.158	0.063	1.06	92	2	100	0.9	0	71	199	81	66
564	88.264	0.158	0.063	1.06	92	2	100	0.8	-0.1	71	200	80	66
565	88.421	0.157	0.063	1.03	92	2	100	0.9	0.1	71	199	80	66
566	88.579	0.158	0.063	1.05	92	2	100	0.9	0	70	199	81	66
567	88.735	0.156	0.063	1.04	92	2	99	0.9	0	70	199	82	66
568	88.892	0.157	0.063	1.06	92	2	100	0.9	0	70	199	85	66
569	89.049	0.157	0.063	1.07	92	2	100	0.9	0	70	199	86	66
570	89.205	0.156	0.063	1.07	92	2	99	0.8	-0.1	70	199	84	66
571	89.365	0.160	0.063	1.06	92	2	102	0.8	0	70	198	82	66
572	89.520	0.155	0.063	1.05	92	2	98	0.9	0.1	71	199	80	66
573	89.678	0.158	0.063	1.07	92	2	100	0.8	-0.1	72	198	80	66
574	89.838	0.160	0.063	1.06	92	2	102	0.7	-0.1	72	197	80	66
575	89.995	0.157	0.063	1.03	92	2	100	0.8	0.1	71	198	82	66
576	90.153	0.158	0.063	1.05	92	2	100	0.8	0	71	198	84	66
577	90.310	0.157	0.063	1.05	92	2	100	0.8	0	71	197	86	66
578	90.467	0.157	0.063	1.05	92	2	100	0.7	-0.1	71	197	85	66
579	90.627	0.160	0.063	1.05	92	2	102	0.8	0.1	71	198	82	66
580	90.784	0.157	0.063	1.04	92	2	100	0.8	0	71	197	80	66
581	90.942	0.158	0.063	1.03	92	2	100	0.8	0	71	197	80	66
582	91.099	0.157	0.063	1.03	92	2	100	0.7	-0.1	71	197	80	66
583	91.257	0.158	0.063	1.05	92	2	100	0.7	0	71	197	81	66
584	91.415	0.158	0.063	1.06	92	2	100	0.7	0	71	196	84	66
585	91.572	0.157	0.063	1.07	92	2	100	0.7	0	71	196	86	66
586	91.729	0.157	0.063	1.07	92	2	100	0.6	-0.1	71	196	86	66
587	91.887	0.158	0.063	1.05	92	2	100	0.7	0.1	71	196	83	66
588	92.044	0.157	0.063	1.06	92	2	100	0.7	0	71	196	81	66
589	92.202	0.158	0.063	1.06	92	2	100	0.7	0	71	196	80	66
590	92.357	0.155	0.063	1.04	92	2	98	0.7	0	71	196	80	66
591	92.517	0.160	0.063	1.04	92	2	102	0.7	0	71	196	81	66
592	92.677	0.160	0.063	1.05	92	2	102	0.6	-0.1	70	196	83	66
593	92.833	0.156	0.063	1.05	92	2	99	0.6	0	70	196	85	66

BOX A TEST DATA - ASTM E3053 / ASTM E2515

Client: Pacific Energy
Model: FP25
Run #: 2

Job #: 19-537
Tracking #: 0048
Technician: SJB
Date: 11/25/2019

	Particulate Sampling Data							Fuel Weight (lb)		Temperature Data (°F)			
Elapsed Time (min)	Gas Meter (ft^3)	Sample Rate (cfm)	Dilution Tunnel dP (in H_2O)	Orifice dH (in H_2O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Scale Reading	Weight Change	Dilution Tunnel	Flue	Filter	Ambient
594	92.992	0.159	0.063	1.04	92	2	101	0.6	0	70	195	86	66
595	93.148	0.156	0.063	1.07	92	2	99	0.5	-0.1	70	196	85	66
596	93.305	0.157	0.063	1.06	92	2	100	0.5	0	70	195	82	66
597	93.464	0.159	0.063	1.05	92	2	101	0.6	0.1	70	196	80	66
598	93.621	0.157	0.063	1.04	92	2	100	0.6	0	70	195	80	66
599	93.780	0.159	0.063	1.04	92	2	101	0.6	0	70	195	80	66
600	93.937	0.157	0.063	1.05	92	2	100	0.6	0	70	195	82	66
601	94.095	0.158	0.063	1.05	92	2	100	0.5	-0.1	70	195	85	65
602	94.255	0.160	0.063	1.05	92	2	102	0.5	0	70	195	86	66
603	94.411	0.156	0.063	1.08	92	2	99	0.5	0	70	194	85	66
604	94.568	0.157	0.063	1.05	92	2	100	0.5	0	70	195	82	66
605	94.727	0.159	0.063	1.08	92	2	101	0.4	-0.1	70	194	81	65
606	94.883	0.156	0.063	1.07	92	2	99	0.5	0.1	71	193	80	66
607	95.041	0.158	0.063	1.04	92	2	100	0.5	0	72	194	80	66
608	95.196	0.155	0.063	1.07	92	2	98	0.5	0	71	193	82	66
609	95.355	0.159	0.063	1.05	92	2	101	0.4	-0.1	71	194	84	66
610	95.513	0.158	0.063	1.06	92	2	100	0.4	0	71	193	86	66
611	95.669	0.156	0.063	1.03	92	2	99	0.5	0.1	71	193	86	66
612	95.828	0.159	0.063	1.04	92	2	101	0.4	-0.1	71	193	83	66
613	95.985	0.157	0.063	1.05	92	2	100	0.4	0	71	193	81	66
614	96.143	0.158	0.063	1.07	92	2	100	0.5	0.1	70	193	80	66
615	96.300	0.157	0.063	1.07	92	2	100	0.4	-0.1	70	193	80	66
616	96.456	0.156	0.063	1.07	92	2	99	0.4	0	70	193	81	65
617	96.614	0.158	0.063	1.05	92	2	100	0.4	0	71	193	83	66
618	96.772	0.158	0.063	1.06	92	2	100	0.4	0	72	192	85	66
619	96.930	0.158	0.063	1.05	92	2	100	0.4	0	71	192	86	66
620	97.089	0.159	0.063	1.06	92	2	101	0.4	0	71	192	84	66
621	97.243	0.154	0.063	1.06	92	2	98	0.4	0	71	192	82	66
622	97.402	0.159	0.063	1.06	92	2	101	0.3	-0.1	71	192	80	66
623	97.562	0.160	0.063	1.06	92	2	102	0.4	0.1	71	193	80	66
624	97.717	0.155	0.063	1.03	92	2	98	0.4	0	71	192	80	66
625	97.877	0.160	0.063	1.04	92	2	102	0.3	-0.1	71	192	82	66
626	98.033	0.156	0.063	1.06	92	2	99	0.3	0	70	191	85	66

BOX A TEST DATA - ASTM E3053 / ASTM E2515

Client: Pacific Energy
Model: FP25
Run #: 2

Job #: 19-537
Tracking #: 0048
Technician: SJB
Date: 11/25/2019

	Particulate Sampling Data							Fuel Weight (lb)		Temperature Data (°F)			
Elapsed Time (min)	Gas Meter (ft^3)	Sample Rate (cfm)	Dilution Tunnel dP (in H_2O)	Orifice dH (in H_2O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Scale Reading	Weight Change	Dilution Tunnel	Flue	Filter	Ambient
627	98.190	0.157	0.063	1.03	92	2	100	0.2	-0.1	70	191	86	66
628	98.349	0.159	0.063	1.04	92	2	101	0.3	0.1	70	191	85	66
629	98.505	0.156	0.063	1.03	92	2	99	0.3	0	70	191	83	66
630	98.663	0.158	0.063	1.05	92	2	100	0.3	0	70	191	81	66
631	98.821	0.158	0.063	1.05	92	2	100	0.3	0	71	191	80	66
632	98.977	0.156	0.063	1.04	92	2	99	0.3	0	72	190	80	66
633	99.134	0.157	0.063	1.05	92	2	100	0.3	0	71	190	82	66
634	99.289	0.155	0.063	1.08	92	2	98	0.2	-0.1	71	190	84	66
635	99.447	0.158	0.063	1.04	92	2	100	0.3	0.1	71	190	86	66
636	99.606	0.159	0.063	1.06	92	2	101	0.1	-0.2	71	189	85	66
637	99.762	0.156	0.063	1.05	92	2	99	0.1	0	71	189	83	66
638	99.921	0.159	0.063	1.06	92	2	101	0.1	0	71	189	81	66
639	100.078	0.157	0.063	1.07	92	2	100	0.2	0.1	71	189	80	66
640	100.234	0.156	0.063	1.05	92	2	99	0.2	0	70	189	80	66
641	100.393	0.159	0.063	1.06	92	2	101	0.1	-0.1	70	188	81	66
642	100.549	0.156	0.063	1.06	92	2	99	0.1	0	70	189	83	66
643	100.706	0.157	0.063	1.07	92	2	100	0.2	0.1	71	189	86	66
644	100.866	0.160	0.063	1.06	92	2	102	0.1	-0.1	72	188	86	66
645	101.022	0.156	0.063	1.07	92	2	99	0.2	0.1	71	188	84	66
646	101.180	0.158	0.063	1.07	92	2	100	0.2	0	71	187	82	66
647	101.337	0.157	0.063	1.07	92	2	100	0.1	-0.1	71	187	80	66
648	101.494	0.157	0.063	1.04	92	2	100	0.0	-0.1	71	188	80	66
Avg/Tot	101.494	0.157	0.063	1.03	93	2.00	100			78	340	83	67.0

BOX B TEST DATA - ASTM E3053 / ASTM E2515

Client: Pacific Energy
Model: FP25
Run #: 2

Job #: 19-537
Tracking #: 0048
Technician: SJB
Date: 11/25/2019

	Particulate Sampling Data							Flue Gas Data		
Elapsed Time (min)	Gas Meter (ft^3)	Sample Rate (cfm)	Orifice dH (in H_2O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Filter (°F)	Flue Draft (in H_2O)	CO_2 (%)	CO (%)
0	0.000		0.00	91	2		80	0.000	8.37	0.31
1	0.133	0.133	0.94	91	2	88	81	-0.080	7.42	0.29
2	0.293	0.160	1.15	91	2	105	83	-0.090	6.74	0.19
3	0.451	0.158	1.14	91	2	104	86	-0.090	5.79	0.27
4	0.612	0.161	1.12	91	2	106	88	-0.090	11.70	0.42
5	0.768	0.156	1.13	91	2	103	87	-0.090	17.42	0.83
6	0.925	0.157	1.11	91	2	103	84	-0.090	18.00	1.64
7	1.082	0.157	1.11	91	2	102	82	-0.090	18.97	1.07
8	1.238	0.156	1.12	91	2	101	81	-0.080	18.44	2.00
9	1.394	0.156	1.11	91	2	101	81	-0.080	17.40	2.66
10	1.550	0.156	1.09	91	2	101	83	-0.080	16.66	2.15
11	1.706	0.156	1.10	91	2	101	85	-0.090	16.56	1.55
12	1.861	0.155	1.09	91	2	100	87	-0.090	16.62	1.54
13	2.015	0.154	1.09	91	2	99	86	-0.080	16.38	1.09
14	2.170	0.155	1.10	92	2	100	84	-0.080	16.00	0.73
15	2.328	0.158	1.08	92	2	102	82	-0.080	15.66	0.69
16	2.483	0.155	1.09	92	2	100	81	-0.080	15.51	0.64
17	2.638	0.155	1.08	92	2	100	82	-0.080	15.37	0.58
18	2.792	0.154	1.09	92	2	99	84	-0.080	15.10	0.52
19	2.947	0.155	1.08	92	2	100	86	-0.080	15.09	0.40
20	3.100	0.153	1.09	92	2	98	87	-0.080	15.18	0.45
21	3.254	0.154	1.07	92	2	99	86	-0.080	15.37	0.61
22	3.409	0.155	1.10	92	2	100	84	-0.080	15.54	0.75
23	3.565	0.156	1.09	92	2	100	82	-0.080	15.73	0.86
24	3.719	0.154	1.08	92	2	99	82	-0.080	15.84	0.94
25	3.873	0.154	1.08	92	2	99	83	-0.080	16.04	0.87
26	4.027	0.154	1.09	92	2	99	85	-0.080	16.16	0.80
27	4.181	0.154	1.08	92	2	99	87	-0.080	16.19	0.78
28	4.336	0.155	1.09	92	2	100	87	-0.080	16.31	0.74
29	4.490	0.154	1.08	92	2	99	85	-0.080	16.24	0.79
30	4.646	0.156	1.09	92	2	100	83	-0.080	16.35	0.88
31	4.799	0.153	1.08	92	2	98	82	-0.080	16.49	1.03

BOX B TEST DATA - ASTM E3053 / ASTM E2515

Client: Pacific Energy
Model: FP25
Run #: 2

Job #: 19-537
Tracking #: 0048
Technician: SJB
Date: 11/25/2019

	Particulate Sampling Data							Flue Gas Data		
Elapsed Time (min)	Gas Meter (ft^3)	Sample Rate (cfm)	Orifice dH (in H_2O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Filter (°F)	Flue Draft (in H_2O)	CO_2 (%)	CO (%)
32	4.955	0.156	1.08	93	2	100	82	-0.080	16.56	1.11
33	5.109	0.154	1.10	93	2	99	83	-0.080	16.50	1.18
34	5.263	0.154	1.09	93	2	99	86	-0.080	16.53	1.18
35	5.418	0.155	1.08	93	2	99	87	-0.080	16.52	1.04
36	5.574	0.156	1.08	93	2	100	86	-0.080	16.27	0.95
37	5.728	0.154	1.08	93	2	99	84	-0.080	16.20	0.88
38	5.882	0.154	1.08	93	2	99	82	-0.080	16.27	0.87
39	6.036	0.154	1.07	93	2	99	81	-0.070	16.16	0.73
40	6.191	0.155	1.07	93	2	99	82	-0.070	15.95	0.60
41	6.346	0.155	1.07	93	2	99	84	-0.080	15.65	0.65
42	6.502	0.156	1.08	93	2	100	87	-0.080	15.51	0.65
43	6.655	0.153	1.07	93	2	98	87	-0.070	15.50	0.64
44	6.808	0.153	1.09	93	2	98	85	-0.070	15.56	0.62
45	6.962	0.154	1.07	93	2	98	83	-0.070	15.59	0.61
46	7.117	0.155	1.08	93	2	99	82	-0.080	15.62	0.58
47	7.272	0.155	1.09	93	2	99	81	-0.070	15.57	0.62
48	7.426	0.154	1.09	93	2	98	83	-0.070	15.54	0.67
49	7.578	0.152	1.08	93	2	97	85	-0.070	15.60	0.71
50	7.733	0.155	1.06	93	2	99	87	-0.070	15.74	0.68
51	7.887	0.154	1.08	93	2	98	87	-0.070	15.75	0.65
52	8.040	0.153	1.08	93	2	98	85	-0.070	15.60	0.61
53	8.195	0.155	1.08	93	2	99	83	-0.070	15.37	0.59
54	8.348	0.153	1.08	94	2	97	81	-0.070	15.22	0.59
55	8.500	0.152	1.09	94	2	97	82	-0.080	15.12	0.58
56	8.655	0.155	1.07	94	2	99	83	-0.070	15.19	0.54
57	8.810	0.155	1.05	94	2	99	86	-0.070	15.33	0.56
58	8.962	0.152	1.07	94	2	97	87	-0.070	15.42	0.59
59	9.116	0.154	1.08	94	2	98	87	-0.070	15.56	0.62
60	9.270	0.154	1.08	94	2	98	85	-0.080	15.60	0.68
61	9.423	0.153	1.08	94	2	97	82	-0.070	15.71	0.73
62	9.578	0.155	1.15	94	2	99	81	-0.070	15.82	0.75
63	9.736	0.158	1.13	94	2	101	82	-0.070	15.71	0.69

BOX B TEST DATA - ASTM E3053 / ASTM E2515

Client: Pacific Energy
Model: FP25
Run #: 2

Job #: 19-537
Tracking #: 0048
Technician: SJB
Date: 11/25/2019

	Particulate Sampling Data							Flue Gas Data		
Elapsed Time (min)	Gas Meter (ft^3)	Sample Rate (cfm)	Orifice dH (in H_2O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Filter (°F)	Flue Draft (in H_2O)	CO_2 (%)	CO (%)
64	9.893	0.157	1.15	94	2	100	84	-0.070	15.54	0.64
65	10.051	0.158	1.13	94	2	100	86	-0.070	15.50	0.62
66	10.208	0.157	1.11	94	2	100	88	-0.070	15.56	0.60
67	10.366	0.158	1.13	94	2	100	86	-0.070	15.36	0.57
68	10.524	0.158	1.12	94	2	100	84	-0.070	15.08	0.49
69	10.683	0.159	1.11	94	2	101	82	-0.070	14.98	0.44
70	10.842	0.159	1.12	94	2	101	81	-0.070	14.99	0.43
71	11.000	0.158	1.12	94	2	100	82	-0.070	14.95	0.42
72	11.157	0.157	1.12	94	2	100	84	-0.070	14.90	0.39
73	11.315	0.158	1.12	94	2	100	87	-0.070	14.80	0.42
74	11.474	0.159	1.12	94	2	101	87	-0.070	14.72	0.46
75	11.630	0.156	1.12	94	2	99	86	-0.070	14.67	0.50
76	11.789	0.159	1.12	94	2	101	83	-0.070	14.60	0.50
77	11.946	0.157	1.13	94	2	100	82	-0.070	14.50	0.58
78	12.102	0.156	1.11	94	2	99	81	-0.070	14.45	0.65
79	12.260	0.158	1.14	94	2	100	82	-0.070	14.49	0.68
80	12.420	0.160	1.11	94	2	102	84	-0.070	14.65	0.64
81	12.576	0.156	1.11	94	2	99	87	-0.070	14.92	0.54
82	12.735	0.159	1.12	94	2	101	87	-0.070	15.28	0.60
83	12.894	0.159	1.13	94	2	101	85	-0.070	15.28	0.62
84	13.050	0.156	1.11	95	2	99	83	-0.070	15.22	0.65
85	13.208	0.158	1.11	95	2	100	81	-0.080	15.09	0.66
86	13.367	0.159	1.12	95	2	101	81	-0.070	15.00	0.69
87	13.523	0.156	1.13	95	2	99	82	-0.070	14.98	0.71
88	13.677	0.154	1.13	95	2	98	85	-0.070	15.37	0.82
89	13.834	0.157	1.12	95	2	99	87	-0.070	15.59	0.96
90	13.994	0.160	1.13	95	2	101	87	-0.070	15.42	0.94
91	14.150	0.156	1.12	95	2	99	85	-0.070	15.41	0.91
92	14.308	0.158	1.12	95	2	100	82	-0.070	15.31	0.99
93	14.466	0.158	1.11	95	2	100	81	-0.070	15.36	1.13
94	14.623	0.157	1.12	95	2	99	81	-0.070	15.33	1.17
95	14.779	0.156	1.10	95	2	99	82	-0.070	15.37	1.09

BOX B TEST DATA - ASTM E3053 / ASTM E2515

Client: Pacific Energy
Model: FP25
Run #: 2

Job #: 19-537
Tracking #: 0048
Technician: SJB
Date: 11/25/2019

	Particulate Sampling Data							Flue Gas Data		
Elapsed Time (min)	Gas Meter (ft^3)	Sample Rate (cfm)	Orifice dH (in H_2O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Filter (°F)	Flue Draft (in H_2O)	CO_2 (%)	CO (%)
96	14.938	0.159	1.10	95	2	101	85	-0.070	15.45	0.98
97	15.095	0.157	1.12	95	2	99	87	-0.070	15.27	0.96
98	15.250	0.155	1.09	95	2	98	86	-0.070	15.02	0.98
99	15.407	0.157	1.10	95	2	99	84	-0.070	14.84	1.01
100	15.564	0.157	1.12	95	2	99	82	-0.070	14.80	1.01
101	15.723	0.159	1.11	95	2	101	81	-0.070	14.56	0.98
102	15.878	0.155	1.09	95	2	98	81	-0.070	14.11	0.87
103	16.034	0.156	1.09	95	2	99	83	-0.070	13.66	0.66
104	16.191	0.157	1.10	95	2	99	85	-0.070	13.53	0.49
105	16.348	0.157	1.11	95	2	99	87	-0.070	13.58	0.44
106	16.505	0.157	1.10	95	2	99	87	-0.070	13.54	0.35
107	16.664	0.159	1.10	95	2	101	84	-0.060	13.47	0.32
108	16.822	0.158	1.09	95	2	100	82	-0.070	13.37	0.31
109	16.978	0.156	1.10	95	2	99	81	-0.070	13.23	0.32
110	17.135	0.157	1.09	95	2	99	81	-0.060	13.19	0.32
111	17.293	0.158	1.09	95	2	100	83	-0.070	13.11	0.34
112	17.449	0.156	1.11	95	2	99	85	-0.060	12.81	0.27
113	17.602	0.153	1.09	95	2	97	87	-0.060	12.55	0.25
114	17.759	0.157	1.08	95	2	99	87	-0.070	12.42	0.23
115	17.916	0.157	1.12	95	2	99	84	-0.060	12.21	0.23
116	18.073	0.157	1.12	95	2	99	82	-0.060	11.93	0.21
117	18.227	0.154	1.10	95	2	97	81	-0.060	11.74	0.20
118	18.384	0.157	1.10	95	2	99	81	-0.070	11.61	0.23
119	18.542	0.158	1.10	95	2	100	83	-0.060	11.55	0.21
120	18.700	0.158	1.11	95	2	100	85	-0.070	11.45	0.19
121	18.855	0.155	1.10	95	2	98	87	-0.070	11.43	0.19
122	19.011	0.156	1.10	95	2	98	87	-0.060	11.32	0.20
123	19.167	0.156	1.08	95	2	98	85	-0.070	11.19	0.23
124	19.323	0.156	1.11	95	2	98	82	-0.060	11.10	0.24
125	19.479	0.156	1.10	95	2	98	81	-0.060	11.20	0.24
126	19.637	0.158	1.11	95	2	100	82	-0.060	11.19	0.22
127	19.795	0.158	1.11	95	2	100	83	-0.060	11.03	0.24

BOX B TEST DATA - ASTM E3053 / ASTM E2515

Client: Pacific Energy
Model: FP25
Run #: 2

Job #: 19-537
Tracking #: 0048
Technician: SJB
Date: 11/25/2019

	Particulate Sampling Data							Flue Gas Data		
Elapsed Time (min)	Gas Meter (ft^3)	Sample Rate (cfm)	Orifice dH (in H_2O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Filter (°F)	Flue Draft (in H_2O)	CO_2 (%)	CO (%)
128	19.952	0.157	1.11	95	2	99	86	-0.060	10.74	0.27
129	20.107	0.155	1.08	95	2	98	87	-0.060	10.68	0.29
130	20.266	0.159	1.11	95	2	100	86	-0.060	10.73	0.32
131	20.423	0.157	1.10	95	2	99	84	-0.060	10.72	0.33
132	20.578	0.155	1.11	95	2	98	82	-0.060	10.84	0.37
133	20.732	0.154	1.10	95	2	97	81	-0.060	10.89	0.41
134	20.890	0.158	1.09	95	2	100	82	-0.060	10.95	0.45
135	21.048	0.158	1.11	95	2	100	84	-0.060	10.96	0.51
136	21.203	0.155	1.09	95	2	98	86	-0.060	11.03	0.52
137	21.361	0.158	1.10	95	2	100	87	-0.060	11.06	0.50
138	21.518	0.157	1.10	95	2	99	86	-0.060	11.11	0.52
139	21.675	0.157	1.11	95	2	99	84	-0.060	11.14	0.54
140	21.830	0.155	1.10	95	2	98	82	-0.060	11.16	0.59
141	21.986	0.156	1.10	95	2	98	81	-0.070	11.00	0.67
142	22.143	0.157	1.09	95	2	99	82	-0.050	10.87	0.73
143	22.302	0.159	1.10	95	2	100	83	-0.060	10.77	0.75
144	22.456	0.154	1.10	95	2	97	86	-0.060	10.76	0.78
145	22.612	0.156	1.10	95	2	98	87	-0.060	10.76	0.81
146	22.768	0.156	1.10	95	2	98	86	-0.060	10.69	0.87
147	22.924	0.156	1.10	95	2	98	84	-0.060	10.66	0.91
148	23.080	0.156	1.11	95	2	98	82	-0.060	10.72	0.96
149	23.233	0.153	1.09	95	2	96	81	-0.060	10.83	0.94
150	23.393	0.160	1.10	95	2	101	82	-0.060	10.92	0.95
151	23.550	0.157	1.10	95	2	99	84	-0.060	10.93	0.98
152	23.708	0.158	1.10	95	2	99	86	-0.060	10.79	1.05
153	23.864	0.156	1.10	95	2	98	87	-0.050	10.68	1.14
154	24.022	0.158	1.09	95	2	99	86	-0.060	10.52	1.18
155	24.178	0.156	1.11	95	2	98	83	-0.050	10.46	1.18
156	24.333	0.155	1.11	95	2	97	82	-0.050	10.37	1.22
157	24.486	0.153	1.09	95	2	96	81	-0.060	10.31	1.31
158	24.641	0.155	1.11	95	2	97	82	-0.050	10.17	1.28
159	24.798	0.157	1.08	95	2	99	84	-0.050	9.99	1.23

BOX B TEST DATA - ASTM E3053 / ASTM E2515

Client: Pacific Energy
Model: FP25
Run #: 2

Job #: 19-537
Tracking #: 0048
Technician: SJB
Date: 11/25/2019

	Particulate Sampling Data							Flue Gas Data		
Elapsed Time (min)	Gas Meter (ft^3)	Sample Rate (cfm)	Orifice dH (in H_2O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Filter (°F)	Flue Draft (in H_2O)	CO_2 (%)	CO (%)
160	24.954	0.156	1.08	95	2	98	86	-0.050	9.90	1.25
161	25.107	0.153	1.08	95	2	96	87	-0.060	9.89	1.24
162	25.259	0.152	1.07	95	2	95	86	-0.050	9.93	1.29
163	25.410	0.151	1.04	95	2	95	84	-0.050	10.03	1.34
164	25.563	0.153	1.05	95	2	96	82	-0.050	10.03	1.41
165	25.713	0.150	1.02	95	2	94	81	-0.050	10.10	1.46
166	25.859	0.146	1.00	95	2	92	82	-0.050	10.16	1.46
167	26.006	0.147	0.98	95	2	92	84	-0.050	10.26	1.51
168	26.148	0.142	0.95	95	2	89	86	-0.050	10.41	1.53
169	26.292	0.144	0.91	95	2	90	88	-0.050	10.58	1.53
170	26.433	0.141	0.92	95	2	89	87	-0.050	10.58	1.47
171	26.569	0.136	0.90	95	2	85	84	-0.050	10.59	1.49
172	26.703	0.134	0.87	95	2	84	82	-0.050	10.58	1.56
173	26.836	0.133	0.84	95	2	83	81	-0.050	10.68	1.56
174	26.963	0.127	0.81	95	2	80	82	-0.050	10.66	1.56
175	27.087	0.124	0.79	95	2	78	83	-0.050	10.38	1.43
176	27.208	0.121	0.76	95	2	76	86	-0.050	9.92	1.30
177	27.362	0.154	1.08	95	2	97	87	-0.050	9.63	1.32
178	27.516	0.154	1.04	95	2	97	86	-0.050	9.45	1.38
179	27.703	0.187	1.77	97	2	117	86	-0.050	9.34	1.36
180	27.867	0.164	1.13	98	2	102	87	-0.050	9.29	1.31
181	28.025	0.158	1.14	98	2	99	83	-0.050	9.18	1.28
182	28.188	0.163	1.14	98	2	102	86	-0.050	9.06	1.33
183	28.348	0.160	1.16	98	2	100	88	-0.050	8.99	1.28
184	28.507	0.159	1.15	97	2	99	87	-0.050	8.98	1.23
185	28.670	0.163	1.16	96	2	102	84	-0.050	8.99	1.15
186	28.829	0.159	1.16	96	2	100	82	-0.040	8.98	1.09
187	28.992	0.163	1.17	97	2	102	81	-0.050	9.00	1.03
188	29.152	0.160	1.15	96	2	100	81	-0.040	8.97	0.99
189	29.316	0.164	1.15	96	2	103	83	-0.040	8.96	0.94
190	29.477	0.161	1.15	97	2	101	85	-0.040	8.96	0.91
191	29.640	0.163	1.14	96	2	102	87	-0.040	9.05	0.89

BOX B TEST DATA - ASTM E3053 / ASTM E2515

Client: Pacific Energy
Model: FP25
Run #: 2

Job #: 19-537
Tracking #: 0048
Technician: SJB
Date: 11/25/2019

	Particulate Sampling Data							Flue Gas Data		
Elapsed Time (min)	Gas Meter (ft^3)	Sample Rate (cfm)	Orifice dH (in H_2O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Filter (°F)	Flue Draft (in H_2O)	CO_2 (%)	CO (%)
192	29.803	0.163	1.14	96	2	102	86	-0.040	8.98	0.88
193	29.963	0.160	1.15	96	2	100	84	-0.050	8.92	0.90
194	30.128	0.165	1.16	98	2	103	82	-0.040	8.90	0.92
195	30.288	0.160	1.16	96	2	100	81	-0.040	8.87	0.94
196	30.449	0.161	1.15	96	2	101	82	-0.040	8.87	0.97
197	30.612	0.163	1.15	96	2	102	84	-0.040	8.88	0.97
198	30.772	0.160	1.15	102	2	99	86	-0.040	8.90	0.95
199	30.934	0.162	1.16	96	2	101	87	-0.040	8.91	0.97
200	31.094	0.160	1.14	96	2	100	86	-0.030	8.95	0.98
201	31.256	0.162	1.16	98	2	101	84	-0.040	8.92	0.99
202	31.417	0.161	1.14	96	2	101	82	-0.040	8.96	0.99
203	31.580	0.163	1.16	96	2	102	82	-0.030	8.88	1.00
204	31.742	0.162	1.15	98	2	101	83	-0.040	8.88	0.98
205	31.904	0.162	1.15	96	2	101	85	-0.040	8.96	0.93
206	32.066	0.162	1.15	96	2	101	87	-0.040	8.83	0.95
207	32.229	0.163	1.15	102	2	101	87	-0.040	8.61	1.00
208	32.389	0.160	1.16	97	2	100	85	-0.040	8.49	0.99
209	32.547	0.158	1.15	96	2	99	83	-0.040	8.55	0.99
210	32.709	0.162	1.16	99	2	100	82	-0.030	8.60	1.01
211	32.867	0.158	1.13	96	2	99	82	-0.040	8.67	1.00
212	33.029	0.162	1.15	95	2	101	83	-0.030	8.72	1.01
213	33.191	0.162	1.16	95	2	102	86	-0.040	8.74	1.00
214	33.352	0.161	1.15	96	2	101	87	-0.030	8.78	1.02
215	33.513	0.161	1.16	98	2	100	86	-0.030	8.79	1.08
216	33.672	0.159	1.15	100	2	99	84	-0.030	8.72	1.11
217	33.834	0.162	1.15	100	2	100	82	-0.030	8.67	1.12
218	33.994	0.160	1.15	96	2	100	81	-0.040	8.75	1.13
219	34.157	0.163	1.15	97	2	101	82	-0.040	8.73	1.13
220	34.317	0.160	1.15	97	2	100	84	-0.030	8.72	1.14
221	34.479	0.162	1.17	96	2	101	87	-0.040	8.75	1.14
222	34.639	0.160	1.15	95	2	100	87	-0.030	8.74	1.14
223	34.799	0.160	1.14	98	2	100	85	-0.030	8.69	1.16

BOX B TEST DATA - ASTM E3053 / ASTM E2515

Client: Pacific Energy
Model: FP25
Run #: 2

Job #: 19-537
Tracking #: 0048
Technician: SJB
Date: 11/25/2019

	Particulate Sampling Data							Flue Gas Data		
Elapsed Time (min)	Gas Meter (ft^3)	Sample Rate (cfm)	Orifice dH (in H_2O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Filter (°F)	Flue Draft (in H_2O)	CO_2 (%)	CO (%)
224	34.960	0.161	1.15	96	2	101	83	-0.040	8.78	1.16
225	35.121	0.161	1.15	98	2	100	82	-0.030	8.81	1.15
226	35.285	0.164	1.17	96	2	102	81	-0.030	8.79	1.13
227	35.446	0.161	1.14	95	2	100	83	-0.040	8.84	1.11
228	35.607	0.161	1.15	97	2	100	85	-0.030	8.84	1.08
229	35.770	0.163	1.15	95	2	102	87	-0.030	8.91	1.07
230	35.933	0.163	1.15	95	2	102	87	-0.030	8.81	1.08
231	36.095	0.162	1.18	95	2	101	85	-0.030	8.79	1.11
232	36.255	0.160	1.15	95	2	100	83	-0.030	8.73	1.15
233	36.417	0.162	1.16	95	2	101	81	-0.030	8.76	1.14
234	36.577	0.160	1.16	95	2	100	82	-0.030	8.77	1.13
235	36.738	0.161	1.16	95	2	100	83	-0.030	8.78	1.12
236	36.897	0.159	1.17	95	2	99	86	-0.030	8.78	1.10
237	37.060	0.163	1.14	95	2	102	87	-0.030	8.82	1.10
238	37.223	0.163	1.17	95	2	102	87	-0.030	8.83	1.09
239	37.383	0.160	1.15	95	2	100	85	-0.030	8.85	1.12
240	37.546	0.163	1.15	95	2	102	82	-0.030	8.97	1.13
241	37.706	0.160	1.16	95	2	100	81	-0.030	8.95	1.14
242	37.869	0.163	1.15	95	2	102	82	-0.030	8.95	1.13
243	38.028	0.159	1.15	95	2	99	84	-0.030	9.03	1.12
244	38.189	0.161	1.15	95	2	100	86	-0.030	9.05	1.12
245	38.351	0.162	1.15	95	2	101	88	-0.030	8.91	1.15
246	38.514	0.163	1.16	95	2	102	86	-0.030	8.75	1.11
247	38.677	0.163	1.15	95	2	102	84	-0.030	8.78	1.10
248	38.837	0.160	1.16	95	2	100	82	-0.030	8.72	1.12
249	38.998	0.161	1.15	95	2	100	81	-0.030	8.71	1.14
250	39.160	0.162	1.16	95	2	101	82	-0.030	8.72	1.16
251	39.322	0.162	1.16	95	2	101	84	-0.030	8.65	1.18
252	39.485	0.163	1.15	95	2	101	87	-0.030	8.73	1.18
253	39.648	0.163	1.15	95	2	101	87	-0.030	8.74	1.18
254	39.811	0.163	1.16	95	2	101	86	-0.030	8.78	1.19
255	39.971	0.160	1.15	95	2	100	83	-0.030	8.72	1.21

BOX B TEST DATA - ASTM E3053 / ASTM E2515

Client: Pacific Energy
Model: FP25
Run #: 2

Job #: 19-537
Tracking #: 0048
Technician: SJB
Date: 11/25/2019

	Particulate Sampling Data							Flue Gas Data		
Elapsed Time (min)	Gas Meter (ft^3)	Sample Rate (cfm)	Orifice dH (in H_2O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Filter (°F)	Flue Draft (in H_2O)	CO_2 (%)	CO (%)
256	40.134	0.163	1.16	95	2	101	82	-0.030	8.68	1.20
257	40.296	0.162	1.15	95	2	101	81	-0.030	8.77	1.19
258	40.460	0.164	1.16	95	2	102	82	-0.020	8.73	1.19
259	40.618	0.158	1.15	95	2	98	84	-0.020	8.80	1.20
260	40.779	0.161	1.17	95	2	100	87	-0.030	8.79	1.18
261	40.943	0.164	1.15	95	2	102	87	-0.030	8.76	1.19
262	41.105	0.162	1.16	95	2	101	85	-0.030	8.82	1.17
263	41.266	0.161	1.16	95	2	100	83	-0.020	8.82	1.17
264	41.429	0.163	1.15	95	2	101	81	-0.020	8.89	1.15
265	41.590	0.161	1.15	95	2	100	81	0.050	8.89	1.14
266	41.752	0.162	1.16	95	2	101	82	-0.020	8.86	1.13
267	41.914	0.162	1.17	95	2	101	85	-0.020	8.89	1.11
268	42.076	0.162	1.16	95	2	101	87	-0.030	8.92	1.13
269	42.240	0.164	1.15	95	2	102	87	-0.030	8.91	1.15
270	42.401	0.161	1.16	95	2	100	85	-0.030	8.96	1.14
271	42.565	0.164	1.18	95	2	102	82	-0.020	9.03	1.12
272	42.724	0.159	1.16	95	2	99	81	-0.020	9.09	1.10
273	42.889	0.165	1.15	95	2	103	81	-0.020	9.07	1.09
274	43.051	0.162	1.16	95	2	101	82	-0.020	9.03	1.10
275	43.214	0.163	1.16	95	2	101	85	-0.020	9.03	1.10
276	43.376	0.162	1.16	95	2	101	87	-0.030	9.00	1.09
277	43.537	0.161	1.15	95	2	100	86	-0.020	9.00	1.10
278	43.700	0.163	1.17	95	2	101	84	-0.030	8.95	1.09
279	43.858	0.158	1.15	95	2	98	82	-0.030	8.92	1.10
280	44.022	0.164	1.16	95	2	102	81	-0.030	8.97	1.08
281	44.182	0.160	1.16	95	2	100	81	-0.020	9.00	1.10
282	44.346	0.164	1.16	95	2	102	83	-0.020	9.00	1.15
283	44.507	0.161	1.16	95	2	100	85	-0.020	9.02	1.21
284	44.671	0.164	1.15	95	2	102	87	-0.030	8.86	1.21
285	44.832	0.161	1.15	95	2	100	87	-0.020	8.72	1.21
286	44.993	0.161	1.15	95	2	100	84	-0.020	8.73	1.21
287	45.157	0.164	1.14	95	2	102	82	-0.020	8.72	1.21

BOX B TEST DATA - ASTM E3053 / ASTM E2515

Client: Pacific Energy
Model: FP25
Run #: 2

Job #: 19-537
Tracking #: 0048
Technician: SJB
Date: 11/25/2019

	Particulate Sampling Data							Flue Gas Data		
Elapsed Time (min)	Gas Meter (ft^3)	Sample Rate (cfm)	Orifice dH (in H_2O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Filter (°F)	Flue Draft (in H_2O)	CO_2 (%)	CO (%)
288	45.316	0.159	1.15	95	2	99	81	-0.030	8.69	1.21
289	45.479	0.163	1.16	95	2	101	81	-0.020	8.72	1.22
290	45.640	0.161	1.15	95	2	100	83	-0.020	8.67	1.24
291	45.801	0.161	1.14	95	2	100	85	-0.020	8.65	1.24
292	45.963	0.162	1.14	95	2	101	87	-0.030	8.63	1.25
293	46.124	0.161	1.15	95	2	100	87	-0.020	8.67	1.22
294	46.286	0.162	1.15	95	2	101	84	-0.020	8.68	1.17
295	46.447	0.161	1.16	95	2	100	82	-0.030	8.66	1.11
296	46.609	0.162	1.16	95	2	101	81	-0.020	8.67	1.07
297	46.767	0.158	1.16	95	2	98	81	-0.020	8.75	1.05
298	46.930	0.163	1.15	95	2	101	83	-0.020	8.64	1.02
299	47.091	0.161	1.13	95	2	100	85	-0.020	8.66	1.01
300	47.255	0.164	1.16	95	2	102	87	-0.020	8.62	0.99
301	47.415	0.160	1.15	95	2	99	87	-0.020	8.54	0.97
302	47.577	0.162	1.15	95	2	101	85	-0.020	8.54	0.96
303	47.740	0.163	1.16	95	2	101	82	-0.030	8.56	0.95
304	47.905	0.165	1.16	95	2	103	81	-0.020	8.60	0.94
305	48.068	0.163	1.16	94	2	101	82	-0.020	8.53	0.94
306	48.230	0.162	1.15	94	2	101	83	-0.020	8.55	0.93
307	48.392	0.162	1.17	94	2	101	86	-0.020	8.54	0.92
308	48.554	0.162	1.17	94	2	101	87	-0.030	8.56	0.92
309	48.715	0.161	1.17	94	2	100	86	-0.030	8.52	0.92
310	48.874	0.159	1.16	94	2	99	84	-0.020	8.56	0.90
311	49.038	0.164	1.16	94	2	102	82	-0.030	8.60	0.90
312	49.197	0.159	1.16	94	2	99	81	-0.020	8.66	0.92
313	49.358	0.161	1.16	94	2	100	82	-0.020	8.51	0.98
314	49.519	0.161	1.16	94	2	100	84	-0.020	8.42	1.08
315	49.683	0.164	1.16	94	2	102	86	-0.030	8.36	1.13
316	49.843	0.160	1.17	94	2	100	87	-0.020	8.34	1.17
317	50.005	0.162	1.17	94	2	101	86	-0.020	8.35	1.17
318	50.168	0.163	1.15	94	2	101	84	-0.020	8.36	1.18
319	50.331	0.163	1.16	94	2	101	82	-0.020	8.38	1.19

BOX B TEST DATA - ASTM E3053 / ASTM E2515

Client: Pacific Energy
Model: FP25
Run #: 2

Job #: 19-537
Tracking #: 0048
Technician: SJB
Date: 11/25/2019

	Particulate Sampling Data							Flue Gas Data		
Elapsed Time (min)	Gas Meter (ft^3)	Sample Rate (cfm)	Orifice dH (in H_2O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Filter (°F)	Flue Draft (in H_2O)	CO_2 (%)	CO (%)
320	50.495	0.164	1.16	94	2	102	81	-0.020	8.30	1.19
321	50.656	0.161	1.16	94	2	100	82	-0.020	8.30	1.23
322	50.821	0.165	1.18	94	2	103	83	-0.020	8.29	1.23
323	50.985	0.164	1.15	94	2	102	86	-0.020	8.32	1.24
324	51.149	0.164	1.16	94	2	102	87	-0.020	8.25	1.24
325	51.312	0.163	1.16	94	2	101	86	-0.020	8.29	1.25
326	51.475	0.163	1.16	94	2	101	84	-0.020	8.23	1.24
327	51.637	0.162	1.17	94	2	101	82	-0.020	8.20	1.21
328	51.801	0.164	1.17	94	2	102	81	-0.020	8.22	1.19
329	51.966	0.165	1.16	94	2	103	82	-0.020	8.20	1.13
330	52.129	0.163	1.15	94	2	101	84	-0.020	8.18	1.08
331	52.290	0.161	1.16	94	2	100	86	-0.020	8.22	1.06
332	52.449	0.159	1.15	94	2	99	87	-0.020	8.24	1.07
333	52.612	0.163	1.18	94	2	101	86	-0.020	8.20	1.08
334	52.773	0.161	1.15	94	2	100	83	-0.020	8.13	1.09
335	52.935	0.162	1.15	94	2	101	82	-0.020	8.18	1.08
336	53.096	0.161	1.16	94	2	100	81	-0.020	8.16	1.07
337	53.260	0.164	1.16	94	2	102	82	-0.020	8.14	1.08
338	53.421	0.161	1.18	94	2	100	84	-0.020	8.17	1.07
339	53.584	0.163	1.16	94	2	101	86	-0.020	8.18	1.06
340	53.745	0.161	1.16	94	2	100	87	-0.020	8.18	1.06
341	53.910	0.165	1.15	94	2	103	86	-0.020	8.19	1.07
342	54.071	0.161	1.17	94	2	100	84	-0.020	8.12	1.08
343	54.235	0.164	1.17	94	2	102	82	-0.020	8.01	1.07
344	54.396	0.161	1.17	94	2	100	81	-0.020	7.97	1.10
345	54.558	0.162	1.15	94	2	101	82	-0.020	8.02	1.07
346	54.721	0.163	1.16	94	2	101	84	-0.020	7.98	1.07
347	54.882	0.161	1.15	94	2	100	86	-0.020	7.98	1.05
348	55.044	0.162	1.16	94	2	101	88	-0.020	7.89	1.04
349	55.205	0.161	1.16	94	2	100	87	-0.020	7.91	1.02
350	55.368	0.163	1.17	94	2	101	84	-0.020	7.91	1.00
351	55.528	0.160	1.15	94	2	99	82	-0.010	7.87	0.99

BOX B TEST DATA - ASTM E3053 / ASTM E2515

Client: Pacific Energy
Model: FP25
Run #: 2

Job #: 19-537
Tracking #: 0048
Technician: SJB
Date: 11/25/2019

	Particulate Sampling Data							Flue Gas Data		
Elapsed Time (min)	Gas Meter (ft^3)	Sample Rate (cfm)	Orifice dH (in H_2O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Filter (°F)	Flue Draft (in H_2O)	CO_2 (%)	CO (%)
352	55.691	0.163	1.16	94	2	101	81	-0.020	7.87	0.97
353	55.850	0.159	1.16	94	2	99	82	-0.020	7.84	0.98
354	56.013	0.163	1.15	94	2	101	83	-0.020	7.81	1.01
355	56.174	0.161	1.17	94	2	100	86	-0.030	7.75	1.03
356	56.336	0.162	1.16	94	2	101	87	-0.010	7.80	1.07
357	56.499	0.163	1.16	94	2	101	86	-0.020	7.83	1.09
358	56.663	0.164	1.18	94	2	102	85	-0.020	7.82	1.10
359	56.826	0.163	1.17	94	2	101	83	-0.020	7.78	1.12
360	56.987	0.161	1.17	94	2	100	86	-0.020	7.76	1.11
361	57.151	0.164	1.17	94	2	102	87	-0.020	7.72	1.12
362	57.309	0.158	1.16	94	2	98	87	-0.020	7.75	1.10
363	57.473	0.164	1.16	94	2	102	85	-0.020	7.75	1.10
364	57.634	0.161	1.16	94	2	100	82	-0.020	7.71	1.08
365	57.799	0.165	1.17	94	2	103	81	-0.020	7.65	1.07
366	57.961	0.162	1.17	94	2	101	82	-0.030	7.68	1.07
367	58.124	0.163	1.17	94	2	101	84	-0.020	7.64	1.07
368	58.285	0.161	1.16	94	2	100	86	-0.020	7.63	1.04
369	58.449	0.164	1.16	94	2	102	88	-0.020	7.59	1.04
370	58.610	0.161	1.16	94	2	100	86	-0.020	7.59	1.05
371	58.773	0.163	1.16	94	2	101	84	-0.020	7.60	1.03
372	58.936	0.163	1.18	94	2	101	82	-0.020	7.60	1.04
373	59.099	0.163	1.16	94	2	101	81	-0.020	7.59	1.04
374	59.263	0.164	1.16	94	2	102	82	-0.020	7.63	1.04
375	59.423	0.160	1.14	94	2	99	84	-0.020	7.57	1.01
376	59.589	0.166	1.16	94	2	103	87	-0.020	7.58	1.02
377	59.750	0.161	1.16	94	2	100	87	-0.020	7.56	1.03
378	59.915	0.165	1.16	94	2	103	86	-0.020	7.61	1.03
379	60.076	0.161	1.16	94	2	100	83	-0.020	7.67	1.07
380	60.239	0.163	1.17	94	2	101	82	-0.020	7.76	1.08
381	60.401	0.162	1.17	94	2	101	81	-0.020	7.82	1.09
382	60.563	0.162	1.16	94	2	101	82	-0.020	7.74	1.10
383	60.727	0.164	1.17	94	2	102	84	-0.020	7.78	1.09

BOX B TEST DATA - ASTM E3053 / ASTM E2515

Client: Pacific Energy
Model: FP25
Run #: 2

Job #: 19-537
Tracking #: 0048
Technician: SJB
Date: 11/25/2019

	Particulate Sampling Data							Flue Gas Data		
Elapsed Time (min)	Gas Meter (ft^3)	Sample Rate (cfm)	Orifice dH (in H_2O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Filter (°F)	Flue Draft (in H_2O)	CO_2 (%)	CO (%)
384	60.889	0.162	1.16	94	2	101	87	-0.020	7.85	1.11
385	61.052	0.163	1.17	94	2	101	87	-0.010	7.85	1.10
386	61.214	0.162	1.16	94	2	101	85	-0.020	7.89	1.10
387	61.378	0.164	1.16	94	2	102	83	-0.020	7.84	1.09
388	61.538	0.160	1.16	94	2	99	81	-0.020	7.78	1.07
389	61.702	0.164	1.15	94	2	102	81	-0.020	7.84	1.06
390	61.863	0.161	1.15	94	2	100	82	-0.020	7.86	1.07
391	62.028	0.165	1.16	94	2	103	85	-0.020	7.90	1.08
392	62.192	0.164	1.17	94	2	102	87	-0.020	7.88	1.09
393	62.354	0.162	1.16	94	2	101	87	-0.020	7.89	1.09
394	62.519	0.165	1.18	94	2	103	85	-0.020	7.91	1.08
395	62.680	0.161	1.16	94	2	100	82	-0.020	7.98	1.09
396	62.843	0.163	1.17	94	2	101	81	-0.020	7.97	1.10
397	63.005	0.162	1.17	94	2	101	81	-0.020	8.03	1.11
398	63.168	0.163	1.16	94	2	101	82	-0.020	8.03	1.12
399	63.331	0.163	1.15	94	2	101	85	-0.020	8.04	1.10
400	63.495	0.164	1.16	94	2	102	87	-0.020	8.02	1.12
401	63.656	0.161	1.15	94	2	100	86	-0.020	8.08	1.11
402	63.818	0.162	1.17	94	2	101	84	-0.020	8.07	1.13
403	63.980	0.162	1.16	94	2	101	82	-0.020	8.03	1.13
404	64.143	0.163	1.16	94	2	101	81	-0.020	8.04	1.11
405	64.306	0.163	1.17	94	2	101	81	-0.020	7.96	1.12
406	64.469	0.163	1.16	94	2	101	83	-0.020	7.93	1.10
407	64.632	0.163	1.15	94	2	101	85	-0.020	7.93	1.11
408	64.793	0.161	1.17	94	2	100	87	-0.020	7.86	1.12
409	64.957	0.164	1.16	94	2	102	87	-0.020	7.86	1.10
410	65.120	0.163	1.15	94	2	101	84	-0.020	7.83	1.11
411	65.285	0.165	1.17	94	2	102	82	-0.020	7.87	1.11
412	65.445	0.160	1.15	94	2	99	81	-0.020	7.87	1.09
413	65.608	0.163	1.16	94	2	101	81	-0.020	7.81	1.10
414	65.770	0.162	1.16	94	2	101	83	-0.020	7.79	1.09
415	65.933	0.163	1.15	94	2	101	85	-0.020	7.82	1.10

BOX B TEST DATA - ASTM E3053 / ASTM E2515

Client: Pacific Energy
Model: FP25
Run #: 2

Job #: 19-537
Tracking #: 0048
Technician: SJB
Date: 11/25/2019

	Particulate Sampling Data							Flue Gas Data		
Elapsed Time (min)	Gas Meter (ft^3)	Sample Rate (cfm)	Orifice dH (in H_2O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Filter (°F)	Flue Draft (in H_2O)	CO_2 (%)	CO (%)
416	66.095	0.162	1.18	94	2	101	87	-0.020	7.84	1.08
417	66.256	0.161	1.15	94	2	100	87	-0.020	7.87	1.08
418	66.420	0.164	1.17	94	2	102	84	-0.020	7.89	1.08
419	66.584	0.164	1.16	94	2	102	82	-0.020	7.89	1.08
420	66.747	0.163	1.16	94	2	101	81	-0.020	7.89	1.09
421	66.908	0.161	1.16	94	2	100	81	-0.020	7.88	1.10
422	67.072	0.164	1.15	94	2	102	83	-0.020	7.87	1.09
423	67.233	0.161	1.16	94	2	100	85	-0.020	7.85	1.08
424	67.396	0.163	1.16	94	2	101	87	-0.020	7.94	1.07
425	67.560	0.164	1.15	94	2	102	87	-0.020	7.92	1.08
426	67.723	0.163	1.14	94	2	101	85	-0.020	7.89	1.08
427	67.887	0.164	1.14	94	2	102	82	-0.020	7.92	1.07
428	68.047	0.160	1.15	94	2	99	81	-0.020	7.84	1.06
429	68.210	0.163	1.17	93	2	101	82	-0.020	7.92	1.05
430	68.372	0.162	1.14	93	2	101	83	-0.020	7.86	1.05
431	68.534	0.162	1.15	93	2	101	86	-0.020	7.89	1.05
432	68.694	0.160	1.15	93	2	99	87	-0.020	7.83	1.06
433	68.859	0.165	1.15	93	2	103	86	-0.020	7.89	1.05
434	69.018	0.159	1.16	93	2	99	84	-0.020	7.90	1.05
435	69.179	0.161	1.15	93	2	100	82	-0.010	7.88	1.05
436	69.340	0.161	1.16	93	2	100	81	-0.020	7.89	1.06
437	69.503	0.163	1.17	93	2	101	82	-0.010	7.91	1.06
438	69.668	0.165	1.16	93	2	103	84	-0.020	7.97	1.06
439	69.830	0.162	1.17	93	2	101	86	-0.020	7.97	1.05
440	69.994	0.164	1.17	93	2	102	87	-0.020	7.95	1.05
441	70.155	0.161	1.16	93	2	100	86	-0.020	7.98	1.06
442	70.318	0.163	1.16	93	2	101	84	-0.020	8.01	1.05
443	70.478	0.160	1.17	93	2	99	82	-0.010	7.99	1.06
444	70.641	0.163	1.16	93	2	101	81	-0.020	7.99	1.07
445	70.803	0.162	1.17	93	2	101	82	-0.020	8.02	1.05
446	70.966	0.163	1.16	93	2	101	83	-0.020	8.02	1.05
447	71.125	0.159	1.18	93	2	99	86	-0.010	8.03	1.06

BOX B TEST DATA - ASTM E3053 / ASTM E2515

Client: Pacific Energy
Model: FP25
Run #: 2

Job #: 19-537
Tracking #: 0048
Technician: SJB
Date: 11/25/2019

	Particulate Sampling Data							Flue Gas Data		
Elapsed Time (min)	Gas Meter (ft^3)	Sample Rate (cfm)	Orifice dH (in H_2O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Filter (°F)	Flue Draft (in H_2O)	CO_2 (%)	CO (%)
448	71.288	0.163	1.18	93	2	101	87	-0.020	8.07	1.07
449	71.451	0.163	1.16	93	2	101	86	-0.020	8.16	1.08
450	71.612	0.161	1.16	93	2	100	84	-0.020	8.10	1.07
451	71.775	0.163	1.16	93	2	101	82	-0.020	8.09	1.07
452	71.936	0.161	1.15	93	2	100	81	-0.020	8.11	1.06
453	72.098	0.162	1.16	93	2	101	82	-0.010	8.12	1.06
454	72.257	0.159	1.15	93	2	99	84	-0.020	8.05	1.06
455	72.419	0.162	1.16	93	2	101	86	-0.020	8.01	1.05
456	72.580	0.161	1.15	93	2	100	87	-0.020	8.03	1.04
457	72.743	0.163	1.16	93	2	101	86	-0.020	8.01	1.06
458	72.904	0.161	1.15	93	2	100	83	-0.020	8.00	1.06
459	73.067	0.163	1.17	93	2	101	82	-0.020	8.01	1.05
460	73.229	0.162	1.15	93	2	101	81	-0.010	8.01	1.05
461	73.390	0.161	1.17	93	2	100	82	-0.020	7.97	1.05
462	73.552	0.162	1.16	93	2	101	84	-0.020	7.94	1.10
463	73.710	0.158	1.16	93	2	98	86	-0.020	7.92	1.10
464	73.872	0.162	1.16	93	2	101	87	-0.020	7.89	1.15
465	74.033	0.161	1.16	93	2	100	86	-0.010	7.90	1.19
466	74.195	0.162	1.16	93	2	101	84	-0.020	7.90	1.20
467	74.356	0.161	1.15	93	2	100	82	-0.020	7.83	1.20
468	74.518	0.162	1.15	93	2	101	81	-0.020	7.75	1.22
469	74.679	0.161	1.16	93	2	100	82	-0.020	7.77	1.21
470	74.842	0.163	1.15	93	2	101	84	-0.020	7.79	1.21
471	75.007	0.165	1.16	93	2	103	86	-0.020	7.80	1.18
472	75.168	0.161	1.16	93	2	100	88	-0.010	7.80	1.16
473	75.331	0.163	1.17	93	2	101	87	-0.020	7.64	1.15
474	75.492	0.161	1.16	93	2	100	84	-0.010	7.59	1.16
475	75.656	0.164	1.15	93	2	102	82	-0.020	7.58	1.15
476	75.818	0.162	1.15	93	2	101	81	-0.020	7.57	1.13
477	75.980	0.162	1.14	93	2	101	82	-0.010	7.65	1.13
478	76.142	0.162	1.17	93	2	101	83	-0.010	7.74	1.12
479	76.303	0.161	1.14	93	2	100	86	-0.030	7.76	1.13

BOX B TEST DATA - ASTM E3053 / ASTM E2515

Client: Pacific Energy
Model: FP25
Run #: 2

Job #: 19-537
Tracking #: 0048
Technician: SJB
Date: 11/25/2019

	Particulate Sampling Data							Flue Gas Data		
Elapsed Time (min)	Gas Meter (ft^3)	Sample Rate (cfm)	Orifice dH (in H_2O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Filter (°F)	Flue Draft (in H_2O)	CO_2 (%)	CO (%)
480	76.466	0.163	1.15	93	2	101	87	-0.020	7.73	1.14
481	76.626	0.160	1.16	93	2	99	86	-0.020	7.73	1.12
482	76.790	0.164	1.15	93	2	102	84	-0.010	7.75	1.12
483	76.951	0.161	1.15	93	2	100	86	-0.020	7.68	1.13
484	77.115	0.164	1.15	93	2	102	87	-0.020	7.74	1.12
485	77.274	0.159	1.15	93	2	99	86	-0.020	7.75	1.13
486	77.435	0.161	1.15	93	2	100	84	-0.020	7.66	1.13
487	77.598	0.163	1.16	93	2	101	82	-0.010	7.69	1.13
488	77.760	0.162	1.15	93	2	101	81	-0.020	7.68	1.14
489	77.921	0.161	1.14	93	2	100	82	-0.010	7.71	1.14
490	78.081	0.160	1.15	93	2	99	84	-0.020	7.73	1.15
491	78.245	0.164	1.16	93	2	102	86	-0.020	7.68	1.15
492	78.403	0.158	1.16	93	2	98	88	-0.020	7.71	1.15
493	78.565	0.162	1.16	93	2	101	87	-0.020	7.67	1.15
494	78.726	0.161	1.15	93	2	100	84	-0.020	7.68	1.15
495	78.886	0.160	1.16	93	2	99	82	-0.010	7.66	1.14
496	79.047	0.161	1.17	93	2	100	81	-0.020	7.65	1.14
497	79.207	0.160	1.15	93	2	99	82	-0.020	7.64	1.15
498	79.370	0.163	1.15	93	2	101	83	-0.010	7.63	1.13
499	79.530	0.160	1.15	93	2	100	86	-0.010	7.61	1.13
500	79.693	0.163	1.17	93	2	102	87	-0.010	7.65	1.12
501	79.855	0.162	1.16	93	2	101	86	-0.010	7.64	1.12
502	80.016	0.161	1.15	93	2	100	85	-0.020	7.68	1.11
503	80.179	0.163	1.17	93	2	102	83	-0.020	7.66	1.12
504	80.339	0.160	1.16	93	2	100	86	-0.010	7.68	1.12
505	80.505	0.166	1.15	93	2	103	87	-0.020	7.68	1.11
506	80.666	0.161	1.15	93	2	100	87	-0.020	7.66	1.11
507	80.829	0.163	1.16	93	2	101	85	-0.020	7.65	1.11
508	80.991	0.162	1.16	93	2	101	82	-0.020	7.71	1.10
509	81.152	0.161	1.15	93	2	100	81	-0.010	7.72	1.11
510	81.312	0.160	1.15	93	2	100	82	-0.010	7.65	1.11
511	81.472	0.160	1.14	93	2	100	84	-0.020	7.70	1.11

BOX B TEST DATA - ASTM E3053 / ASTM E2515

Client: Pacific Energy
Model: FP25
Run #: 2

Job #: 19-537
Tracking #: 0048
Technician: SJB
Date: 11/25/2019

	Particulate Sampling Data							Flue Gas Data		
Elapsed Time (min)	Gas Meter (ft^3)	Sample Rate (cfm)	Orifice dH (in H_2O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Filter (°F)	Flue Draft (in H_2O)	CO_2 (%)	CO (%)
512	81.634	0.162	1.17	93	2	101	86	-0.020	7.71	1.11
513	81.794	0.160	1.13	93	2	100	88	-0.020	7.76	1.12
514	81.957	0.163	1.17	93	2	102	86	-0.020	7.79	1.10
515	82.115	0.158	1.15	93	2	98	84	-0.010	7.80	1.09
516	82.277	0.162	1.16	93	2	101	82	-0.020	7.76	1.09
517	82.438	0.161	1.15	93	2	100	81	-0.020	7.85	1.10
518	82.599	0.161	1.14	93	2	100	82	-0.020	7.79	1.11
519	82.763	0.164	1.15	93	2	102	84	-0.020	7.79	1.10
520	82.923	0.160	1.13	93	2	100	87	-0.020	7.77	1.11
521	83.086	0.163	1.16	93	2	102	87	-0.020	7.76	1.10
522	83.248	0.162	1.16	93	2	101	86	-0.020	7.80	1.10
523	83.410	0.162	1.15	93	2	101	83	-0.020	7.82	1.11
524	83.575	0.165	1.14	93	2	103	82	-0.020	7.75	1.11
525	83.736	0.161	1.15	93	2	100	81	-0.020	7.72	1.10
526	83.898	0.162	1.15	93	2	101	82	-0.010	7.67	1.10
527	84.059	0.161	1.15	93	2	100	84	-0.010	7.71	1.10
528	84.220	0.161	1.16	93	2	100	87	-0.020	7.63	1.10
529	84.380	0.160	1.16	93	2	100	87	-0.020	7.67	1.10
530	84.542	0.162	1.16	93	2	101	85	-0.020	7.62	1.10
531	84.704	0.162	1.16	93	2	101	83	-0.020	7.63	1.09
532	84.865	0.161	1.16	93	2	100	81	-0.010	7.66	1.09
533	85.026	0.161	1.16	93	2	100	81	-0.020	7.64	1.10
534	85.185	0.159	1.15	93	2	99	82	-0.020	7.65	1.11
535	85.347	0.162	1.15	93	2	101	85	-0.020	7.69	1.09
536	85.507	0.160	1.15	93	2	100	87	-0.010	7.64	1.10
537	85.669	0.162	1.16	93	2	101	87	-0.020	7.71	1.10
538	85.831	0.162	1.15	93	2	101	85	-0.020	7.66	1.09
539	85.990	0.159	1.16	93	2	99	82	-0.020	7.69	1.10
540	86.151	0.161	1.16	93	2	100	81	-0.020	7.74	1.09
541	86.312	0.161	1.14	93	2	100	81	-0.010	7.76	1.12
542	86.473	0.161	1.15	93	2	100	82	-0.020	7.77	1.12
543	86.634	0.161	1.15	93	2	100	85	-0.020	7.78	1.12

BOX B TEST DATA - ASTM E3053 / ASTM E2515

Client: Pacific Energy
Model: FP25
Run #: 2

Job #: 19-537
Tracking #: 0048
Technician: SJB
Date: 11/25/2019

	Particulate Sampling Data							Flue Gas Data		
Elapsed Time (min)	Gas Meter (ft^3)	Sample Rate (cfm)	Orifice dH (in H_2O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Filter (°F)	Flue Draft (in H_2O)	CO_2 (%)	CO (%)
544	86.794	0.160	1.15	93	2	100	87	-0.010	7.81	1.11
545	86.957	0.163	1.15	93	2	102	86	-0.020	7.81	1.11
546	87.115	0.158	1.14	93	2	99	84	-0.010	7.82	1.12
547	87.277	0.162	1.15	93	2	101	82	-0.010	7.79	1.12
548	87.438	0.161	1.15	93	2	100	81	-0.020	7.88	1.13
549	87.599	0.161	1.13	93	2	100	81	-0.020	7.84	1.12
550	87.761	0.162	1.16	93	2	101	83	-0.020	7.85	1.12
551	87.919	0.158	1.15	93	2	98	85	-0.020	7.86	1.13
552	88.081	0.162	1.16	93	2	101	87	-0.020	7.77	1.14
553	88.240	0.159	1.15	93	2	99	87	-0.020	7.66	1.15
554	88.401	0.161	1.14	93	2	100	84	-0.010	7.63	1.14
555	88.565	0.164	1.16	93	2	102	82	-0.020	7.55	1.14
556	88.725	0.160	1.15	93	2	100	81	-0.010	7.53	1.13
557	88.887	0.162	1.14	93	2	101	81	-0.010	7.58	1.14
558	89.046	0.159	1.15	93	2	99	83	-0.020	7.54	1.13
559	89.209	0.163	1.15	93	2	102	85	-0.020	7.55	1.12
560	89.370	0.161	1.16	93	2	100	87	-0.020	7.52	1.13
561	89.533	0.163	1.13	93	2	102	87	-0.020	7.56	1.10
562	89.695	0.162	1.15	93	2	101	84	-0.020	7.43	1.08
563	89.855	0.160	1.16	93	2	100	82	-0.020	7.43	1.08
564	90.017	0.162	1.15	93	2	101	81	-0.020	7.42	1.09
565	90.178	0.161	1.15	93	2	100	81	-0.020	7.39	1.08
566	90.340	0.162	1.13	93	2	101	83	-0.020	7.41	1.08
567	90.500	0.160	1.17	93	2	100	85	-0.020	7.49	1.08
568	90.661	0.161	1.14	93	2	100	87	-0.020	7.41	1.07
569	90.822	0.161	1.14	93	2	100	87	-0.020	7.41	1.08
570	90.982	0.160	1.15	93	2	100	85	-0.020	7.40	1.09
571	91.145	0.163	1.15	93	2	101	82	-0.020	7.40	1.07
572	91.308	0.163	1.14	93	2	102	81	-0.010	7.45	1.08
573	91.468	0.160	1.15	93	2	100	82	-0.010	7.43	1.08
574	91.630	0.162	1.15	93	2	101	83	-0.010	7.38	1.08
575	91.789	0.159	1.14	93	2	99	86	-0.020	7.43	1.07

BOX B TEST DATA - ASTM E3053 / ASTM E2515

Client: Pacific Energy
Model: FP25
Run #: 2

Job #: 19-537
Tracking #: 0048
Technician: SJB
Date: 11/25/2019

	Particulate Sampling Data							Flue Gas Data		
Elapsed Time (min)	Gas Meter (ft^3)	Sample Rate (cfm)	Orifice dH (in H_2O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Filter (°F)	Flue Draft (in H_2O)	CO_2 (%)	CO (%)
576	91.951	0.162	1.15	93	2	101	87	-0.010	7.43	1.08
577	92.112	0.161	1.14	93	2	100	86	-0.020	7.43	1.07
578	92.273	0.161	1.14	93	2	100	84	-0.020	7.38	1.07
579	92.435	0.162	1.16	93	2	101	82	-0.010	7.39	1.07
580	92.594	0.159	1.13	93	2	99	81	-0.010	7.38	1.07
581	92.756	0.162	1.15	93	2	101	82	-0.020	7.32	1.05
582	92.918	0.162	1.15	93	2	101	84	-0.010	7.33	1.05
583	93.079	0.161	1.14	93	2	100	86	-0.020	7.30	1.06
584	93.240	0.161	1.16	93	2	100	87	-0.010	7.32	1.06
585	93.399	0.159	1.15	93	2	99	86	-0.020	7.34	1.06
586	93.560	0.161	1.13	93	2	100	84	-0.020	7.33	1.06
587	93.720	0.160	1.16	93	2	100	82	-0.020	7.33	1.05
588	93.879	0.159	1.14	93	2	99	81	-0.020	7.32	1.04
589	94.042	0.163	1.15	93	2	102	82	-0.020	7.32	1.05
590	94.201	0.159	1.13	93	2	99	83	-0.020	7.27	1.09
591	94.364	0.163	1.15	93	2	102	86	-0.020	7.23	1.11
592	94.523	0.159	1.14	93	2	99	87	-0.020	7.28	1.13
593	94.683	0.160	1.14	93	2	100	86	-0.020	7.25	1.13
594	94.845	0.162	1.16	93	2	101	84	-0.020	7.26	1.13
595	95.007	0.162	1.15	93	2	101	82	-0.020	7.32	1.14
596	95.168	0.161	1.14	93	2	100	81	-0.020	7.31	1.13
597	95.330	0.162	1.14	93	2	101	82	-0.020	7.27	1.12
598	95.489	0.159	1.14	93	2	99	84	-0.020	7.28	1.12
599	95.652	0.163	1.14	93	2	101	86	-0.010	7.30	1.14
600	95.811	0.159	1.15	93	2	99	87	-0.020	7.29	1.13
601	95.973	0.162	1.14	93	2	101	86	-0.020	7.28	1.12
602	96.133	0.160	1.14	93	2	100	83	-0.020	7.26	1.13
603	96.293	0.160	1.15	93	2	100	82	-0.020	7.28	1.11
604	96.456	0.163	1.15	93	2	101	81	-0.020	7.31	1.12
605	96.616	0.160	1.15	93	2	100	82	-0.020	7.26	1.12
606	96.778	0.162	1.14	93	2	101	84	-0.010	7.28	1.11
607	96.936	0.158	1.15	93	2	99	86	-0.020	7.28	1.12

BOX B TEST DATA - ASTM E3053 / ASTM E2515

Client: Pacific Energy
Model: FP25
Run #: 2

Job #: 19-537
Tracking #: 0048
Technician: SJB
Date: 11/25/2019

	Particulate Sampling Data							Flue Gas Data		
Elapsed Time (min)	Gas Meter (ft^3)	Sample Rate (cfm)	Orifice dH (in H_2O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Filter (°F)	Flue Draft (in H_2O)	CO_2 (%)	CO (%)
608	97.096	0.160	1.14	93	2	100	86	-0.010	7.28	1.13
609	97.256	0.160	1.14	93	2	100	84	-0.020	7.29	1.12
610	97.417	0.161	1.16	93	2	100	82	-0.020	7.31	1.11
611	97.581	0.164	1.15	93	2	102	81	-0.020	7.30	1.12
612	97.739	0.158	1.15	93	2	98	82	-0.020	7.28	1.12
613	97.899	0.160	1.14	93	2	100	84	-0.020	7.28	1.10
614	98.060	0.161	1.14	93	2	100	86	-0.020	7.28	1.10
615	98.218	0.158	1.15	93	2	98	87	-0.020	7.27	1.11
616	98.380	0.162	1.14	93	2	101	86	-0.020	7.29	1.10
617	98.541	0.161	1.16	93	2	100	83	-0.020	7.27	1.10
618	98.703	0.162	1.14	93	2	101	82	-0.020	7.23	1.11
619	98.864	0.161	1.14	93	2	100	81	-0.020	7.33	1.11
620	99.022	0.158	1.15	93	2	98	82	-0.010	7.25	1.12
621	99.186	0.164	1.13	93	2	102	84	-0.010	7.30	1.11
622	99.347	0.161	1.14	93	2	100	86	-0.020	7.25	1.11
623	99.506	0.159	1.12	93	2	99	87	-0.020	7.29	1.11
624	99.667	0.161	1.14	93	2	100	86	-0.020	7.25	1.09
625	99.826	0.159	1.13	93	2	99	84	-0.020	7.25	1.10
626	99.986	0.160	1.15	93	2	100	82	-0.020	7.29	1.10
627	100.146	0.160	1.14	93	2	100	81	-0.010	7.28	1.10
628	100.306	0.160	1.14	93	2	100	82	-0.010	7.23	1.09
629	100.466	0.160	1.14	93	2	100	84	-0.010	7.17	1.09
630	100.625	0.159	1.14	93	2	99	86	-0.020	7.16	1.09
631	100.786	0.161	1.14	93	2	100	88	-0.010	7.08	1.09
632	100.948	0.162	1.14	93	2	101	87	-0.020	7.10	1.09
633	101.109	0.161	1.14	93	2	100	84	-0.010	7.10	1.10
634	101.272	0.163	1.16	93	2	102	82	-0.010	7.13	1.09
635	101.431	0.159	1.15	93	2	99	81	-0.020	7.10	1.09
636	101.592	0.161	1.14	93	2	100	82	-0.010	7.05	1.08
637	101.754	0.162	1.16	93	2	101	83	-0.010	7.06	1.09
638	101.912	0.158	1.14	93	2	98	86	-0.010	7.06	1.09
639	102.073	0.161	1.13	93	2	100	87	-0.020	7.05	1.08

BOX B TEST DATA - ASTM E3053 / ASTM E2515

Client: Pacific Energy
Model: FP25
Run #: 2
Job #: 19-537
Tracking #: 0048
Technician: SJB
Date: 11/25/2019

	Particulate Sampling Data							Flue Gas Data		
Elapsed Time (min)	Gas Meter (ft^3)	Sample Rate (cfm)	Orifice dH (in H_2O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Filter (°F)	Flue Draft (in H_2O)	CO_2 (%)	CO (%)
640	102.232	0.159	1.14	93	2	99	86	-0.010	7.00	1.09
641	102.393	0.161	1.14	93	2	100	85	-0.020	7.04	1.09
642	102.554	0.161	1.14	93	2	100	83	-0.010	7.03	1.10
643	102.714	0.160	1.14	93	2	100	86	-0.020	7.02	1.09
644	102.875	0.161	1.15	93	2	100	87	-0.020	7.01	1.09
645	103.037	0.162	1.14	93	2	101	87	-0.020	7.00	1.08
646	103.197	0.160	1.15	93	2	100	85	-0.010	7.05	1.10
647	103.359	0.162	1.15	93	2	101	82	-0.010	7.06	1.09
648	103.518	0.159	1.14	93	2	99	81	-0.010	7.06	1.10
Avg/Tot	103.518	0.160	1.13	94	2.00	100	84	-0.034	9.53	1.01

WOODSTOVE SURFACE TEMPERATURE DATA

Client: Pacific Energy
Model: FP25
Run #: 2

Job #: 19-537
Tracking #: 0048
Technician: SJB
Date: 11/25/2019

	Temperature Data (°F)						
Elapsed Time (min)	FB Left	FB Right	FB Back	FB Top	FB Bottom	Stove Surface Average	Catalyst Exit
0	439	397	516	666	569	517.4	N/A
1	448	407	524	663	573	523.0	N/A
2	457	416	527	661	576	527.4	N/A
3	464	424	527	675	578	533.6	N/A
4	470	431	526	702	580	541.8	N/A
5	475	437	523	736	580	550.2	N/A
6	479	441	521	770	580	558.2	N/A
7	482	445	518	799	581	565.0	N/A
8	485	448	515	819	580	569.4	N/A
9	487	451	513	833	580	572.8	N/A
10	488	453	509	843	578	574.2	N/A
11	481	446	496	837	577	567.4	N/A
12	467	435	481	831	575	557.8	N/A
13	453	425	466	821	574	547.8	N/A
14	441	414	451	809	572	537.4	N/A
15	431	404	437	795	569	527.2	N/A
16	420	395	424	781	567	517.4	N/A
17	412	387	412	767	565	508.6	N/A
18	404	381	401	755	562	500.6	N/A
19	397	375	390	745	560	493.4	N/A
20	390	370	381	736	557	486.8	N/A
21	384	365	372	729	554	480.8	N/A
22	378	360	365	721	551	475.0	N/A
23	374	356	358	715	548	470.2	N/A
24	369	352	351	709	545	465.2	N/A
25	365	349	345	703	542	460.8	N/A
26	361	345	339	698	539	456.4	N/A
27	357	341	334	694	535	452.2	N/A
28	354	337	329	691	532	448.6	N/A
29	351	334	325	690	529	445.8	N/A
30	348	331	320	689	525	442.6	N/A
31	345	329	316	689	522	440.2	N/A
32	343	327	313	688	518	437.8	N/A
33	340	324	309	688	515	435.2	N/A
34	338	322	306	688	511	433.0	N/A
35	336	320	303	687	508	430.8	N/A
36	335	319	300	686	505	429.0	N/A
37	332	317	297	684	501	426.2	N/A
38	330	315	295	681	498	423.8	N/A
39	329	314	292	676	495	421.2	N/A
40	328	312	290	671	492	418.6	N/A
41	326	312	288	666	489	416.2	N/A
42	325	311	286	661	486	413.8	N/A
43	324	311	284	657	483	411.8	N/A
44	322	309	282	652	480	409.0	N/A
45	321	308	281	649	477	407.2	N/A
46	320	307	279	645	474	405.0	N/A
47	319	307	278	642	471	403.4	N/A

WOODSTOVE SURFACE TEMPERATURE DATA

Client: Pacific Energy
Model: FP25
Run #: 2

Job #: 19-537
Tracking #: 0048
Technician: SJB
Date: 11/25/2019

	Temperature Data (°F)						
Elapsed Time (min)	FB Left	FB Right	FB Back	FB Top	FB Bottom	Stove Surface Average	Catalyst Exit
48	318	306	276	639	468	401.4	N/A
49	318	305	275	637	465	400.0	N/A
50	317	304	274	634	462	398.2	N/A
51	316	304	273	631	459	396.6	N/A
52	316	303	272	628	456	395.0	N/A
53	316	303	271	625	453	393.6	N/A
54	315	303	270	622	450	392.0	N/A
55	315	303	269	619	448	390.8	N/A
56	315	302	268	616	445	389.2	N/A
57	315	302	267	614	442	388.0	N/A
58	315	302	267	611	440	387.0	N/A
59	314	301	266	610	437	385.6	N/A
60	314	302	266	608	434	384.8	N/A
61	314	302	265	607	432	384.0	N/A
62	314	302	265	606	429	383.2	N/A
63	314	301	264	605	427	382.2	N/A
64	314	301	264	604	424	381.4	N/A
65	314	301	263	603	422	380.6	N/A
66	315	301	263	601	419	379.8	N/A
67	315	301	263	599	416	378.8	N/A
68	315	300	262	597	414	377.6	N/A
69	315	299	262	595	411	376.4	N/A
70	315	300	262	593	409	375.8	N/A
71	314	299	262	591	406	374.4	N/A
72	314	300	262	589	404	373.8	N/A
73	315	300	261	588	402	373.2	N/A
74	315	301	261	586	400	372.6	N/A
75	315	301	261	585	397	371.8	N/A
76	314	300	260	584	395	370.6	N/A
77	314	300	260	584	393	370.2	N/A
78	314	300	260	583	391	369.6	N/A
79	314	300	259	583	389	369.0	N/A
80	313	300	259	582	387	368.2	N/A
81	313	300	259	582	385	367.8	N/A
82	313	300	259	582	384	367.6	N/A
83	313	300	259	584	382	367.6	N/A
84	313	300	259	585	381	367.6	N/A
85	313	301	259	586	379	367.6	N/A
86	313	300	258	586	378	367.0	N/A
87	313	300	258	586	376	366.6	N/A
88	312	301	258	586	375	366.4	N/A
89	312	301	258	586	374	366.2	N/A
90	312	301	258	586	373	366.0	N/A
91	312	301	258	586	372	365.8	N/A
92	312	301	258	586	371	365.6	N/A
93	312	301	258	586	370	365.4	N/A
94	312	302	258	586	369	365.4	N/A
95	312	302	258	587	368	365.4	N/A

WOODSTOVE SURFACE TEMPERATURE DATA

Client: Pacific Energy
Model: FP25
Run #: 2

Job #: 19-537
Tracking #: 0048
Technician: SJB
Date: 11/25/2019

	Temperature Data (°F)						
Elapsed Time (min)	FB Left	FB Right	FB Back	FB Top	FB Bottom	Stove Surface Average	Catalyst Exit
96	312	302	258	587	368	365.4	N/A
97	312	302	258	587	367	365.2	N/A
98	312	302	258	586	366	364.8	N/A
99	312	302	258	586	366	364.8	N/A
100	311	303	258	585	365	364.4	N/A
101	311	303	257	585	364	364.0	N/A
102	311	303	257	584	364	363.8	N/A
103	310	303	257	582	364	363.2	N/A
104	309	302	257	579	363	362.0	N/A
105	309	302	257	576	363	361.4	N/A
106	308	301	256	573	363	360.2	N/A
107	307	300	256	570	363	359.2	N/A
108	307	299	256	566	363	358.2	N/A
109	306	298	256	563	363	357.2	N/A
110	305	297	255	559	364	356.0	N/A
111	305	296	255	555	364	355.0	N/A
112	305	297	255	550	365	354.4	N/A
113	304	297	255	545	365	353.2	N/A
114	304	296	254	540	366	352.0	N/A
115	303	295	254	535	366	350.6	N/A
116	302	294	254	529	367	349.2	N/A
117	302	293	253	524	367	347.8	N/A
118	302	293	253	518	368	346.8	N/A
119	301	293	252	514	368	345.6	N/A
120	300	292	252	509	369	344.4	N/A
121	299	291	251	504	369	342.8	N/A
122	298	289	251	500	369	341.4	N/A
123	298	288	250	495	370	340.2	N/A
124	297	288	250	491	370	339.2	N/A
125	296	287	249	486	370	337.6	N/A
126	295	285	249	482	371	336.4	N/A
127	295	284	248	477	371	335.0	N/A
128	294	283	248	472	372	333.8	N/A
129	293	282	247	467	372	332.2	N/A
130	292	282	247	462	372	331.0	N/A
131	291	282	246	458	373	330.0	N/A
132	290	280	246	453	373	328.4	N/A
133	290	279	245	450	374	327.6	N/A
134	289	278	245	446	375	326.6	N/A
135	288	277	244	444	375	325.6	N/A
136	288	275	244	441	376	324.8	N/A
137	287	275	243	438	376	323.8	N/A
138	287	274	243	436	377	323.4	N/A
139	286	273	243	434	377	322.6	N/A
140	285	271	243	432	378	321.8	N/A
141	285	271	242	430	379	321.4	N/A
142	285	270	242	428	379	320.8	N/A
143	284	270	242	425	380	320.2	N/A

WOODSTOVE SURFACE TEMPERATURE DATA

Client: Pacific Energy
Model: FP25
Run #: 2

Job #: 19-537
Tracking #: 0048
Technician: SJB
Date: 11/25/2019

	Temperature Data (°F)						
Elapsed Time (min)	FB Left	FB Right	FB Back	FB Top	FB Bottom	Stove Surface Average	Catalyst Exit
144	284	270	242	423	380	319.8	N/A
145	283	269	242	420	381	319.0	N/A
146	282	268	242	418	382	318.4	N/A
147	282	266	242	415	382	317.4	N/A
148	281	267	242	413	383	317.2	N/A
149	281	265	242	411	384	316.6	N/A
150	280	266	242	409	384	316.2	N/A
151	280	266	243	408	385	316.4	N/A
152	279	266	243	406	385	315.8	N/A
153	278	265	243	404	386	315.2	N/A
154	278	264	243	401	386	314.4	N/A
155	278	264	243	399	387	314.2	N/A
156	277	263	243	397	387	313.4	N/A
157	277	263	243	394	388	313.0	N/A
158	276	262	243	391	389	312.2	N/A
159	276	263	242	388	389	311.6	N/A
160	275	263	242	384	390	310.8	N/A
161	275	261	243	381	390	310.0	N/A
162	274	260	242	378	391	309.0	N/A
163	274	259	242	375	391	308.2	N/A
164	273	258	242	372	392	307.4	N/A
165	272	257	242	369	392	306.4	N/A
166	272	257	242	367	392	306.0	N/A
167	271	256	242	364	392	305.0	N/A
168	270	256	242	363	393	304.8	N/A
169	270	255	242	361	393	304.2	N/A
170	269	255	242	360	393	303.8	N/A
171	269	254	243	359	393	303.6	N/A
172	268	253	243	358	394	303.2	N/A
173	268	252	243	357	394	302.8	N/A
174	267	252	244	356	394	302.6	N/A
175	267	253	244	355	394	302.6	N/A
176	266	254	245	354	394	302.6	N/A
177	266	255	245	351	395	302.4	N/A
178	265	255	245	349	395	301.8	N/A
179	269	258	250	347	396	304.0	N/A
180	269	258	249	353	399	305.6	N/A
181	268	258	248	351	399	304.8	N/A
182	267	257	248	345	397	302.8	N/A
183	267	256	247	345	397	302.4	N/A
184	264	255	246	342	398	301.0	N/A
185	265	255	246	328	393	297.4	N/A
186	263	253	247	325	393	296.2	N/A
187	265	253	244	331	397	298.0	N/A
188	262	254	244	323	394	295.4	N/A
189	266	252	243	316	392	293.8	N/A
190	261	251	242	323	393	294.0	N/A
191	261	250	240	312	390	290.6	N/A

WOODSTOVE SURFACE TEMPERATURE DATA

Client: Pacific Energy
Model: FP25
Run #: 2

Job #: 19-537
Tracking #: 0048
Technician: SJB
Date: 11/25/2019

	Temperature Data (°F)						
Elapsed Time (min)	FB Left	FB Right	FB Back	FB Top	FB Bottom	Stove Surface Average	Catalyst Exit
192	260	248	240	308	390	289.2	N/A
193	257	247	242	307	388	288.2	N/A
194	255	246	240	310	391	288.4	N/A
195	257	245	238	302	387	285.8	N/A
196	258	244	236	311	389	287.6	N/A
197	255	242	240	301	387	285.0	N/A
198	255	243	247	298	387	286.0	N/A
199	253	241	244	294	385	283.4	N/A
200	253	241	236	293	386	281.8	N/A
201	249	239	234	316	388	285.2	N/A
202	259	243	231	298	386	283.4	N/A
203	254	238	230	288	384	278.8	N/A
204	249	236	231	298	386	280.0	N/A
205	247	235	231	285	383	276.2	N/A
206	247	235	230	285	382	275.8	N/A
207	244	234	230	289	383	276.0	N/A
208	247	235	227	283	382	274.8	N/A
209	245	233	226	283	382	273.8	N/A
210	245	231	226	280	383	273.0	N/A
211	241	230	227	277	385	272.0	N/A
212	240	231	224	276	379	270.0	N/A
213	241	231	224	273	378	269.4	N/A
214	239	231	226	278	378	270.4	N/A
215	238	228	231	280	382	271.8	N/A
216	237	227	225	279	381	269.8	N/A
217	237	228	224	287	391	273.4	N/A
218	239	231	223	277	377	269.4	N/A
219	241	225	221	275	377	267.8	N/A
220	232	224	226	273	375	266.0	N/A
221	232	225	225	265	375	264.4	N/A
222	234	232	220	262	372	264.0	N/A
223	234	232	220	274	375	267.0	N/A
224	237	225	219	260	371	262.4	N/A
225	231	222	220	271	375	263.8	N/A
226	226	221	221	258	370	259.2	N/A
227	226	238	218	266	370	263.6	N/A
228	226	221	219	266	371	260.6	N/A
229	223	218	217	254	367	255.8	N/A
230	222	218	217	253	367	255.4	N/A
231	222	217	216	252	366	254.6	N/A
232	221	217	216	251	366	254.2	N/A
233	220	216	216	250	365	253.4	N/A
234	219	216	216	249	364	252.8	N/A
235	218	216	216	249	364	252.6	N/A
236	217	215	215	248	363	251.6	N/A
237	217	214	215	247	362	251.0	N/A
238	216	214	215	246	362	250.6	N/A
239	215	214	215	245	361	250.0	N/A

WOODSTOVE SURFACE TEMPERATURE DATA

Client: Pacific Energy
Model: FP25
Run #: 2

Job #: 19-537
Tracking #: 0048
Technician: SJB
Date: 11/25/2019

	Temperature Data (°F)						
Elapsed Time (min)	FB Left	FB Right	FB Back	FB Top	FB Bottom	Stove Surface Average	Catalyst Exit
240	215	214	215	244	361	249.8	N/A
241	214	213	215	244	360	249.2	N/A
242	214	212	214	243	360	248.6	N/A
243	212	211	214	242	359	247.6	N/A
244	212	211	214	242	358	247.4	N/A
245	211	211	214	241	358	247.0	N/A
246	211	210	214	241	357	246.6	N/A
247	211	210	214	240	357	246.4	N/A
248	210	209	213	239	356	245.4	N/A
249	209	209	213	239	356	245.2	N/A
250	209	209	213	238	356	245.0	N/A
251	208	208	213	237	355	244.2	N/A
252	207	207	213	237	355	243.8	N/A
253	207	206	212	236	354	243.0	N/A
254	206	206	212	236	354	242.8	N/A
255	206	206	212	235	353	242.4	N/A
256	206	206	212	235	353	242.4	N/A
257	205	206	212	234	352	241.8	N/A
258	204	205	212	234	352	241.4	N/A
259	204	205	212	233	351	241.0	N/A
260	203	204	212	233	351	240.6	N/A
261	203	203	212	232	350	240.0	N/A
262	203	203	212	232	350	240.0	N/A
263	202	203	212	231	349	239.4	N/A
264	202	203	212	231	348	239.2	N/A
265	201	202	212	230	348	238.6	N/A
266	201	202	212	230	347	238.4	N/A
267	201	202	212	229	347	238.2	N/A
268	201	201	212	229	346	237.8	N/A
269	200	201	212	229	346	237.6	N/A
270	200	201	212	228	345	237.2	N/A
271	199	201	212	228	345	237.0	N/A
272	199	201	212	227	344	236.6	N/A
273	199	200	212	227	344	236.4	N/A
274	198	200	212	227	343	236.0	N/A
275	198	199	212	226	343	235.6	N/A
276	198	198	212	226	342	235.2	N/A
277	197	198	213	226	342	235.2	N/A
278	197	197	213	225	341	234.6	N/A
279	197	197	213	225	341	234.6	N/A
280	196	197	213	225	340	234.2	N/A
281	196	196	213	224	340	233.8	N/A
282	196	196	213	224	339	233.6	N/A
283	196	195	213	224	339	233.4	N/A
284	195	195	213	223	338	232.8	N/A
285	195	195	213	223	338	232.8	N/A
286	195	194	212	223	337	232.2	N/A
287	195	194	212	223	337	232.2	N/A

WOODSTOVE SURFACE TEMPERATURE DATA

Client: Pacific Energy
Model: FP25
Run #: 2

Job #: 19-537
Tracking #: 0048
Technician: SJB
Date: 11/25/2019

	Temperature Data (°F)						
Elapsed Time (min)	FB Left	FB Right	FB Back	FB Top	FB Bottom	Stove Surface Average	Catalyst Exit
288	195	195	212	222	336	232.0	N/A
289	194	194	212	222	336	231.6	N/A
290	194	194	211	222	335	231.2	N/A
291	194	194	211	222	335	231.2	N/A
292	194	193	211	221	334	230.6	N/A
293	194	193	210	221	334	230.4	N/A
294	193	193	210	221	334	230.2	N/A
295	193	193	210	221	333	230.0	N/A
296	193	193	210	221	333	230.0	N/A
297	193	193	209	220	333	229.6	N/A
298	193	192	209	220	332	229.2	N/A
299	193	192	209	220	332	229.2	N/A
300	193	192	208	220	332	229.0	N/A
301	193	192	208	220	331	228.8	N/A
302	193	191	208	219	331	228.4	N/A
303	192	191	207	219	330	227.8	N/A
304	192	191	207	219	330	227.8	N/A
305	192	191	207	219	329	227.6	N/A
306	192	191	207	218	329	227.4	N/A
307	192	190	206	218	328	226.8	N/A
308	191	190	206	218	328	226.6	N/A
309	191	190	206	217	327	226.2	N/A
310	190	190	206	217	326	225.8	N/A
311	190	190	206	217	326	225.8	N/A
312	190	190	205	217	325	225.4	N/A
313	190	190	205	217	324	225.2	N/A
314	190	190	205	217	324	225.2	N/A
315	189	190	205	217	323	224.8	N/A
316	189	190	204	216	323	224.4	N/A
317	189	190	204	216	322	224.2	N/A
318	188	190	204	216	322	224.0	N/A
319	189	190	203	216	321	223.8	N/A
320	189	190	203	216	321	223.8	N/A
321	188	189	203	215	320	223.0	N/A
322	188	189	202	215	320	222.8	N/A
323	188	189	202	215	319	222.6	N/A
324	187	189	201	214	319	222.0	N/A
325	187	189	201	214	318	221.8	N/A
326	186	189	201	214	318	221.6	N/A
327	187	188	200	213	317	221.0	N/A
328	186	188	200	213	317	220.8	N/A
329	186	188	200	213	316	220.6	N/A
330	186	188	199	212	315	220.0	N/A
331	185	188	199	212	315	219.8	N/A
332	185	188	199	211	314	219.4	N/A
333	185	187	199	211	314	219.2	N/A
334	185	187	198	211	313	218.8	N/A
335	185	187	198	210	313	218.6	N/A

WOODSTOVE SURFACE TEMPERATURE DATA

Client: Pacific Energy
Model: FP25
Run #: 2

Job #: 19-537
Tracking #: 0048
Technician: SJB
Date: 11/25/2019

	Temperature Data (°F)						
Elapsed Time (min)	FB Left	FB Right	FB Back	FB Top	FB Bottom	Stove Surface Average	Catalyst Exit
336	184	187	198	210	313	218.4	N/A
337	184	187	197	210	312	218.0	N/A
338	184	186	197	209	312	217.6	N/A
339	184	186	197	209	311	217.4	N/A
340	183	186	196	208	311	216.8	N/A
341	183	186	196	208	310	216.6	N/A
342	182	186	196	208	310	216.4	N/A
343	182	185	195	207	309	215.6	N/A
344	182	185	195	207	309	215.6	N/A
345	182	185	194	207	309	215.4	N/A
346	181	184	194	206	308	214.6	N/A
347	181	184	194	206	308	214.6	N/A
348	181	184	193	206	308	214.4	N/A
349	180	184	193	205	307	213.8	N/A
350	180	184	193	205	307	213.8	N/A
351	180	184	192	205	307	213.6	N/A
352	180	184	192	204	306	213.2	N/A
353	179	184	192	204	306	213.0	N/A
354	179	184	191	204	306	212.8	N/A
355	179	183	191	203	305	212.2	N/A
356	178	183	191	203	305	212.0	N/A
357	178	183	190	202	305	211.6	N/A
358	178	182	190	202	304	211.2	N/A
359	177	183	190	202	304	211.2	N/A
360	177	182	190	201	304	210.8	N/A
361	177	183	190	201	303	210.8	N/A
362	176	182	189	201	303	210.2	N/A
363	176	182	189	200	303	210.0	N/A
364	176	182	189	200	303	210.0	N/A
365	175	181	189	200	302	209.4	N/A
366	175	182	188	199	302	209.2	N/A
367	175	181	188	199	302	209.0	N/A
368	174	182	188	199	301	208.8	N/A
369	174	181	188	198	301	208.4	N/A
370	174	181	187	198	301	208.2	N/A
371	173	181	187	198	301	208.0	N/A
372	173	181	187	197	300	207.6	N/A
373	173	181	187	197	300	207.6	N/A
374	173	181	187	197	300	207.6	N/A
375	172	181	186	196	300	207.0	N/A
376	172	181	186	196	299	206.8	N/A
377	172	180	186	196	299	206.6	N/A
378	172	180	186	195	299	206.4	N/A
379	172	180	186	195	299	206.4	N/A
380	171	180	186	195	298	206.0	N/A
381	171	180	186	194	298	205.8	N/A
382	171	179	186	194	298	205.6	N/A
383	170	179	186	194	298	205.4	N/A

WOODSTOVE SURFACE TEMPERATURE DATA

Client: Pacific Energy
Model: FP25
Run #: 2

Job #: 19-537
Tracking #: 0048
Technician: SJB
Date: 11/25/2019

	Temperature Data (°F)						
Elapsed Time (min)	FB Left	FB Right	FB Back	FB Top	FB Bottom	Stove Surface Average	Catalyst Exit
384	170	179	186	194	297	205.2	N/A
385	170	179	185	193	297	204.8	N/A
386	170	179	185	193	297	204.8	N/A
387	170	179	185	193	296	204.6	N/A
388	170	179	185	193	296	204.6	N/A
389	169	178	185	192	296	204.0	N/A
390	169	178	184	192	295	203.6	N/A
391	169	178	184	192	295	203.6	N/A
392	169	177	184	192	295	203.4	N/A
393	169	178	184	191	294	203.2	N/A
394	168	177	184	191	294	202.8	N/A
395	168	177	183	191	294	202.6	N/A
396	168	177	183	191	294	202.6	N/A
397	168	177	183	190	293	202.2	N/A
398	168	177	183	190	293	202.2	N/A
399	167	177	183	190	293	202.0	N/A
400	167	177	183	190	292	201.8	N/A
401	167	177	183	190	292	201.8	N/A
402	167	177	183	190	292	201.8	N/A
403	167	177	182	189	292	201.4	N/A
404	167	177	182	189	291	201.2	N/A
405	166	177	182	189	291	201.0	N/A
406	166	176	182	189	291	200.8	N/A
407	166	176	182	189	291	200.8	N/A
408	166	176	182	189	290	200.6	N/A
409	166	176	182	188	290	200.4	N/A
410	166	176	182	188	290	200.4	N/A
411	166	176	182	188	290	200.4	N/A
412	166	177	182	188	290	200.6	N/A
413	166	176	181	188	290	200.2	N/A
414	166	176	181	187	289	199.8	N/A
415	165	176	181	187	289	199.6	N/A
416	165	175	181	187	289	199.4	N/A
417	165	175	181	187	289	199.4	N/A
418	165	175	181	187	289	199.4	N/A
419	165	176	181	186	289	199.4	N/A
420	165	176	181	186	288	199.2	N/A
421	165	176	181	186	288	199.2	N/A
422	165	176	181	186	288	199.2	N/A
423	165	175	181	186	288	199.0	N/A
424	164	175	181	186	288	198.8	N/A
425	165	175	181	186	288	199.0	N/A
426	164	175	181	186	288	198.8	N/A
427	164	175	181	186	288	198.8	N/A
428	164	175	181	186	287	198.6	N/A
429	164	175	181	186	287	198.6	N/A
430	164	175	181	185	287	198.4	N/A
431	164	175	181	185	287	198.4	N/A

WOODSTOVE SURFACE TEMPERATURE DATA

Client: Pacific Energy
Model: FP25
Run #: 2

Job #: 19-537
Tracking #: 0048
Technician: SJB
Date: 11/25/2019

	Temperature Data (°F)						
Elapsed Time (min)	FB Left	FB Right	FB Back	FB Top	FB Bottom	Stove Surface Average	Catalyst Exit
432	164	175	181	185	287	198.4	N/A
433	164	174	181	185	287	198.2	N/A
434	164	175	181	185	287	198.4	N/A
435	164	174	181	185	287	198.2	N/A
436	164	175	181	185	287	198.4	N/A
437	164	175	181	185	287	198.4	N/A
438	164	176	181	185	287	198.6	N/A
439	163	175	181	185	286	198.0	N/A
440	163	175	181	185	286	198.0	N/A
441	163	174	182	185	286	198.0	N/A
442	163	175	182	185	286	198.2	N/A
443	163	175	182	185	286	198.2	N/A
444	163	174	182	185	286	198.0	N/A
445	163	175	182	186	286	198.4	N/A
446	163	175	182	186	286	198.4	N/A
447	163	174	182	186	286	198.2	N/A
448	163	175	182	186	286	198.4	N/A
449	163	174	182	186	286	198.2	N/A
450	164	174	182	186	286	198.4	N/A
451	164	174	182	186	285	198.2	N/A
452	163	174	182	186	285	198.0	N/A
453	164	174	182	186	285	198.2	N/A
454	164	175	182	186	285	198.4	N/A
455	163	175	182	186	285	198.2	N/A
456	164	175	182	186	285	198.4	N/A
457	163	175	182	187	285	198.4	N/A
458	164	175	182	187	285	198.6	N/A
459	164	175	182	187	285	198.6	N/A
460	164	174	183	187	285	198.6	N/A
461	164	174	183	187	285	198.6	N/A
462	164	175	183	187	285	198.8	N/A
463	164	174	183	187	284	198.4	N/A
464	164	175	183	187	284	198.6	N/A
465	164	175	183	187	284	198.6	N/A
466	164	175	183	187	284	198.6	N/A
467	165	175	183	187	284	198.8	N/A
468	165	175	184	187	284	199.0	N/A
469	165	174	184	187	284	198.8	N/A
470	165	174	184	187	284	198.8	N/A
471	165	175	184	187	284	199.0	N/A
472	165	174	184	187	284	198.8	N/A
473	165	174	184	187	284	198.8	N/A
474	165	174	184	187	284	198.8	N/A
475	165	174	184	187	284	198.8	N/A
476	165	174	184	187	284	198.8	N/A
477	165	174	184	187	284	198.8	N/A
478	166	174	185	187	283	199.0	N/A
479	166	174	185	187	283	199.0	N/A

WOODSTOVE SURFACE TEMPERATURE DATA

Client: Pacific Energy
Model: FP25
Run #: 2

Job #: 19-537
Tracking #: 0048
Technician: SJB
Date: 11/25/2019

	Temperature Data (°F)						
Elapsed Time (min)	FB Left	FB Right	FB Back	FB Top	FB Bottom	Stove Surface Average	Catalyst Exit
480	166	173	185	186	283	198.6	N/A
481	166	173	185	187	283	198.8	N/A
482	166	173	185	186	283	198.6	N/A
483	166	173	185	186	282	198.4	N/A
484	166	172	185	186	282	198.2	N/A
485	166	172	185	186	282	198.2	N/A
486	166	173	185	186	282	198.4	N/A
487	166	172	185	186	282	198.2	N/A
488	166	172	185	186	281	198.0	N/A
489	166	172	185	186	281	198.0	N/A
490	166	171	185	186	281	197.8	N/A
491	167	171	185	186	281	198.0	N/A
492	166	171	185	185	280	197.4	N/A
493	166	171	186	185	280	197.6	N/A
494	166	171	186	185	280	197.6	N/A
495	166	171	186	185	280	197.6	N/A
496	166	171	186	185	280	197.6	N/A
497	166	170	186	185	279	197.2	N/A
498	166	171	186	185	279	197.4	N/A
499	166	171	186	185	279	197.4	N/A
500	166	171	187	185	279	197.6	N/A
501	167	171	187	184	279	197.6	N/A
502	166	171	187	184	278	197.2	N/A
503	167	170	187	184	278	197.2	N/A
504	166	170	187	184	278	197.0	N/A
505	166	170	187	184	278	197.0	N/A
506	166	170	187	184	278	197.0	N/A
507	166	170	188	184	277	197.0	N/A
508	166	170	188	184	277	197.0	N/A
509	166	170	188	184	277	197.0	N/A
510	167	170	188	184	277	197.2	N/A
511	167	170	188	184	277	197.2	N/A
512	167	171	188	184	277	197.4	N/A
513	167	170	188	184	276	197.0	N/A
514	166	170	188	184	276	196.8	N/A
515	166	170	188	184	276	196.8	N/A
516	166	170	189	184	276	197.0	N/A
517	166	170	189	184	276	197.0	N/A
518	166	170	189	184	276	197.0	N/A
519	166	170	189	184	275	196.8	N/A
520	166	171	189	184	275	197.0	N/A
521	167	171	189	184	275	197.2	N/A
522	167	171	189	184	275	197.2	N/A
523	167	171	189	184	275	197.2	N/A
524	166	171	189	184	275	197.0	N/A
525	166	171	189	184	275	197.0	N/A
526	166	171	189	184	275	197.0	N/A
527	166	170	189	184	274	196.6	N/A

WOODSTOVE SURFACE TEMPERATURE DATA

Client: Pacific Energy
Model: FP25
Run #: 2

Job #: 19-537
Tracking #: 0048
Technician: SJB
Date: 11/25/2019

	Temperature Data (°F)						
Elapsed Time (min)	FB Left	FB Right	FB Back	FB Top	FB Bottom	Stove Surface Average	Catalyst Exit
528	166	170	189	184	274	196.6	N/A
529	166	170	189	184	274	196.6	N/A
530	166	171	189	184	274	196.8	N/A
531	166	171	189	184	274	196.8	N/A
532	167	171	189	184	274	197.0	N/A
533	167	171	189	184	274	197.0	N/A
534	167	172	189	184	273	197.0	N/A
535	166	171	189	184	273	196.6	N/A
536	166	171	189	184	273	196.6	N/A
537	166	171	189	184	273	196.6	N/A
538	166	171	189	184	273	196.6	N/A
539	166	171	189	183	273	196.4	N/A
540	166	171	189	183	273	196.4	N/A
541	166	171	189	183	272	196.2	N/A
542	166	171	189	184	272	196.4	N/A
543	166	171	189	184	272	196.4	N/A
544	166	172	189	184	272	196.6	N/A
545	166	172	189	184	272	196.6	N/A
546	166	173	189	184	272	196.8	N/A
547	166	173	189	184	272	196.8	N/A
548	166	173	189	184	272	196.8	N/A
549	166	173	190	184	271	196.8	N/A
550	166	173	190	184	271	196.8	N/A
551	166	173	190	184	271	196.8	N/A
552	165	173	189	184	271	196.4	N/A
553	165	174	189	184	271	196.6	N/A
554	166	174	189	184	271	196.8	N/A
555	166	174	189	184	271	196.8	N/A
556	166	174	189	184	270	196.6	N/A
557	166	175	189	184	270	196.8	N/A
558	166	175	189	184	270	196.8	N/A
559	166	174	189	184	270	196.6	N/A
560	165	174	189	184	270	196.4	N/A
561	165	174	189	184	270	196.4	N/A
562	165	173	189	184	270	196.2	N/A
563	165	173	189	184	270	196.2	N/A
564	165	173	189	184	270	196.2	N/A
565	165	173	189	183	270	196.0	N/A
566	165	173	189	183	269	195.8	N/A
567	165	172	189	183	269	195.6	N/A
568	164	172	189	183	269	195.4	N/A
569	165	172	189	183	269	195.6	N/A
570	164	172	188	183	269	195.2	N/A
571	165	172	188	182	269	195.2	N/A
572	165	172	188	182	269	195.2	N/A
573	165	172	188	182	269	195.2	N/A
574	165	173	188	182	269	195.4	N/A
575	164	172	188	182	269	195.0	N/A

WOODSTOVE SURFACE TEMPERATURE DATA

Client: Pacific Energy
Model: FP25
Run #: 2

Job #: 19-537
Tracking #: 0048
Technician: SJB
Date: 11/25/2019

	Temperature Data (°F)						
Elapsed Time (min)	FB Left	FB Right	FB Back	FB Top	FB Bottom	Stove Surface Average	Catalyst Exit
576	164	172	188	182	269	195.0	N/A
577	164	172	188	182	269	195.0	N/A
578	164	171	188	182	269	194.8	N/A
579	164	171	188	181	269	194.6	N/A
580	164	171	188	181	268	194.4	N/A
581	163	171	188	181	268	194.2	N/A
582	164	171	188	181	268	194.4	N/A
583	164	172	188	181	268	194.6	N/A
584	164	171	188	181	268	194.4	N/A
585	165	172	188	181	268	194.8	N/A
586	164	172	188	180	268	194.4	N/A
587	164	171	188	180	268	194.2	N/A
588	164	171	188	180	268	194.2	N/A
589	164	171	188	180	268	194.2	N/A
590	163	171	189	180	268	194.2	N/A
591	163	171	189	180	268	194.2	N/A
592	163	170	189	180	268	194.0	N/A
593	163	170	189	180	268	194.0	N/A
594	163	170	189	179	268	193.8	N/A
595	163	169	189	179	267	193.4	N/A
596	163	169	189	179	267	193.4	N/A
597	163	168	189	179	267	193.2	N/A
598	163	168	189	179	267	193.2	N/A
599	163	168	190	179	267	193.4	N/A
600	163	168	190	179	267	193.4	N/A
601	163	167	190	178	267	193.0	N/A
602	163	167	190	178	267	193.0	N/A
603	163	167	191	178	267	193.2	N/A
604	163	167	191	178	267	193.2	N/A
605	163	166	191	178	266	192.8	N/A
606	164	167	192	178	267	193.6	N/A
607	164	167	192	178	266	193.4	N/A
608	164	166	192	177	266	193.0	N/A
609	164	166	192	177	266	193.0	N/A
610	164	166	193	177	266	193.2	N/A
611	164	165	193	177	266	193.0	N/A
612	164	164	193	177	266	192.8	N/A
613	164	165	193	177	266	193.0	N/A
614	164	165	194	177	266	193.2	N/A
615	163	165	194	177	266	193.0	N/A
616	164	164	194	177	266	193.0	N/A
617	164	165	194	176	266	193.0	N/A
618	164	164	194	176	266	192.8	N/A
619	164	164	194	176	266	192.8	N/A
620	164	164	195	176	266	193.0	N/A
621	164	164	195	176	266	193.0	N/A
622	164	164	195	176	266	193.0	N/A
623	164	164	195	176	266	193.0	N/A

WOODSTOVE SURFACE TEMPERATURE DATA

Client: Pacific Energy
Model: FP25
Run #: 2

Job #: 19-537
Tracking #: 0048
Technician: SJB
Date: 11/25/2019

	Temperature Data (°F)						
Elapsed Time (min)	FB Left	FB Right	FB Back	FB Top	FB Bottom	Stove Surface Average	Catalyst Exit
624	164	163	195	176	266	192.8	N/A
625	163	163	195	176	266	192.6	N/A
626	163	163	195	176	265	192.4	N/A
627	163	162	195	176	265	192.2	N/A
628	163	162	195	175	265	192.0	N/A
629	163	162	195	175	265	192.0	N/A
630	163	162	195	175	265	192.0	N/A
631	164	163	195	175	265	192.4	N/A
632	164	162	196	175	265	192.4	N/A
633	164	163	196	175	265	192.6	N/A
634	163	162	196	175	265	192.2	N/A
635	163	162	196	175	265	192.2	N/A
636	163	161	196	175	265	192.0	N/A
637	163	161	196	174	265	191.8	N/A
638	163	161	196	174	265	191.8	N/A
639	163	161	196	174	265	191.8	N/A
640	162	161	197	174	265	191.8	N/A
641	162	161	197	174	265	191.8	N/A
642	162	161	197	174	265	191.8	N/A
643	163	161	197	173	265	191.8	N/A
644	163	161	197	173	265	191.8	N/A
645	163	161	197	173	265	191.8	N/A
646	163	161	197	173	265	191.8	N/A
647	163	161	197	173	265	191.8	N/A
648	162	160	197	173	265	191.4	N/A
Average	221	220	223	306	340	262	N/A

LAB SAMPLE DATA - ASTM E2515

Client: Pacific Energy
Model: FP25
Run #: 2

Job #: 19-537
Tracking #: 0048
Technician: SJB
Date: 11/25/2019

	Sample ID	Tare, mg	Total, mg	Final, mg	Catch, mg
Train A Filters - First Hour	T372	86.7	86.7	88.0	1.3
Train A Filters - Remainder	T373	87.2	174.6	175.7	1.1
	T374	87.4			
Train A Probe	15A	117418.3	117418.3	117418.5	0.2
Train A O-Rings	15A	3570.1	3570.1	3571.1	1.0
Train B Filters	T375	87.1	262.1	265.4	3.3
	T376	87.8			
	T379	87.2			
Train B Probe	15B	116905.1	116905.1	116905.5	0.4
Train B O-Rings	15B	3570.8	3570.8	3570.8	0.0
Background Filter			0.0	0.0	

Placed in Dessicator on:	11/26 - 7:30

Train A Filters - First Hour	88.2	11/27 13:14	88.0	12/2 8:09				
Train A Filters - Remainder	175.6	11/27 13:14	175.7	12/2 8:09				
Train A Probe	117419.1	11/27 13:14	117418.4	12/2 8:09	117418.5	12/2 15:21		
Train A O-Rings	3571.6	11/27 13:14	3571.1	12/2 8:09	3571.1	12/2 15:21		
Train B Filters	265.5	11/27 13:14	265.4	12/2 8:09				
Train B Probe	116906.1	11/27 13:14	116905.3	12/2 8:10	116905.5	12/2 15:21		
Train B O-Rings	3571.1	11/27 13:14	3570.7	12/2 8:10	3570.8	12/2 15:22		
Background Filter								

1st hour Sub-Total, mg:	1.3
Remainder Sub-Total, mg:	2.3
Train 1 Aggregate, mg:	**3.6**
Train 2 Aggregate, mg:	**3.7**
Ambient Aggregate, mg:	0.0

ASTM E3053 Wood Heater Run Sheets

Client: Pacific Energy | Job Number: 19-537 | Tracking #: 0048
Model: FP25 | Run Number: 2 | Test Date: 11/25/2019

Wood Heater Run Notes

Pre-Test Notes
Pre-Test Start Time: N/A
Air Control Setting: N/A

Time	Notes
N/A	This test is a continuation of High Fire Test per ASTM E3053, see run 1 test notes for further detail.

Test Notes
Test Burn Start Time: 12:18
Air Control Setting: Fully Closed

Time	Notes
0 min	With 3.9 lbs of coal bed remaining from previously test; leveled coal bed, zeroed scale, turned off fan and loaded test fuel.
1 min	Closed door.
5 min	Set air to test setting
10 min	Turned fan on
60 min	Changed 1-hr filter
176 min	Changed Train B front filter due to clogging
648 min	End of Test

Test Burn End Time: 23:06

Flue Gas Concentration Measurement

Calibration Gas Values: Span Gas CO_2 (%): 16.93 CO (%): 4.330
Mid Gas CO_2 (%): 10.00 CO (%): 2.51

Calibration Results:

	Pre Test			Post Test		
	Zero	Mid	Span	Zero	Mid	Span
Time	8:19	8:23	8:21	11/26 - 6:46	11/26 - 6:49	11/26 - 6:47
CO_2	0.00	10.03	16.99	0.00	9.84	16.80
CO	0.000	2.502	4.303	0.002	2.465	4.238

Flue Gas Probe Leak Check: Initial: No Leakage Final: No Leakage

Technician Signature: Date: 11/26/2019

ASTM E3053 Wood Heater Run Sheets

Client: Pacific Energy | Job Number: 19-537 | Tracking #: 0048
Model: FP25 | Run Number: 2 | Test Date: 11/25/2019

Test Photos

Kindling Fuel Load

Start-up Fuel Load

High Fire Fuel Load

Residual Start-up Fuel Coal Bed

Technician Signature: _____ Date: 11/26/2019

ASTM E3053 Wood Heater Run Sheets

Client: Pacific Energy | Job Number: 19-537 | Tracking #: 0048
Model: FP25 | Run Number: 2 | Test Date: 11/25/2019

High Fire Fuel Loaded

Residual High Fire Load Coal Bed

Low Fire Fuel Load

Low Fire Fuel Loaded

Technician Signature: _____ Date: 11/26/2019

WOOD STOVE TEST DATA PACKET
ASTM E3053/E2515

Run 3 Data Summary

Client: Pacific Energy
Model: FP25
Job #: 19-537
Tracking #: 0048
Test Date: 11/26/2019

12/2/2019

Techician Signature — Date

TEST RESULTS - ASTM E3053 / ASTM E2515

Client: Pacific Energy
Model: FP25
Run #: 3

Job #: 19-537
Tracking #: 0048
Technician: SJB
Date: 11/26/2019

Burn Rate (kg/hr):	1.20

	Ambient Sample	Sample Train A	Sample Train B	1st Hour Filter
Total Sample Volume (ft^3)	0.000	71.960	72.459	9.012
Average Gas Velocity in Dilution Tunnel (ft/sec)	15.01			
Average Gas Flow Rate in Dilution Tunnel (dscf/hr)	17591.9			
Average Gas Meter Temperature (°F)	68.6	89.7	91.4	75.9
Total Sample Volume (dscf)	0.000	67.518	68.480	8.672
Average Tunnel Temperature (°F)	85.0			
Total Time of Test (min)	459			
Total Particulate Catch (mg)	0.0	3.3	3.7	1.9
Particulate Concentration, dry-standard (g/dscf)	0.0000000	0.0000489	0.0000540	0.0002191
Total PM Emissions (g)	0.00	6.58	7.27	3.85
Particulate Emission Rate (g/hr)	0.00	0.86	0.95	3.85
Emissions Factor (g/kg)	-	0.71	0.79	-
Difference from Average Total Particulate Emissions (g)	-	0.35	0.35	-
Difference from Average Emissions Factor (g/kg)	-	0.04	0.04	-

Final Average Results	
Total Particulate Emissions (g)	6.92
Particulate Emission Rate (g/hr)	0.91
Emissions Factor (g/kg)	0.75
HHV Efficiency (%)	67.6%
LHV Efficiency (%)	72.3%
CO Emissions (g/min)	1.57

Quality Checks	Requirement	Observed	Result
Dual Train Precision	Each train within 7.5% of average emissions (in grams), or emission factors within 0.5 g/kg	See Above	OK
Filter Temps	>80 °F, <90 °F	Min: 80 / Max: 88	OK
Face Velocity	< 30 ft/min	10.0	OK
Leakage Rate	Less than 4% of average sample rate	0 cfm	OK
Ambient Temp	55-90 °F	Min: 66 / Max: 71	OK
Negative Probe Weight Evaluation	<5% of Total Catch	-3.0%	OK
Pro-Rate Variation	90% of readings between 90-110%; none greater than 120% or less than 80%	See Data Tabs	OK

B415.1 Efficiency Results

Manufacturer:	Pacific Energy
Model:	FP25
Date:	11/26/19
Run:	3
Control #:	19-537
Test Duration:	459
Output Category:	Medium

Test Results in Accordance with CSA B415.1-09

	HHV Basis	LHV Basis
Overall Efficiency	67.6%	72.3%
Combustion Efficiency	94.5%	94.5%
Heat Transfer Efficiency	71.6%	76.6%

Output Rate (kJ/h)	16,254	15,419	**(Btu/h)**
Burn Rate (kg/h)	1.20	2.65	**(lb/h)**
Input (kJ/h)	24,029	22,794	**(Btu/h)**

Test Load Weight (dry kg)	9.21	20.30	**dry lb**
MC wet (%)	18.15		
MC dry (%)	22.18		
Particulate (g)	6.92		
CO (g)	720		
Test Duration (h)	7.65		

Emissions	**Particulate**	**CO**
g/MJ Output	0.06	5.79
g/kg Dry Fuel	0.75	78.14
g/h	0.91	94.08
g/min	0.02	1.57
lb/MM Btu Output	0.13	13.45

Air/Fuel Ratio (A/F)	11.18

VERSION: **2.2** **12/14/2009**

HIGH FIRE FUEL LOAD DATA - ASTM E3053

Client: Pacific Energy | Job #: 19-537
Model: FP25 | Tracking #: 0048
Run #: 3 | Technician: SJB
Date: 11/26/2019

Nominal Loading Density (lbs/ft^3, wet basis):	10		
Usable Firebox Volume (ft^3):	2.10		
Target Load Weight (lbs):	21.00		
Total Load Weight Range (lbs):	20.00	to	22.10
Core Load Weight Range (lbs):	9.50	to	13.70
Remainder Load Weight Range (lbs):	7.40	to	11.60
Core Load Piece Range (lbs):	3.20	to	5.30
Remainder Load Piece Range (lbs):	2.10	to	11.60
Max Allowable Kindling Weight (lbs):	4.19		
Max Allowable Start-up Fuel Weight (lbs):	6.29		

CORE LOAD DATA

				Fuel Piece Moisture Readings (%DB)					Dry Weight	
Piece #	Length (in)	Weight (lbs)	Within Spec?	1	2	3	Ave.	Within Spec?	lbs	kg
1	16.00	4.01	In Range	23.7	22.7	19.8	22.1	In Range	3.29	1.49
2	16.00	4.87	In Range	19.7	24.9	18.6	21.1	In Range	4.02	1.82
3	16.00	3.21	In Range	22.8	23.7	25.1	23.9	In Range	2.59	1.18
Core Load Wt. (lbs)		12.09	In Range							

REMAINDER LOAD DATA (1 to 3 Pieces)

				Fuel Piece Moisture Readings (%DB)					Dry Weight	
Piece #	Length (in)	Weight (lbs)	Within Spec?	1	2	3	Ave.	Within Spec?	lbs	kg
1	16.00	6.03	In Range	24.4	22.9	25.8	24.4	In Range	4.85	2.20
2	16.00	2.85	In Range	19.7	23.1	22.3	21.7	In Range	2.34	1.06
3			NA				NA	NA	NA	NA
Remainder Load (lbs)		8.88	In Range							

Total Load Weight (lbs):	20.97	In Range		
Core Load % of Total Weight:	58%	In Range	45-65%	
Remainder % of Total Weight:	42%	In Range	35-55%	
Total Load % of Target Weight:	100%	In Range	95-105%	
Actual Fuel Loading Density (lb/ft3):	10.0			
Total Load Average Moisture Content (%DB):	22.7	In Range	19-25%	
Total Load Average Moisture Content (%WB):	18.5			
Total Test Load Weight (dry basis):	17.09 lbs		7.75 kg	

KINDLING AND START-UP FUEL

		Kindling Moisture Readings (%DB)					Dry Weight	
Kindling Weight (lbs)	Within Spec?	1	2	3	Avg.	Within Spec?	lbs	kg
3.02	In Range	10	10	10	10.0	In Range	2.75	1.25

		Start-up Moisture Readings (%DB)					Dry Weight	
Start-up Fuel Wt. (lb)	Within Spec?	1	2	3	Avg.	Within Spec?	lbs	kg
4.02	In Range	19.7	22.3	21.8	21.3	In Range	3.32	1.50

TEST FUEL LOADING RANGE

Allowable Residual Start-up Fuel Range (lb):	2.1	to	4.2	
Actual Residual Start-up Fuel Weight (lb):		2.1		In Range

LOW & MEDIUM FIRE FUEL LOAD DATA - ASTM E3053

Client: Pacific Energy
Job #: 19-537
Model: FP25
Tracking #: 0048
Run #: 3
Technician: SJB
Date: 11/26/2019

Nominal Loading Density (lbs/ft^3, wet basis):	12		
Usable Firebox Volume (ft^3):	2.10		
Target Load Weight (lbs):	25.20		
Total Load Weight Range (lbs):	23.94	to	26.46
Core Load Weight Range (lbs):	11.34	to	16.38
Remainder Load Weight Range (lbs):	8.82	to	13.86
Core Load Piece Range (lbs):	3.78	to	6.30
Remainder Load Piece Range (lbs):	2.52	to	7.56

CORE LOAD DATA

				Fuel Piece Moisture Readings (%DB)					Dry Weight	
Piece #	Length (in)	Weight (lbs)	Within Spec?	1	2	3	Ave.	Within Spec?	lbs	kg
1	16.00	5.69	In Range	24.9	25.6	23.7	24.7	In Range	4.56	2.07
2	16.00	4.72	In Range	20.0	19.7	18.6	19.4	In Range	3.95	1.79
3	16.00	5.39	In Range	22.9	18.5	23.6	21.7	In Range	4.43	2.01
Core Load Wt. (lbs)		15.80	In Range							

REMAINDER LOAD DATA (2 to 3 Pieces)

				Fuel Piece Moisture Readings (%DB)					Dry Weight	
Piece #	Length (in)	Weight (lbs)	Within Spec?	1	2	3	Ave.	Within Spec?	lbs	kg
1	16.00	6.05	In Range	19.8	24.2	24.7	22.9	In Range	4.92	2.23
2	16.00	2.95	In Range	24.7	20.6	18.7	21.3	In Range	2.43	1.10
3			NA				NA	NA	NA	NA
Remainder Load (lbs)		9.00	In Range							

Remainder Load Small/Large Piece Weight Ratio:	49%	In Range	≤ 67%
Total Load Weight (lbs):	24.80	In Range	
Core Load % of Total Weight:	64%	In Range	45-65%
Remainder % of Total Weight:	36%	In Range	35-55%
Total Load % of Target Weight:	98%	In Range	95-105%
Actual Fuel Loading Density (lb/ft3):	11.8		
Total Load Average Moisture Content (%DB):	22.2	In Range	19-25%
Total Load Average Moisture Content (%WB):	18.2		
Total Test Load Weight (dry basis):	20.30 lbs	9.21 kg	

TEST FUEL LOADING RANGE

Allowable Charcoal Bed Weight Range (lb):	2.5	to	4.9	
Actual Charcoal Bed Wt. (lb):		4.0		In Range

TEST END POINT

Actual Fuel Load Ending Weight (lb):	0.0	Valid Test (≥90%)

Total Fuel Burned During Test Run:	24.8	lbs, wet basis
	20.3	lbs, dry basis
	9.21	kg, dry basis

DILUTION TUNNEL & MISC. DATA - ASTM E3053 / E2515

Client:	Pacific Energy	Job #:	19-537
Model:	FP25	Tracking #:	0048
Run #:	3	Technician:	SJB
Test Start Time:	11:46	Date:	11/26/2019
Test Type:	Medium Fire		

Recording Interval (min):	1
Total Sampling Time (min):	459

	Pre-Test	Post Test	Avg.
Barometric Pressure (in. Hg)	29.58	29.22	29.40
Relative Humidity (%)	26.0	19.8	
Room Air Velocity (ft/min)	0	0	
Scale Audit (lbs)	10.0	10.0	
Ambient Sample Volume:			ft^3

Meter Box γ Factor:	0.992	(A)
Meter Box γ Factor:	1.002	(B)
Meter Box γ Factor:		(Ambient)

Induced Draft Check (in. H_2O):	0
Smoke Capture Check (%):	100%
Date Flue Pipe Last Cleaned:	11/22/2019

Sample Train Post-Test Leak Checks

(A)	0.000	cfm @	-5	in. Hg
(B)	0.000	cfm @	-5	in. Hg
(Ambient)		cfm @		in. Hg

DILUTION TUNNEL FLOW

Traverse Data

Point	dP (in H_2O)	Temp (°F)
1	0.050	99
2	0.060	99
3	0.062	99
4	0.052	99
5	0.054	99
6	0.066	99
7	0.064	99
8	0.048	99
Center	0.065	99

Static Pressure: -0.140 in. H_2O

Dilution Tunnel H_2O:	2.00	percent
Tunnel Diameter:	8	inches
Pitot Tube Cp:	0.99	[unitless]
Dilution Tunnel MW(dry):	29.00	lb/lb-mole
Dilution Tunnel MW(wet):	28.78	lb/lb-mole
Tunnel Area:	0.3491	ft^2
V_{strav}:	16.48	ft/sec
V_{scent}:	17.49	ft/sec
F_p:	0.942	[ratio]
Initial Tunnel Flow:	312.3	scf/min

TEST FUEL PROPERTIES

ASTM 3053-17 - Table A1.1 Fuel Properties by Fuel Species

Select Fuel Type	Species	%C	%H	%O	%Ash	MJ/kg	BTU/lb
	Ash, White	49.70	6.90	43.00	0.30	20.75	8927
	Beech	48.70	5.80	44.70	0.60	18.80	8088
	Birch, Sweet	49.80	6.50	43.40	0.30	20.12	8656
	Birch, Yellow	49.80	6.50	43.40	0.30	20.12	8656
	Doug Fir (Coast, Interior West/North)	48.73	6.87	43.90	0.50	19.81	8522
	Doug Fir (Interioir South)	48.73	6.87	43.90	0.50	19.81	8522
	Elm, Rock	50.40	6.60	42.30	0.70	20.49	8815
	Elm, Soft	50.40	6.60	42.30	0.70	20.49	8815
	Gum, Red	50.88	6.06	41.57	1.28	19.72	8478
	Larch, Western	50.54	6.36	42.40	0.70	17.58	7558
X	Maple, Hard	50.64	6.02	41.74	1.35	19.96	8587
	Maple, Sugar	50.64	6.02	41.74	1.35	19.96	8587
	Oak, Red	49.50	6.62	43.70	0.20	20.20	8690
	Oak, White	50.40	6.59	42.70	0.20	20.50	8819
	Pine, Southern	52.60	7.00	40.10	1.31	22.30	9587
	Pine, Southern Long Leaf	52.60	7.02	40.10	1.30	22.30	9594

WOODSTOVE PREBURN DATA

Client: Pacific Energy
Model: FP25
Run #: 3

Job #: 19-537
Tracking #: 0048
Technician: SJB
Date: 11/26/2019

Recording Interval (min): 1
Run Time (min): 113

			Temperatures (°F)							
Elapsed Time (min)	**Scale Reading (lbs)**	**Flue Draft (in H_2O)**	**FB Left**	**FB Right**	**FB Back**	**FB Top**	**FB Bottom**	**Stove Surface Average**	**Flue**	**Ambient**
0	2.0	0.001	74	72	76	79	80	76.2	58	60
1	2.0	-0.023	75	72	76	79	80	76.4	117	60
2	1.8	-0.027	79	74	77	81	80	78.2	179	61
3	1.7	-0.044	86	77	80	85	80	81.6	297	61
4	1.6	-0.039	95	82	85	93	80	87.0	308	61
5	1.5	-0.041	103	87	90	102	80	92.4	312	61
6	1.4	-0.043	109	91	96	113	80	97.8	326	61
7	1.3	-0.044	115	95	102	124	81	103.4	347	61
8	1.1	-0.048	119	98	108	136	82	108.6	350	61
9	1.1	-0.045	124	103	115	149	83	114.8	372	61
10	0.9	-0.055	129	109	122	162	86	121.6	401	61
11	3.3	-0.054	133	113	128	177	88	127.8	404	62
12	3.1	-0.058	137	120	135	192	92	135.2	409	62
13	2.8	-0.070	143	126	144	207	96	143.2	526	62
14	2.6	-0.074	149	132	153	230	101	153.0	618	62
15	2.4	-0.074	156	138	161	263	107	165.0	660	62
16	2.0	-0.077	165	144	172	303	113	179.4	690	62
17	1.9	-0.079	175	151	186	347	119	195.6	712	62
18	1.6	-0.080	184	157	198	391	126	211.2	715	62
19	1.4	-0.080	195	166	213	430	133	227.4	717	62
20	3.7	-0.080	205	176	230	464	141	243.2	732	62
21	3.5	-0.081	216	186	246	491	149	257.6	728	63
22	3.2	-0.077	227	196	262	516	157	271.6	756	63
23	3.1	-0.080	238	206	278	541	165	285.6	772	63
24	2.7	-0.082	249	215	294	566	174	299.6	785	63
25	2.6	-0.086	260	225	310	590	183	313.6	798	63
26	2.4	-0.082	272	235	326	612	191	327.2	802	63
27	2.1	-0.080	284	244	342	632	200	340.4	799	63
28	8.7	-0.083	296	254	359	650	209	353.6	784	63
29	22.6	-0.089	308	264	375	658	218	364.6	822	64
30	22.3	-0.091	319	273	386	669	227	374.8	917	64
31	21.9	-0.089	330	282	393	689	235	385.8	936	64
32	21.7	-0.091	340	290	398	712	244	396.8	944	64
33	21.4	-0.088	349	298	403	734	252	407.2	949	64
34	21.1	-0.093	358	305	407	754	259	416.6	950	64
35	20.7	-0.088	367	312	411	771	267	425.6	952	64
36	20.5	-0.091	369	313	405	774	273	426.8	962	64
37	20.2	-0.091	366	311	398	776	279	426.0	967	64
38	20.0	-0.093	365	308	391	778	285	425.4	989	65
39	19.7	-0.092	364	306	383	782	290	425.0	1023	65
40	19.4	-0.092	365	304	376	786	295	425.2	1037	65
41	19.2	-0.098	365	303	371	792	299	426.0	1041	65
42	18.9	-0.094	367	302	366	796	303	426.8	1045	65
43	18.7	-0.093	368	302	363	800	307	428.0	1043	65

WOODSTOVE PREBURN DATA

Client: Pacific Energy
Model: FP25
Run #: 3

Job #: 19-537
Tracking #: 0048
Technician: SJB
Date: 11/26/2019

Recording Interval (min): 1
Run Time (min): 113

			Temperatures (°F)							
Elapsed Time (min)	**Scale Reading (lbs)**	**Flue Draft (in H_2O)**	**FB Left**	**FB Right**	**FB Back**	**FB Top**	**FB Bottom**	**Stove Surface Average**	**Flue**	**Ambient**
44	18.4	-0.092	370	302	360	803	310	429.0	1050	66
45	18.2	-0.096	371	302	359	804	313	429.8	1057	66
46	17.7	-0.092	373	302	358	806	316	431.0	1082	66
47	17.4	-0.097	375	303	358	809	319	432.8	1103	66
48	17.1	-0.092	377	304	359	811	321	434.4	1111	66
49	16.8	-0.095	379	304	360	813	323	435.8	1112	67
50	16.5	-0.098	381	306	361	816	325	437.8	1113	67
51	16.2	-0.097	383	307	363	817	327	439.4	1128	67
52	15.9	-0.095	386	309	366	819	329	441.8	1134	67
53	15.7	-0.101	388	311	368	820	331	443.6	1134	67
54	15.3	-0.098	390	313	371	822	333	445.8	1135	67
55	15.0	-0.095	392	315	374	823	335	447.8	1139	67
56	14.9	-0.096	394	317	377	825	336	449.8	1137	68
57	14.5	-0.094	396	319	380	826	338	451.8	1138	68
58	14.3	-0.100	398	320	383	827	340	453.6	1137	68
59	14.0	-0.097	400	322	387	828	341	455.6	1142	68
60	13.7	-0.097	401	324	390	828	343	457.2	1163	68
61	13.5	-0.098	403	325	394	829	345	459.2	1178	69
62	13.2	-0.095	404	327	398	830	347	461.2	1173	69
63	12.8	-0.094	405	328	401	831	349	462.8	1161	69
64	12.5	-0.096	407	330	405	832	351	465.0	1152	69
65	12.3	-0.097	408	332	408	830	354	466.4	1143	69
66	12.0	-0.096	410	333	411	829	356	467.8	1131	69
67	11.8	-0.097	412	334	414	827	359	469.2	1119	69
68	11.5	-0.096	414	335	417	825	362	470.6	1111	69
69	11.2	-0.096	416	337	419	823	365	472.0	1107	70
70	10.9	-0.096	418	338	421	823	368	473.6	1091	70
71	10.6	-0.098	420	339	422	824	372	475.4	1105	70
72	10.3	-0.095	421	341	423	826	375	477.2	1118	70
73	10.0	-0.098	422	342	424	830	379	479.4	1125	70
74	9.9	-0.095	424	344	424	833	383	481.6	1133	70
75	9.5	-0.092	425	345	425	836	387	483.6	1137	70
76	9.4	-0.093	425	347	426	839	391	485.6	1128	70
77	9.1	-0.098	426	349	427	840	396	487.6	1127	70
78	8.9	-0.095	426	350	427	840	400	488.6	1115	70
79	8.6	-0.093	426	352	428	841	405	490.4	1102	70
80	8.5	-0.091	426	354	429	839	409	491.4	1091	70
81	8.3	-0.095	426	355	430	838	414	492.6	1086	70
82	8.0	-0.090	426	357	431	837	419	494.0	1070	70
83	7.8	-0.091	427	359	433	835	424	495.6	1058	71
84	7.7	-0.087	427	361	434	834	429	497.0	1045	70
85	7.5	-0.091	427	363	436	833	433	498.4	1032	71
86	7.4	-0.091	427	365	437	831	438	499.6	1020	71
87	7.1	-0.089	427	366	439	828	442	500.4	1011	71

WOODSTOVE PREBURN DATA

Client: Pacific Energy
Model: FP25
Run #: 3

Job #: 19-537
Tracking #: 0048
Technician: SJB
Date: 11/26/2019

Recording Interval (min): 1
Run Time (min): 113

			Temperatures (°F)							
Elapsed Time (min)	**Scale Reading (lbs)**	**Flue Draft (in H_2O)**	**FB Left**	**FB Right**	**FB Back**	**FB Top**	**FB Bottom**	**Stove Surface Average**	**Flue**	**Ambient**
88	7.0	-0.088	427	367	442	824	447	501.4	997	71
89	6.7	-0.084	428	369	444	820	451	502.4	987	71
90	6.6	-0.090	428	371	446	816	456	503.4	977	71
91	6.5	-0.085	428	373	447	812	460	504.0	967	71
92	6.4	-0.088	429	374	449	808	465	505.0	959	71
93	6.1	-0.088	429	376	452	804	469	506.0	951	71
94	6.0	-0.090	430	377	455	800	473	507.0	948	71
95	5.8	-0.082	430	380	458	797	477	508.4	939	71
96	5.6	-0.088	430	381	461	794	481	509.4	930	71
97	5.6	-0.086	430	384	463	791	485	510.6	922	71
98	5.4	-0.084	430	386	466	788	489	511.8	912	71
99	5.2	-0.083	430	387	468	784	492	512.2	901	71
100	5.0	-0.085	430	389	470	779	496	512.8	891	71
101	5.1	-0.085	430	391	472	772	499	512.8	884	71
102	5.0	-0.081	429	393	473	766	502	512.6	882	71
103	4.8	-0.087	429	394	473	760	505	512.2	874	71
104	4.6	-0.085	428	397	473	754	508	512.0	861	71
105	4.6	-0.085	426	398	473	748	511	511.2	852	71
106	4.6	-0.084	425	399	473	741	514	510.4	840	71
107	4.4	-0.079	424	400	472	733	517	509.2	822	71
108	4.4	-0.079	422	400	473	722	519	507.2	808	71
109	4.3	-0.080	421	401	473	710	521	505.2	794	71
110	4.3	-0.078	419	401	473	697	523	502.6	780	71
111	4.1	-0.078	417	402	474	683	525	500.2	765	71
112	4.1	-0.079	415	402	474	669	526	497.2	754	71
113	4.0	-0.079	412	402	474	656	527	494.2	743	71

BOX A TEST DATA - ASTM E3053 / ASTM E2515

Client: Pacific Energy
Model: FP25
Run #: 3

Job #: 19-537
Tracking #: 0048
Technician: SJB
Date: 11/26/2019

	Particulate Sampling Data							Fuel Weight (lb)		Temperature Data (°F)			
Elapsed Time (min)	Gas Meter (ft^3)	Sample Rate (cfm)	Dilution Tunnel dP (in H_2O)	Orifice dH (in H_2O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Scale Reading	Weight Change	Dilution Tunnel	Flue	Filter	Ambient
0	0.000		0.055	0.06	69	2		24.8		123	710	88	71
1	0.129	0.129	0.055	1.00	69	2	90	24.8	0	139	606	87	71
2	0.279	0.150	0.055	1.00	69	2	103	24.4	-0.4	123	788	85	71
3	0.430	0.151	0.055	0.98	69	2	104	24.2	-0.2	125	858	84	71
4	0.579	0.149	0.055	0.95	69	2	102	23.9	-0.3	127	915	84	71
5	0.732	0.153	0.055	1.03	70	2	105	23.5	-0.4	129	971	85	71
6	0.890	0.158	0.055	1.03	70	2	107	23.3	-0.2	116	878	87	71
7	1.041	0.151	0.055	1.00	70	2	102	23.1	-0.2	111	868	88	71
8	1.194	0.153	0.055	1.01	70	2	103	22.9	-0.2	109	856	87	71
9	1.347	0.153	0.055	0.99	70	2	103	22.7	-0.2	108	846	85	71
10	1.500	0.153	0.055	1.01	70	2	103	22.5	-0.2	107	842	84	71
11	1.653	0.153	0.055	1.00	71	2	103	22.3	-0.2	108	841	84	71
12	1.804	0.151	0.055	1.00	71	2	102	22.1	-0.2	108	832	85	71
13	1.955	0.151	0.055	0.97	71	2	102	21.9	-0.2	109	825	87	71
14	2.106	0.151	0.055	0.97	71	2	102	21.7	-0.2	109	818	88	71
15	2.260	0.154	0.055	0.97	72	2	104	21.5	-0.2	108	812	87	71
16	2.411	0.151	0.055	0.97	72	2	102	21.4	-0.1	108	803	85	71
17	2.562	0.151	0.055	0.99	72	2	102	21.2	-0.2	108	795	84	71
18	2.712	0.150	0.055	0.98	72	2	101	21.0	-0.2	108	791	83	71
19	2.863	0.151	0.055	0.97	73	2	101	20.9	-0.1	108	786	84	71
20	3.012	0.149	0.055	0.97	73	2	100	20.7	-0.2	107	781	86	71
21	3.162	0.150	0.055	0.97	73	2	101	20.6	-0.1	107	776	87	71
22	3.312	0.150	0.055	0.99	73	2	101	20.3	-0.3	107	769	87	71
23	3.461	0.149	0.055	0.98	74	2	100	20.1	-0.2	106	766	86	71
24	3.610	0.149	0.055	0.99	74	2	100	20.1	0	106	762	84	71
25	3.759	0.149	0.055	0.96	74	2	100	19.8	-0.3	106	757	83	71
26	3.907	0.148	0.055	0.98	75	2	99	19.7	-0.1	105	754	84	71
27	4.056	0.149	0.055	0.98	75	2	99	19.4	-0.3	105	752	85	71
28	4.206	0.150	0.055	0.97	75	2	100	19.4	0	105	748	87	71
29	4.354	0.148	0.055	0.94	76	2	99	19.3	-0.1	105	743	87	71
30	4.503	0.149	0.055	0.94	76	2	99	19.0	-0.3	104	740	86	71
31	4.653	0.150	0.055	0.99	76	2	100	19.0	0	104	739	84	71
32	4.801	0.148	0.055	0.95	76	2	98	18.9	-0.1	104	738	83	71

BOX A TEST DATA - ASTM E3053 / ASTM E2515

Client: Pacific Energy
Model: FP25
Run #: 3

Job #: 19-537
Tracking #: 0048
Technician: SJB
Date: 11/26/2019

	Particulate Sampling Data							Fuel Weight (lb)		Temperature Data (°F)			
Elapsed Time (min)	Gas Meter (ft^3)	Sample Rate (cfm)	Dilution Tunnel dP (in H_2O)	Orifice dH (in H_2O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Scale Reading	Weight Change	Dilution Tunnel	Flue	Filter	Ambient
33	4.948	0.147	0.055	0.94	77	2	98	18.6	-0.3	104	733	83	71
34	5.099	0.151	0.055	0.98	77	2	100	18.4	-0.2	104	733	84	71
35	5.252	0.153	0.055	0.98	77	2	102	18.3	-0.1	104	730	86	71
36	5.403	0.151	0.055	1.01	78	2	100	18.2	-0.1	103	725	87	71
37	5.553	0.150	0.055	0.97	78	2	99	17.9	-0.3	103	724	87	71
38	5.706	0.153	0.055	0.99	78	2	101	17.8	-0.1	103	722	85	71
39	5.855	0.149	0.055	1.00	78	2	99	17.6	-0.2	103	719	84	71
40	6.007	0.152	0.055	1.00	79	2	100	17.5	-0.1	102	719	83	71
41	6.158	0.151	0.055	0.96	79	2	100	17.4	-0.1	102	718	84	71
42	6.308	0.150	0.055	0.96	79	2	99	17.2	-0.2	102	720	86	71
43	6.458	0.150	0.055	0.98	80	2	99	17.1	-0.1	102	721	87	71
44	6.608	0.150	0.055	0.95	80	2	99	17.0	-0.1	102	721	87	71
45	6.757	0.149	0.055	0.93	80	2	98	16.7	-0.3	102	718	85	71
46	6.906	0.149	0.055	0.98	80	2	98	16.6	-0.1	102	717	84	71
47	7.055	0.149	0.055	0.94	81	2	98	16.5	-0.1	102	714	83	71
48	7.203	0.148	0.055	0.94	81	2	97	16.3	-0.2	102	713	83	71
49	7.355	0.152	0.055	0.97	81	2	100	16.1	-0.2	102	711	85	71
50	7.506	0.151	0.055	0.98	81	2	99	16.0	-0.1	102	708	87	71
51	7.657	0.151	0.055	0.96	82	2	99	15.9	-0.1	101	706	87	71
52	7.807	0.150	0.055	0.96	82	2	98	15.6	-0.3	101	703	86	71
53	7.958	0.151	0.055	0.95	82	2	99	15.5	-0.1	101	703	84	71
54	8.109	0.151	0.055	0.94	82	2	99	15.5	0	101	701	83	71
55	8.258	0.149	0.055	0.96	83	2	98	15.2	-0.3	101	697	83	71
56	8.410	0.152	0.055	1.00	83	2	100	15.1	-0.1	101	697	84	71
57	8.562	0.152	0.055	0.95	83	2	100	15.1	0	101	697	86	71
58	8.711	0.149	0.055	0.97	83	2	98	14.9	-0.2	101	695	87	71
59	8.859	0.148	0.055	0.96	84	2	97	14.7	-0.2	100	696	86	71
60	9.012	0.153	0.055	1.02	84	2	100	14.5	-0.2	100	698	85	71
61	9.180	0.168	0.055	1.07	84	2	110	14.5	0	100	700	83	71
62	9.337	0.157	0.055	1.04	84	2	103	14.2	-0.3	100	701	82	71
63	9.493	0.156	0.055	1.01	84	2	102	14.1	-0.1	100	705	83	71
64	9.650	0.157	0.055	1.03	85	2	102	14.1	0	99	701	83	71
65	9.806	0.156	0.055	1.06	85	2	102	14.0	-0.1	99	696	85	71

BOX A TEST DATA - ASTM E3053 / ASTM E2515

Client: Pacific Energy
Model: FP25
Run #: 3

Job #: 19-537
Tracking #: 0048
Technician: SJB
Date: 11/26/2019

	Particulate Sampling Data							Fuel Weight (lb)		Temperature Data (°F)			
Elapsed Time (min)	Gas Meter (ft^3)	Sample Rate (cfm)	Dilution Tunnel dP (in H_2O)	Orifice dH (in H_2O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Scale Reading	Weight Change	Dilution Tunnel	Flue	Filter	Ambient
66	9.960	0.154	0.055	1.03	85	2	100	13.7	-0.3	99	694	86	71
67	10.118	0.158	0.055	1.01	85	2	103	13.6	-0.1	99	694	86	71
68	10.275	0.157	0.055	1.03	85	2	102	13.5	-0.1	99	692	85	71
69	10.431	0.156	0.055	1.04	86	2	101	13.5	0	99	690	84	71
70	10.586	0.155	0.055	1.02	86	2	101	13.2	-0.3	99	683	83	71
71	10.743	0.157	0.055	1.03	86	2	102	13.0	-0.2	99	680	83	71
72	10.897	0.154	0.055	1.02	86	2	100	12.9	-0.1	98	674	84	71
73	11.051	0.154	0.055	1.02	86	2	100	13.0	0.1	98	669	85	71
74	11.208	0.157	0.055	1.03	87	2	102	12.8	-0.2	98	665	86	71
75	11.365	0.157	0.055	1.01	87	2	102	12.6	-0.2	98	663	86	71
76	11.519	0.154	0.055	1.02	87	2	100	12.5	-0.1	98	661	86	71
77	11.674	0.155	0.055	1.01	87	2	101	12.4	-0.1	98	661	84	71
78	11.829	0.155	0.055	1.02	87	2	101	12.3	-0.1	98	659	84	71
79	11.989	0.160	0.055	1.09	87	2	104	12.3	0	98	659	83	71
80	12.149	0.160	0.055	1.06	88	2	104	12.1	-0.2	98	656	84	71
81	12.310	0.161	0.055	1.09	88	2	104	11.9	-0.2	98	656	85	71
82	12.470	0.160	0.055	1.09	88	2	103	11.9	0	97	649	86	70
83	12.632	0.162	0.055	1.07	88	2	105	11.7	-0.2	97	650	86	71
84	12.792	0.160	0.055	1.09	88	2	103	11.7	0	97	651	85	71
85	12.952	0.160	0.055	1.09	88	2	103	11.6	-0.1	96	649	84	71
86	13.113	0.161	0.055	1.06	88	2	104	11.4	-0.2	96	647	83	71
87	13.274	0.161	0.055	1.06	89	2	104	11.3	-0.1	96	645	83	71
88	13.435	0.161	0.055	1.05	89	2	104	11.3	0	96	643	83	71
89	13.597	0.162	0.055	1.07	89	2	105	11.2	-0.1	96	641	84	71
90	13.756	0.159	0.055	1.05	89	2	103	11.1	-0.1	96	640	86	71
91	13.917	0.161	0.055	1.07	89	2	104	11.0	-0.1	95	639	86	71
92	14.078	0.161	0.055	1.08	89	2	104	10.8	-0.2	95	636	85	71
93	14.241	0.163	0.055	1.10	89	2	105	10.7	-0.1	95	635	84	71
94	14.399	0.158	0.055	1.05	89	2	102	10.7	0	95	632	83	71
95	14.560	0.161	0.055	1.06	90	2	104	10.7	0	95	628	83	71
96	14.719	0.159	0.055	1.07	90	2	102	10.5	-0.2	95	627	83	71
97	14.879	0.160	0.055	1.09	90	2	103	10.5	0	95	626	84	71
98	15.042	0.163	0.055	1.05	90	2	105	10.4	-0.1	95	625	85	71

BOX A TEST DATA - ASTM E3053 / ASTM E2515

Client: Pacific Energy
Model: FP25
Run #: 3

Job #: 19-537
Tracking #: 0048
Technician: SJB
Date: 11/26/2019

	Particulate Sampling Data							Fuel Weight (lb)		Temperature Data (°F)			
Elapsed Time (min)	Gas Meter (ft^3)	Sample Rate (cfm)	Dilution Tunnel dP (in H_2O)	Orifice dH (in H_2O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Scale Reading	Weight Change	Dilution Tunnel	Flue	Filter	Ambient
99	15.201	0.159	0.055	1.06	90	2	102	10.2	-0.2	95	623	86	70
100	15.362	0.161	0.055	1.06	90	2	103	10.1	-0.1	94	621	86	70
101	15.521	0.159	0.055	1.05	90	2	102	10.0	-0.1	94	621	84	70
102	15.682	0.161	0.055	1.06	90	2	103	9.9	-0.1	94	619	83	70
103	15.840	0.158	0.055	1.07	90	2	102	10.0	0.1	94	616	83	70
104	16.001	0.161	0.055	1.07	90	2	103	9.8	-0.2	94	614	83	70
105	16.159	0.158	0.055	1.06	91	2	101	9.7	-0.1	94	612	84	70
106	16.319	0.160	0.055	1.03	91	2	103	9.5	-0.2	94	613	85	70
107	16.478	0.159	0.055	1.04	91	2	102	9.5	0	94	615	86	70
108	16.637	0.159	0.055	1.04	91	2	102	9.5	0	94	619	86	70
109	16.797	0.160	0.055	1.02	91	2	103	9.4	-0.1	94	621	85	70
110	16.955	0.158	0.055	1.06	91	2	101	9.2	-0.2	94	623	84	70
111	17.116	0.161	0.055	1.03	91	2	103	9.2	0	94	625	83	70
112	17.273	0.157	0.055	1.02	91	2	101	9.2	0	93	627	83	69
113	17.432	0.159	0.055	1.05	91	2	102	9.0	-0.2	93	627	83	69
114	17.592	0.160	0.055	1.06	91	2	103	8.8	-0.2	93	627	84	69
115	17.750	0.158	0.055	1.07	91	2	101	8.9	0.1	93	627	86	69
116	17.911	0.161	0.055	1.05	91	2	103	8.8	-0.1	93	627	86	68
117	18.068	0.157	0.055	1.05	91	2	101	8.6	-0.2	93	627	85	69
118	18.228	0.160	0.055	1.04	91	2	103	8.6	0	93	629	84	69
119	18.385	0.157	0.055	1.04	91	2	101	8.5	-0.1	93	627	83	69
120	18.545	0.160	0.055	1.03	91	2	103	8.3	-0.2	93	627	83	69
121	18.703	0.158	0.055	1.06	91	2	101	8.2	-0.1	93	627	83	69
122	18.860	0.157	0.055	1.04	92	2	100	8.2	0	93	628	84	69
123	19.020	0.160	0.055	1.07	92	2	102	8.0	-0.2	93	631	85	69
124	19.178	0.158	0.055	1.05	92	2	101	8.1	0.1	93	633	86	69
125	19.338	0.160	0.055	1.05	92	2	102	7.8	-0.3	93	637	85	69
126	19.497	0.159	0.055	1.05	92	2	102	7.8	0	93	639	84	69
127	19.654	0.157	0.055	1.04	92	2	100	7.8	0	93	642	83	68
128	19.814	0.160	0.055	1.05	92	2	102	7.6	-0.2	93	644	82	68
129	19.971	0.157	0.055	1.05	92	2	100	7.5	-0.1	93	647	82	68
130	20.130	0.159	0.055	1.06	92	2	102	7.4	-0.1	93	654	83	68
131	20.290	0.160	0.055	1.03	92	2	102	7.3	-0.1	93	656	84	68

BOX A TEST DATA - ASTM E3053 / ASTM E2515

Client: Pacific Energy
Model: FP25
Run #: 3

Job #: 19-537
Tracking #: 0048
Technician: SJB
Date: 11/26/2019

	Particulate Sampling Data							Fuel Weight (lb)		Temperature Data (°F)			
Elapsed Time (min)	Gas Meter (ft^3)	Sample Rate (cfm)	Dilution Tunnel dP (in H_2O)	Orifice dH (in H_2O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Scale Reading	Weight Change	Dilution Tunnel	Flue	Filter	Ambient
132	20.445	0.155	0.055	1.03	92	2	99	7.3	0	93	650	86	68
133	20.605	0.160	0.055	1.04	92	2	102	7.2	-0.1	93	648	86	68
134	20.762	0.157	0.055	1.05	92	2	100	7.1	-0.1	93	649	85	68
135	20.921	0.159	0.055	1.02	92	2	102	7.0	-0.1	93	652	84	68
136	21.079	0.158	0.055	1.04	92	2	101	6.8	-0.2	93	653	83	68
137	21.236	0.157	0.055	1.04	92	2	100	6.8	0	93	650	82	68
138	21.394	0.158	0.055	1.06	92	2	101	6.7	-0.1	93	650	82	68
139	21.552	0.158	0.055	1.06	92	2	101	6.6	-0.1	93	649	83	68
140	21.711	0.159	0.055	1.05	92	2	102	6.4	-0.2	93	651	85	68
141	21.871	0.160	0.055	1.04	92	2	102	6.4	0	93	650	86	67
142	22.028	0.157	0.055	1.02	92	2	100	6.4	0	93	648	86	68
143	22.185	0.157	0.055	1.00	92	2	100	6.2	-0.2	93	645	85	68
144	22.343	0.158	0.055	1.02	92	2	101	6.0	-0.2	93	644	83	67
145	22.498	0.155	0.055	1.05	92	2	99	6.0	0	93	646	82	67
146	22.655	0.157	0.055	1.01	92	2	100	5.9	-0.1	93	640	82	68
147	22.813	0.158	0.055	1.05	92	2	101	5.8	-0.1	93	640	83	68
148	22.968	0.155	0.055	1.03	92	2	99	5.7	-0.1	92	637	84	68
149	23.127	0.159	0.055	1.02	92	2	102	5.7	0	92	633	85	67
150	23.283	0.156	0.055	1.02	92	2	100	5.5	-0.2	92	628	86	67
151	23.440	0.157	0.055	1.04	92	2	100	5.5	0	92	624	86	67
152	23.599	0.159	0.055	1.06	92	2	102	5.4	-0.1	92	618	84	67
153	23.755	0.156	0.055	1.02	92	2	100	5.4	0	92	616	83	67
154	23.912	0.157	0.055	1.01	92	2	100	5.4	0	91	612	82	67
155	24.071	0.159	0.055	1.03	92	2	102	5.2	-0.2	91	610	82	67
156	24.228	0.157	0.055	1.01	92	2	100	5.1	-0.1	91	608	83	67
157	24.383	0.155	0.055	1.02	92	2	99	5.1	0	91	608	84	67
158	24.540	0.157	0.055	1.02	92	2	100	4.9	-0.2	91	604	85	67
159	24.695	0.155	0.055	1.02	92	2	99	4.9	0	91	603	86	67
160	24.851	0.156	0.055	1.02	92	2	100	4.8	-0.1	91	601	85	67
161	25.009	0.158	0.055	1.02	92	2	101	4.9	0.1	90	599	84	67
162	25.164	0.155	0.055	1.04	92	2	99	4.7	-0.2	90	597	83	67
163	25.319	0.155	0.055	1.02	92	2	99	4.7	0	90	601	82	67
164	25.476	0.157	0.055	1.01	92	2	100	4.7	0	90	596	82	67

BOX A TEST DATA - ASTM E3053 / ASTM E2515

Client: Pacific Energy
Model: FP25
Run #: 3

Job #: 19-537
Tracking #: 0048
Technician: SJB
Date: 11/26/2019

	Particulate Sampling Data							Fuel Weight (lb)		Temperature Data (°F)			
Elapsed Time (min)	Gas Meter (ft^3)	Sample Rate (cfm)	Dilution Tunnel dP (in H_2O)	Orifice dH (in H_2O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Scale Reading	Weight Change	Dilution Tunnel	Flue	Filter	Ambient
165	25.633	0.157	0.055	1.03	92	2	100	4.6	-0.1	90	589	83	67
166	25.787	0.154	0.055	1.00	92	2	98	4.5	-0.1	90	583	85	67
167	25.942	0.155	0.055	0.99	92	2	99	4.4	-0.1	90	571	86	68
168	26.097	0.155	0.055	1.00	92	2	99	4.5	0.1	89	561	86	68
169	26.251	0.154	0.055	1.01	92	2	98	4.5	0	89	550	85	68
170	26.406	0.155	0.055	1.00	92	2	99	4.3	-0.2	89	540	84	68
171	26.561	0.155	0.055	1.01	92	2	99	4.3	0	88	531	83	68
172	26.718	0.157	0.055	1.02	92	2	100	4.4	0.1	88	522	82	68
173	26.870	0.152	0.055	1.01	92	2	97	4.2	-0.2	88	514	83	68
174	27.026	0.156	0.055	0.99	92	2	99	4.3	0.1	87	507	84	68
175	27.183	0.157	0.055	1.02	92	2	100	4.3	0	87	501	85	69
176	27.338	0.155	0.055	1.00	92	2	99	4.3	0	87	494	86	68
177	27.491	0.153	0.055	1.00	92	2	97	4.2	-0.1	87	489	86	68
178	27.645	0.154	0.055	1.00	92	2	98	4.1	-0.1	86	483	84	68
179	27.799	0.154	0.055	1.02	92	2	98	4.1	0	86	478	83	67
180	27.954	0.155	0.055	0.99	92	2	98	4.1	0	85	472	82	67
181	28.108	0.154	0.055	1.01	92	2	98	4.1	0	85	467	82	66
182	28.264	0.156	0.055	0.97	92	2	99	4.1	0	85	463	82	66
183	28.419	0.155	0.055	1.04	92	2	98	4.0	-0.1	85	459	84	66
184	28.575	0.156	0.055	0.98	92	2	99	4.0	0	84	455	85	67
185	28.729	0.154	0.055	1.00	92	2	98	4.1	0.1	84	451	86	67
186	28.882	0.153	0.055	0.99	92	2	97	4.0	-0.1	84	447	85	67
187	29.037	0.155	0.055	1.01	92	2	98	4.0	0	84	443	84	68
188	29.191	0.154	0.055	1.01	92	2	98	4.0	0	84	438	83	68
189	29.346	0.155	0.055	0.98	92	2	98	4.0	0	84	436	82	68
190	29.501	0.155	0.055	1.02	92	2	98	3.9	-0.1	83	432	82	68
191	29.658	0.157	0.055	1.00	92	2	100	3.9	0	83	430	83	68
192	29.811	0.153	0.055	1.03	92	2	97	3.8	-0.1	83	426	84	68
193	29.966	0.155	0.055	0.98	92	2	98	3.7	-0.1	83	423	86	68
194	30.120	0.154	0.055	1.00	92	2	98	3.9	0.2	83	420	86	68
195	30.275	0.155	0.055	0.96	92	2	98	3.9	0	83	418	85	68
196	30.429	0.154	0.055	1.01	92	2	98	3.8	-0.1	83	416	84	68
197	30.584	0.155	0.055	1.00	92	2	98	3.8	0	82	414	83	68

BOX A TEST DATA - ASTM E3053 / ASTM E2515

Client: Pacific Energy
Model: FP25
Run #: 3

Job #: 19-537
Tracking #: 0048
Technician: SJB
Date: 11/26/2019

	Particulate Sampling Data							Fuel Weight (lb)		Temperature Data (°F)			
Elapsed Time (min)	Gas Meter (ft^3)	Sample Rate (cfm)	Dilution Tunnel dP (in H_2O)	Orifice dH (in H_2O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Scale Reading	Weight Change	Dilution Tunnel	Flue	Filter	Ambient
198	30.738	0.154	0.055	0.98	92	2	98	3.8	0	82	412	82	68
199	30.894	0.156	0.055	1.00	92	2	99	3.7	-0.1	82	410	82	68
200	31.049	0.155	0.055	1.00	92	2	98	3.8	0.1	82	407	83	68
201	31.203	0.154	0.055	0.99	92	2	98	3.7	-0.1	82	405	84	68
202	31.359	0.156	0.055	0.97	92	2	99	3.7	0	82	403	86	68
203	31.514	0.155	0.055	1.01	92	2	98	3.7	0	82	401	86	67
204	31.668	0.154	0.055	1.00	92	2	98	3.6	-0.1	82	399	85	68
205	31.821	0.153	0.055	1.02	92	2	97	3.6	0	82	396	84	68
206	31.974	0.153	0.055	1.00	92	2	97	3.6	0	81	395	83	68
207	32.131	0.157	0.055	0.98	92	2	99	3.6	0	81	394	82	68
208	32.285	0.154	0.055	1.00	92	2	97	3.5	-0.1	81	393	83	68
209	32.438	0.153	0.055	0.99	92	2	97	3.6	0.1	81	390	84	68
210	32.593	0.155	0.055	1.02	92	2	98	3.5	-0.1	81	388	85	68
211	32.748	0.155	0.055	1.00	92	2	98	3.5	0	81	385	86	68
212	32.903	0.155	0.055	1.01	92	2	98	3.5	0	81	383	86	68
213	33.056	0.153	0.055	1.01	92	2	97	3.3	-0.2	80	382	84	69
214	33.210	0.154	0.055	0.99	92	2	97	3.3	0	80	379	83	69
215	33.364	0.154	0.055	1.02	92	2	97	3.4	0.1	80	378	82	69
216	33.521	0.157	0.055	0.99	92	2	99	3.3	-0.1	80	376	82	69
217	33.673	0.152	0.055	1.01	92	2	96	3.4	0.1	80	374	83	69
218	33.827	0.154	0.055	0.98	92	2	97	3.4	0	80	373	84	69
219	33.982	0.155	0.055	0.99	92	2	98	3.4	0	80	371	86	69
220	34.136	0.154	0.055	1.01	92	2	97	3.4	0	80	370	86	69
221	34.289	0.153	0.055	0.99	92	2	97	3.3	-0.1	80	369	85	69
222	34.441	0.152	0.055	0.98	92	2	96	3.3	0	80	367	84	69
223	34.596	0.155	0.055	1.00	93	2	98	3.3	0	80	365	83	69
224	34.752	0.156	0.055	1.00	92	2	99	3.1	-0.2	80	364	82	69
225	34.908	0.156	0.055	1.00	93	2	98	3.2	0.1	80	362	83	69
226	35.061	0.153	0.055	1.01	93	2	96	3.2	0	79	361	83	69
227	35.214	0.153	0.055	1.00	93	2	96	3.1	-0.1	79	361	85	69
228	35.368	0.154	0.055	1.00	93	2	97	3.2	0.1	79	359	86	69
229	35.522	0.154	0.055	0.99	93	2	97	3.2	0	79	359	86	69
230	35.678	0.156	0.055	1.00	93	2	98	3.2	0	79	357	84	69

BOX A TEST DATA - ASTM E3053 / ASTM E2515

Client: Pacific Energy
Model: FP25
Run #: 3

Job #: 19-537
Tracking #: 0048
Technician: SJB
Date: 11/26/2019

	Particulate Sampling Data							Fuel Weight (lb)		Temperature Data (°F)			
Elapsed Time (min)	Gas Meter (ft^3)	Sample Rate (cfm)	Dilution Tunnel dP (in H_2O)	Orifice dH (in H_2O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Scale Reading	Weight Change	Dilution Tunnel	Flue	Filter	Ambient
231	35.829	0.151	0.055	0.98	93	2	95	3.1	-0.1	79	357	83	69
232	35.983	0.154	0.055	1.02	93	2	97	3.1	0	79	354	83	69
233	36.137	0.154	0.055	0.99	93	2	97	3.1	0	79	352	82	69
234	36.292	0.155	0.055	0.98	93	2	98	3.1	0	79	350	83	69
235	36.446	0.154	0.055	1.00	93	2	97	3.1	0	79	349	84	69
236	36.599	0.153	0.055	0.96	93	2	96	3.0	-0.1	79	349	85	69
237	36.753	0.154	0.055	1.00	93	2	97	3.1	0.1	79	347	86	69
238	36.908	0.155	0.055	1.03	93	2	98	3.0	-0.1	79	346	85	69
239	37.063	0.155	0.055	0.98	93	2	98	2.9	-0.1	79	344	84	69
240	37.215	0.152	0.055	0.98	93	2	96	3.0	0.1	78	343	83	69
241	37.368	0.153	0.055	1.00	93	2	96	3.0	0	78	342	82	69
242	37.521	0.153	0.055	0.98	93	2	96	3.0	0	78	341	82	69
243	37.675	0.154	0.055	1.00	93	2	97	2.8	-0.2	78	340	83	69
244	37.828	0.153	0.055	0.98	93	2	96	2.8	0	78	338	84	69
245	37.980	0.152	0.055	1.01	93	2	96	2.9	0.1	78	336	86	69
246	38.138	0.158	0.055	1.03	93	2	100	2.8	-0.1	78	335	86	69
247	38.300	0.162	0.055	1.07	93	2	102	2.8	0	78	334	85	69
248	38.456	0.156	0.055	1.01	93	2	98	2.8	0	78	332	83	69
249	38.616	0.160	0.055	1.05	93	2	101	2.8	0	78	331	82	69
250	38.775	0.159	0.055	1.03	93	2	100	2.8	0	78	331	82	69
251	38.935	0.160	0.055	1.03	93	2	101	2.9	0.1	78	330	82	69
252	39.092	0.157	0.055	1.06	93	2	99	2.8	-0.1	78	329	83	69
253	39.253	0.161	0.055	1.03	93	2	101	2.8	0	78	328	85	69
254	39.412	0.159	0.055	1.06	93	2	100	2.7	-0.1	78	327	86	69
255	39.571	0.159	0.055	1.04	93	2	100	2.8	0.1	78	327	86	68
256	39.731	0.160	0.055	1.05	93	2	101	2.7	-0.1	78	325	84	69
257	39.888	0.157	0.055	1.03	93	2	99	2.6	-0.1	78	325	83	69
258	40.050	0.162	0.055	1.06	93	2	102	2.7	0.1	78	324	82	68
259	40.209	0.159	0.055	1.05	93	2	100	2.6	-0.1	77	324	82	69
260	40.369	0.160	0.055	1.07	93	2	101	2.7	0.1	77	322	82	69
261	40.528	0.159	0.055	1.04	93	2	100	2.6	-0.1	77	323	83	69
262	40.687	0.159	0.055	1.02	93	2	100	2.6	0	77	322	85	68
263	40.848	0.161	0.055	1.06	93	2	101	2.6	0	77	321	86	68

BOX A TEST DATA - ASTM E3053 / ASTM E2515

Client: Pacific Energy
Model: FP25
Run #: 3

Job #: 19-537
Tracking #: 0048
Technician: SJB
Date: 11/26/2019

	Particulate Sampling Data							Fuel Weight (lb)		Temperature Data (°F)			
Elapsed Time (min)	Gas Meter (ft^3)	Sample Rate (cfm)	Dilution Tunnel dP (in H_2O)	Orifice dH (in H_2O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Scale Reading	Weight Change	Dilution Tunnel	Flue	Filter	Ambient
264	41.007	0.159	0.055	1.06	93	2	100	2.6	0	77	320	86	68
265	41.168	0.161	0.055	1.03	93	2	101	2.5	-0.1	77	320	84	68
266	41.327	0.159	0.055	1.03	93	2	100	2.6	0.1	77	319	83	69
267	41.488	0.161	0.055	1.03	93	2	101	2.5	-0.1	77	319	82	69
268	41.645	0.157	0.055	1.06	93	2	99	2.5	0	77	318	82	68
269	41.805	0.160	0.055	1.06	93	2	101	2.6	0.1	77	317	83	68
270	41.964	0.159	0.055	1.04	93	2	100	2.5	-0.1	77	317	84	68
271	42.123	0.159	0.055	1.04	93	2	100	2.5	0	77	316	85	68
272	42.283	0.160	0.055	1.03	93	2	101	2.5	0	77	317	86	68
273	42.441	0.158	0.055	1.06	93	2	99	2.3	-0.2	77	316	85	68
274	42.602	0.161	0.055	1.03	93	2	101	2.4	0.1	77	316	84	68
275	42.760	0.158	0.055	1.04	93	2	99	2.4	0	77	316	83	68
276	42.920	0.160	0.055	1.03	93	2	101	2.4	0	77	315	82	68
277	43.078	0.158	0.055	1.01	93	2	99	2.4	0	77	316	82	68
278	43.238	0.160	0.055	1.05	93	2	101	2.3	-0.1	77	315	83	68
279	43.397	0.159	0.055	1.05	93	2	100	2.4	0.1	77	315	84	68
280	43.558	0.161	0.055	1.06	93	2	101	2.3	-0.1	77	314	85	68
281	43.717	0.159	0.055	1.05	93	2	100	2.3	0	77	315	86	68
282	43.874	0.157	0.055	1.05	93	2	99	2.3	0	76	314	85	68
283	44.035	0.161	0.055	1.04	93	2	101	2.3	0	76	314	84	68
284	44.193	0.158	0.055	1.04	93	2	99	2.3	0	76	313	83	68
285	44.354	0.161	0.055	1.06	93	2	101	2.2	-0.1	76	313	82	68
286	44.514	0.160	0.055	1.03	93	2	101	2.3	0.1	76	313	82	68
287	44.673	0.159	0.055	1.03	93	2	100	2.3	0	76	313	82	68
288	44.832	0.159	0.055	1.04	93	2	100	2.3	0	76	312	84	68
289	44.992	0.160	0.055	1.04	93	2	101	2.2	-0.1	76	311	85	68
290	45.152	0.160	0.055	1.03	93	2	101	2.1	-0.1	76	312	86	68
291	45.311	0.159	0.055	1.07	93	2	100	2.2	0.1	76	311	85	68
292	45.470	0.159	0.055	1.05	93	2	100	2.2	0	76	311	84	68
293	45.627	0.157	0.055	1.03	93	2	99	2.1	-0.1	76	310	83	68
294	45.788	0.161	0.055	1.08	93	2	101	2.1	0	76	310	82	68
295	45.948	0.160	0.055	1.04	93	2	101	2.1	0	76	310	82	68
296	46.109	0.161	0.055	1.05	93	2	101	2.1	0	76	310	83	68

BOX A TEST DATA - ASTM E3053 / ASTM E2515

Client: Pacific Energy
Model: FP25
Run #: 3

Job #: 19-537
Tracking #: 0048
Technician: SJB
Date: 11/26/2019

	Particulate Sampling Data							Fuel Weight (lb)		Temperature Data (°F)			
Elapsed Time (min)	Gas Meter (ft^3)	Sample Rate (cfm)	Dilution Tunnel dP (in H_2O)	Orifice dH (in H_2O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Scale Reading	Weight Change	Dilution Tunnel	Flue	Filter	Ambient
297	46.268	0.159	0.055	1.05	93	2	100	2.1	0	76	309	84	68
298	46.426	0.158	0.055	1.05	93	2	99	2.1	0	76	310	86	68
299	46.588	0.162	0.055	1.04	93	2	102	2.0	-0.1	76	309	86	68
300	46.746	0.158	0.055	1.05	93	2	99	2.1	0.1	76	309	85	68
301	46.907	0.161	0.055	1.07	93	2	101	2.0	-0.1	76	308	83	68
302	47.065	0.158	0.055	1.06	93	2	99	2.0	0	76	308	82	68
303	47.224	0.159	0.055	1.02	93	2	100	1.9	-0.1	76	309	82	68
304	47.383	0.159	0.055	1.01	93	2	100	1.9	0	76	308	82	68
305	47.540	0.157	0.055	1.06	93	2	99	1.9	0	76	309	83	68
306	47.700	0.160	0.055	1.04	93	2	101	2.0	0.1	76	309	84	68
307	47.857	0.157	0.055	1.04	93	2	99	1.9	-0.1	76	309	86	68
308	48.017	0.160	0.055	1.06	93	2	101	2.0	0.1	76	308	86	68
309	48.174	0.157	0.055	1.01	93	2	99	1.8	-0.2	76	309	85	68
310	48.334	0.160	0.055	1.04	93	2	101	1.9	0.1	76	309	84	68
311	48.493	0.159	0.055	1.05	93	2	100	1.9	0	76	308	82	68
312	48.651	0.158	0.055	1.06	93	2	99	1.9	0	76	308	82	68
313	48.812	0.161	0.055	1.02	93	2	101	1.9	0	76	308	82	68
314	48.970	0.158	0.055	1.07	93	2	99	1.8	-0.1	76	308	83	68
315	49.129	0.159	0.055	1.06	93	2	100	1.8	0	76	308	84	68
316	49.286	0.157	0.055	1.07	93	2	99	1.9	0.1	76	306	86	68
317	49.446	0.160	0.055	1.04	93	2	101	1.8	-0.1	76	307	86	68
318	49.605	0.159	0.055	1.04	93	2	100	1.8	0	76	306	84	68
319	49.764	0.159	0.055	1.06	93	2	100	1.8	0	76	306	83	68
320	49.924	0.160	0.055	1.05	93	2	101	1.8	0	76	306	82	68
321	50.082	0.158	0.055	1.06	93	2	99	1.6	-0.2	76	306	82	68
322	50.242	0.160	0.055	1.03	93	2	101	1.7	0.1	76	305	82	68
323	50.399	0.157	0.055	1.03	93	2	99	1.7	0	76	304	83	68
324	50.559	0.160	0.055	1.05	93	2	101	1.7	0	76	305	84	68
325	50.717	0.158	0.055	1.03	93	2	99	1.7	0	76	305	86	68
326	50.876	0.159	0.055	1.04	93	2	100	1.7	0	76	305	85	68
327	51.035	0.159	0.055	1.02	93	2	100	1.7	0	76	305	84	68
328	51.192	0.157	0.055	1.04	93	2	99	1.6	-0.1	76	304	83	68
329	51.352	0.160	0.055	1.05	93	2	101	1.6	0	76	304	82	68

BOX A TEST DATA - ASTM E3053 / ASTM E2515

Client: Pacific Energy
Model: FP25
Run #: 3

Job #: 19-537
Tracking #: 0048
Technician: SJB
Date: 11/26/2019

	Particulate Sampling Data							Fuel Weight (lb)		Temperature Data (°F)			
Elapsed Time (min)	Gas Meter (ft^3)	Sample Rate (cfm)	Dilution Tunnel dP (in H_2O)	Orifice dH (in H_2O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Scale Reading	Weight Change	Dilution Tunnel	Flue	Filter	Ambient
330	51.509	0.157	0.055	1.04	93	2	99	1.6	0	76	303	82	68
331	51.669	0.160	0.055	1.04	93	2	101	1.5	-0.1	76	303	82	68
332	51.825	0.156	0.055	1.05	93	2	98	1.6	0.1	76	303	83	68
333	51.985	0.160	0.055	1.03	93	2	101	1.5	-0.1	76	302	85	68
334	52.145	0.160	0.055	1.03	93	2	101	1.5	0	76	301	86	68
335	52.303	0.158	0.055	1.06	93	2	99	1.5	0	76	300	85	68
336	52.462	0.159	0.055	1.05	93	2	100	1.5	0	76	300	84	68
337	52.619	0.157	0.055	1.04	93	2	99	1.5	0	76	299	83	68
338	52.778	0.159	0.055	1.06	93	2	100	1.5	0	76	297	82	68
339	52.936	0.158	0.055	1.05	93	2	99	1.5	0	76	297	82	68
340	53.094	0.158	0.055	1.08	93	2	99	1.5	0	76	297	82	68
341	53.252	0.158	0.055	1.08	93	2	99	1.5	0	75	296	83	68
342	53.411	0.159	0.055	1.04	93	2	100	1.4	-0.1	75	295	85	68
343	53.570	0.159	0.055	1.06	93	2	100	1.4	0	75	295	86	67
344	53.728	0.158	0.055	1.02	93	2	99	1.4	0	75	293	85	68
345	53.887	0.159	0.055	1.05	93	2	100	1.4	0	75	293	84	68
346	54.044	0.157	0.055	1.03	93	2	99	1.4	0	75	293	83	68
347	54.202	0.158	0.055	1.05	93	2	99	1.3	-0.1	75	292	82	68
348	54.362	0.160	0.055	1.06	93	2	101	1.3	0	75	291	82	68
349	54.519	0.157	0.055	1.03	93	2	99	1.3	0	75	291	82	68
350	54.679	0.160	0.055	1.05	93	2	101	1.3	0	75	290	84	67
351	54.836	0.157	0.055	1.03	93	2	99	1.3	0	75	289	85	67
352	54.997	0.161	0.055	1.04	93	2	101	1.2	-0.1	75	288	86	67
353	55.153	0.156	0.055	1.05	93	2	98	1.2	0	75	290	85	67
354	55.313	0.160	0.055	1.04	93	2	101	1.3	0.1	75	289	84	68
355	55.472	0.159	0.055	1.04	93	2	100	1.3	0	75	288	82	68
356	55.630	0.158	0.055	1.03	93	2	99	1.3	0	75	287	82	68
357	55.790	0.160	0.055	1.03	93	2	101	1.2	-0.1	75	288	82	68
358	55.947	0.157	0.055	1.05	93	2	99	1.3	0.1	75	288	82	68
359	56.107	0.160	0.055	1.03	93	2	101	1.1	-0.2	75	288	83	68
360	56.264	0.157	0.055	1.02	93	2	99	1.2	0.1	75	288	85	68
361	56.424	0.160	0.055	1.04	93	2	101	1.2	0	75	287	86	68
362	56.582	0.158	0.055	1.01	92	2	99	1.1	-0.1	75	287	85	67

BOX A TEST DATA - ASTM E3053 / ASTM E2515

Client: Pacific Energy
Model: FP25
Run #: 3

Job #: 19-537
Tracking #: 0048
Technician: SJB
Date: 11/26/2019

	Particulate Sampling Data							Fuel Weight (lb)		Temperature Data (°F)			
Elapsed Time (min)	Gas Meter (ft^3)	Sample Rate (cfm)	Dilution Tunnel dP (in H_2O)	Orifice dH (in H_2O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Scale Reading	Weight Change	Dilution Tunnel	Flue	Filter	Ambient
363	56.739	0.157	0.055	1.05	92	2	99	1.2	0.1	75	286	84	68
364	56.898	0.159	0.055	1.03	92	2	100	1.1	-0.1	75	286	83	68
365	57.056	0.158	0.055	1.04	92	2	99	1.1	0	75	285	82	68
366	57.214	0.158	0.055	1.07	92	2	99	1.1	0	75	286	82	68
367	57.371	0.157	0.055	1.04	93	2	99	1.1	0	75	286	82	68
368	57.530	0.159	0.055	1.05	92	2	100	1.1	0	75	284	83	68
369	57.689	0.159	0.055	1.05	92	2	100	1.1	0	75	283	85	67
370	57.847	0.158	0.055	1.04	92	2	99	1.1	0	75	283	86	67
371	58.008	0.161	0.055	1.02	92	2	101	1.1	0	75	283	85	68
372	58.164	0.156	0.055	1.03	92	2	98	1.0	-0.1	75	282	84	68
373	58.324	0.160	0.055	1.03	92	2	101	0.9	-0.1	75	281	83	68
374	58.484	0.160	0.055	1.05	92	2	101	0.9	0	75	281	82	68
375	58.642	0.158	0.055	1.03	92	2	99	1.0	0.1	75	281	82	68
376	58.802	0.160	0.055	1.02	92	2	101	1.0	0	75	281	82	67
377	58.959	0.157	0.055	1.03	92	2	99	1.0	0	75	281	83	68
378	59.118	0.159	0.055	1.03	92	2	100	1.0	0	75	280	85	68
379	59.277	0.159	0.055	1.01	92	2	100	1.0	0	75	278	86	68
380	59.436	0.159	0.055	1.06	92	2	100	1.0	0	75	278	85	67
381	59.595	0.159	0.055	1.05	92	2	100	1.0	0	75	276	84	68
382	59.754	0.159	0.055	1.07	92	2	100	0.9	-0.1	75	276	83	68
383	59.913	0.159	0.055	1.06	92	2	100	0.9	0	75	275	82	68
384	60.071	0.158	0.055	1.07	92	2	99	0.8	-0.1	75	274	82	68
385	60.231	0.160	0.055	1.02	92	2	101	0.9	0.1	75	273	82	68
386	60.389	0.158	0.055	1.02	92	2	99	0.8	-0.1	75	273	83	68
387	60.548	0.159	0.055	1.03	92	2	100	0.8	0	75	272	85	68
388	60.706	0.158	0.055	1.04	92	2	99	0.8	0	75	272	86	67
389	60.865	0.159	0.055	1.03	92	2	100	0.8	0	75	271	85	68
390	61.024	0.159	0.055	1.06	92	2	100	0.8	0	75	270	84	67
391	61.181	0.157	0.055	1.04	92	2	99	0.8	0	75	269	83	68
392	61.340	0.159	0.055	1.03	92	2	100	0.8	0	75	268	82	68
393	61.497	0.157	0.055	1.05	92	2	99	0.8	0	74	268	82	67
394	61.656	0.159	0.055	1.03	92	2	100	0.8	0	75	267	82	67
395	61.815	0.159	0.055	1.04	92	2	100	0.8	0	74	266	83	68

BOX A TEST DATA - ASTM E3053 / ASTM E2515

Client: Pacific Energy
Model: FP25
Run #: 3

Job #: 19-537
Tracking #: 0048
Technician: SJB
Date: 11/26/2019

	Particulate Sampling Data							Fuel Weight (lb)		Temperature Data (°F)			
Elapsed Time (min)	Gas Meter (ft^3)	Sample Rate (cfm)	Dilution Tunnel dP (in H_2O)	Orifice dH (in H_2O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Scale Reading	Weight Change	Dilution Tunnel	Flue	Filter	Ambient
396	61.974	0.159	0.055	1.04	92	2	100	0.8	0	74	266	85	68
397	62.133	0.159	0.055	1.01	92	2	100	0.7	-0.1	74	265	86	68
398	62.290	0.157	0.055	1.02	92	2	99	0.7	0	74	264	85	67
399	62.450	0.160	0.055	1.03	92	2	101	0.7	0	74	264	84	67
400	62.606	0.156	0.055	1.04	92	2	98	0.7	0	74	263	83	67
401	62.765	0.159	0.055	1.02	92	2	100	0.7	0	74	262	82	67
402	62.924	0.159	0.055	1.04	92	2	100	0.7	0	74	261	82	67
403	63.081	0.157	0.055	1.05	92	2	99	0.7	0	74	261	82	68
404	63.240	0.159	0.055	1.05	92	2	100	0.7	0	74	261	83	68
405	63.398	0.158	0.055	1.04	92	2	99	0.7	0	74	260	85	67
406	63.558	0.160	0.055	1.04	92	2	101	0.6	-0.1	74	259	86	67
407	63.715	0.157	0.055	1.04	92	2	99	0.7	0.1	74	259	85	67
408	63.874	0.159	0.055	1.00	92	2	100	0.6	-0.1	74	258	84	67
409	64.033	0.159	0.055	1.04	92	2	100	0.6	0	74	257	83	67
410	64.191	0.158	0.055	1.02	92	2	99	0.6	0	74	257	82	68
411	64.350	0.159	0.055	1.03	92	2	100	0.6	0	74	256	82	67
412	64.508	0.158	0.055	1.04	92	2	99	0.6	0	74	256	82	67
413	64.668	0.160	0.055	1.04	92	2	101	0.6	0	74	254	83	67
414	64.825	0.157	0.055	1.04	92	2	99	0.6	0	74	255	84	67
415	64.983	0.158	0.055	1.04	92	2	99	0.6	0	74	254	86	67
416	65.143	0.160	0.055	1.02	92	2	101	0.5	-0.1	74	254	85	67
417	65.300	0.157	0.055	1.05	92	2	99	0.5	0	74	254	84	67
418	65.459	0.159	0.055	1.03	92	2	100	0.5	0	74	254	83	67
419	65.615	0.156	0.055	1.04	92	2	98	0.5	0	74	253	82	67
420	65.775	0.160	0.055	1.08	92	2	101	0.5	0	74	253	82	67
421	65.934	0.159	0.055	1.06	92	2	100	0.5	0	74	253	82	67
422	66.093	0.159	0.055	1.04	92	2	100	0.5	0	74	252	83	67
423	66.252	0.159	0.055	1.06	92	2	100	0.5	0	74	251	84	67
424	66.410	0.158	0.055	1.03	92	2	99	0.5	0	74	250	85	67
425	66.569	0.159	0.055	1.02	92	2	100	0.5	0	74	250	86	67
426	66.727	0.158	0.055	1.03	92	2	99	0.5	0	74	251	84	68
427	66.886	0.159	0.055	1.06	92	2	100	0.5	0	74	249	83	68
428	67.044	0.158	0.055	1.04	92	2	99	0.4	-0.1	74	250	82	67

BOX A TEST DATA - ASTM E3053 / ASTM E2515

Client: Pacific Energy
Model: FP25
Run #: 3

Job #: 19-537
Tracking #: 0048
Technician: SJB
Date: 11/26/2019

	Particulate Sampling Data							Fuel Weight (lb)		Temperature Data (°F)			
Elapsed Time (min)	Gas Meter (ft^3)	Sample Rate (cfm)	Dilution Tunnel dP (in H_2O)	Orifice dH (in H_2O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Scale Reading	Weight Change	Dilution Tunnel	Flue	Filter	Ambient
429	67.202	0.158	0.055	1.04	92	2	99	0.4	0	74	249	82	68
430	67.361	0.159	0.055	1.05	92	2	100	0.4	0	74	249	82	67
431	67.520	0.159	0.055	1.05	92	2	100	0.4	0	74	249	83	67
432	67.678	0.158	0.055	1.07	92	2	99	0.4	0	74	248	84	67
433	67.837	0.159	0.055	1.05	92	2	100	0.4	0	74	248	85	67
434	67.995	0.158	0.055	1.06	92	2	99	0.4	0	74	248	85	67
435	68.154	0.159	0.055	1.04	92	2	100	0.4	0	74	247	84	67
436	68.313	0.159	0.055	1.04	92	2	100	0.4	0	74	247	83	67
437	68.471	0.158	0.055	1.05	92	2	99	0.2	-0.2	74	246	82	67
438	68.631	0.160	0.055	1.03	92	2	101	0.4	0.2	74	246	82	67
439	68.791	0.160	0.055	1.03	92	2	101	0.3	-0.1	74	246	82	67
440	68.948	0.157	0.055	1.06	92	2	99	0.3	0	74	244	83	67
441	69.107	0.159	0.055	1.06	92	2	100	0.3	0	74	244	85	67
442	69.264	0.157	0.055	1.03	92	2	99	0.2	-0.1	74	243	86	67
443	69.422	0.158	0.055	1.03	92	2	99	0.2	0	74	244	85	67
444	69.582	0.160	0.055	1.05	92	2	101	0.3	0.1	74	243	84	67
445	69.738	0.156	0.055	1.03	92	2	98	0.3	0	74	243	83	67
446	69.896	0.158	0.055	1.04	92	2	99	0.3	0	74	242	82	67
447	70.055	0.159	0.055	1.05	92	2	100	0.3	0	74	242	82	67
448	70.215	0.160	0.055	1.07	92	2	101	0.2	-0.1	74	242	82	67
449	70.373	0.158	0.055	1.05	92	2	99	0.3	0.1	74	243	83	67
450	70.532	0.159	0.055	1.04	92	2	100	0.1	-0.2	74	241	85	67
451	70.693	0.161	0.055	1.06	92	2	101	0.1	0	73	241	86	67
452	70.849	0.156	0.055	1.04	92	2	98	0.1	0	74	241	85	67
453	71.009	0.160	0.055	1.04	92	2	101	0.1	0	73	240	84	67
454	71.166	0.157	0.055	1.03	92	2	99	0.2	0.1	73	241	82	67
455	71.327	0.161	0.055	1.04	92	2	101	0.1	-0.1	73	240	82	67
456	71.485	0.158	0.055	1.03	92	2	99	0.2	0.1	73	239	82	67
457	71.643	0.158	0.055	1.06	92	2	99	0.1	-0.1	73	238	82	67
458	71.802	0.159	0.055	1.06	92	2	100	0.1	0	73	237	83	67
459	71.960	0.158	0.055	1.04	92	2	99	0.0	-0.1	73	237	85	67
Avg/Tot	71.960	0.157	0.055	1.02	90	2.00	100			85	452	84	68.6

BOX B TEST DATA - ASTM E3053 / ASTM E2515

Client: Pacific Energy
Model: FP25
Run #: 3

Job #: 19-537
Tracking #: 0048
Technician: SJB
Date: 11/26/2019

	Particulate Sampling Data							Flue Gas Data		
Elapsed Time (min)	Gas Meter (ft^3)	Sample Rate (cfm)	Orifice dH (in H_2O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Filter (°F)	Flue Draft (in H_2O)	CO_2 (%)	CO (%)
0	0.000		0.00	69	2		82	0.000	5.30	0.63
1	0.126	0.126	1.06	69	2	87	84	-0.070	3.71	0.39
2	0.282	0.156	1.10	69	2	107	87	-0.090	9.22	0.73
3	0.436	0.154	1.10	69	2	105	86	-0.080	12.51	0.52
4	0.588	0.152	1.07	69	2	104	84	-0.090	17.01	1.71
5	0.742	0.154	1.17	69	2	106	83	-0.090	17.35	0.97
6	0.903	0.161	1.15	70	2	109	82	-0.080	17.29	2.48
7	1.060	0.157	1.14	70	2	106	83	-0.080	15.98	1.58
8	1.219	0.159	1.14	70	2	107	85	-0.090	15.56	1.28
9	1.377	0.158	1.14	70	2	106	86	-0.090	15.30	1.14
10	1.534	0.157	1.13	70	2	106	85	-0.080	15.07	1.11
11	1.692	0.158	1.13	71	2	106	82	-0.080	15.23	1.15
12	1.848	0.156	1.12	71	2	105	82	-0.090	15.00	1.09
13	2.003	0.155	1.11	71	2	104	83	-0.080	15.21	1.21
14	2.161	0.158	1.11	71	2	106	85	-0.080	15.01	1.12
15	2.318	0.157	1.11	72	2	105	86	-0.080	15.05	1.20
16	2.472	0.154	1.11	72	2	103	84	-0.080	14.81	1.15
17	2.627	0.155	1.09	72	2	104	82	-0.080	14.89	1.13
18	2.782	0.155	1.10	72	2	104	81	-0.080	14.96	1.03
19	2.939	0.157	1.10	73	2	105	83	-0.080	14.92	0.97
20	3.091	0.152	1.10	73	2	102	85	-0.080	15.16	0.98
21	3.246	0.155	1.10	73	2	104	86	-0.080	14.96	0.98
22	3.401	0.155	1.10	74	2	103	84	-0.080	14.79	0.91
23	3.556	0.155	1.10	74	2	103	82	-0.080	14.80	0.90
24	3.712	0.156	1.09	74	2	104	81	-0.080	14.68	0.87
25	3.865	0.153	1.06	75	2	102	82	-0.080	14.58	0.88
26	4.019	0.154	1.09	75	2	102	85	-0.070	14.33	0.85
27	4.173	0.154	1.09	75	2	102	86	-0.080	13.94	0.86
28	4.325	0.152	1.08	76	2	101	85	-0.080	14.09	0.74
29	4.478	0.153	1.07	76	2	102	82	-0.080	13.88	0.81
30	4.629	0.151	1.08	76	2	100	81	-0.080	14.08	0.82
31	4.782	0.153	1.09	76	2	101	82	-0.080	14.12	0.86

BOX B TEST DATA - ASTM E3053 / ASTM E2515

Client: Pacific Energy
Model: FP25
Run #: 3

Job #: 19-537
Tracking #: 0048
Technician: SJB
Date: 11/26/2019

	Particulate Sampling Data							Flue Gas Data		
Elapsed Time (min)	Gas Meter (ft^3)	Sample Rate (cfm)	Orifice dH (in H_2O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Filter (°F)	Flue Draft (in H_2O)	CO_2 (%)	CO (%)
32	4.935	0.153	1.06	77	2	101	85	-0.080	14.24	0.85
33	5.089	0.154	1.07	77	2	102	86	-0.080	14.08	0.80
34	5.243	0.154	1.07	77	2	102	85	-0.080	14.01	0.81
35	5.396	0.153	1.08	78	2	101	83	-0.080	14.14	0.83
36	5.549	0.153	1.07	78	2	101	81	-0.080	14.06	0.82
37	5.702	0.153	1.06	78	2	101	81	-0.080	14.17	0.91
38	5.853	0.151	1.06	79	2	99	84	-0.070	14.22	0.88
39	6.005	0.152	1.05	79	2	100	86	-0.080	14.09	0.87
40	6.153	0.148	1.06	79	2	97	86	-0.080	14.08	0.90
41	6.304	0.151	1.04	80	2	99	83	-0.080	14.39	0.81
42	6.455	0.151	1.04	80	2	99	81	-0.070	14.70	0.74
43	6.606	0.151	1.04	80	2	99	81	-0.070	14.79	0.70
44	6.756	0.150	1.04	81	2	98	83	-0.080	14.90	0.70
45	6.907	0.151	1.04	81	2	99	85	-0.070	14.91	0.61
46	7.057	0.150	1.04	81	2	98	86	-0.080	15.11	0.63
47	7.209	0.152	1.03	81	2	100	84	-0.080	15.09	0.63
48	7.358	0.149	1.02	82	2	97	82	-0.080	15.10	0.59
49	7.512	0.154	1.13	82	2	101	81	-0.070	14.94	0.61
50	7.672	0.160	1.14	82	2	105	83	-0.070	14.80	0.57
51	7.832	0.160	1.13	83	2	104	85	-0.070	14.47	0.70
52	7.994	0.162	1.15	83	2	106	86	-0.070	14.38	0.65
53	8.153	0.159	1.12	83	2	104	84	-0.080	14.57	0.68
54	8.311	0.158	1.12	83	2	103	82	-0.070	14.37	0.71
55	8.469	0.158	1.11	84	2	103	81	-0.070	14.32	0.74
56	8.623	0.154	1.10	84	2	100	82	-0.070	14.38	0.85
57	8.778	0.155	1.07	84	2	101	85	-0.070	14.40	0.95
58	8.932	0.154	1.07	84	2	100	86	-0.070	14.38	0.86
59	9.084	0.152	1.05	85	2	99	84	-0.080	14.35	0.85
60	9.243	0.159	1.11	85	2	103	82	-0.070	14.49	0.63
61	9.396	0.153	1.08	85	2	99	81	-0.080	14.27	0.59
62	9.551	0.155	1.05	85	2	101	82	-0.070	14.38	0.58
63	9.703	0.152	1.03	86	2	99	85	-0.070	14.44	0.65

BOX B TEST DATA - ASTM E3053 / ASTM E2515

Client: Pacific Energy
Model: FP25
Run #: 3

Job #: 19-537
Tracking #: 0048
Technician: SJB
Date: 11/26/2019

	Particulate Sampling Data							Flue Gas Data		
Elapsed Time (min)	Gas Meter (ft^3)	Sample Rate (cfm)	Orifice dH (in H_2O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Filter (°F)	Flue Draft (in H_2O)	CO_2 (%)	CO (%)
64	9.856	0.153	1.04	86	2	99	86	-0.070	13.56	0.94
65	10.005	0.149	1.01	86	2	97	84	-0.080	13.22	0.72
66	10.155	0.150	1.01	86	2	97	82	-0.070	13.26	0.68
67	10.302	0.147	1.00	86	2	95	81	-0.080	13.45	0.46
68	10.466	0.164	1.22	87	2	106	82	-0.070	13.16	0.65
69	10.630	0.164	1.19	87	2	106	84	-0.070	13.28	0.56
70	10.795	0.165	1.18	87	2	107	86	-0.070	13.54	0.38
71	10.960	0.165	1.18	87	2	107	85	-0.070	13.55	0.32
72	11.125	0.165	1.17	87	2	107	83	-0.070	13.46	0.31
73	11.289	0.164	1.18	88	2	106	81	-0.070	13.40	0.31
74	11.451	0.162	1.15	88	2	104	81	-0.070	13.28	0.32
75	11.615	0.164	1.16	88	2	106	83	-0.070	13.32	0.34
76	11.776	0.161	1.16	88	2	104	86	-0.060	13.40	0.34
77	11.962	0.186	1.17	88	2	120	85	-0.080	13.46	0.32
78	12.125	0.163	1.15	88	2	105	83	-0.070	13.34	0.41
79	12.287	0.162	1.14	89	2	104	81	-0.070	13.58	0.43
80	12.448	0.161	1.15	89	2	104	82	-0.070	13.49	0.44
81	12.611	0.163	1.14	89	2	105	84	-0.070	13.42	0.47
82	12.769	0.158	1.10	89	2	102	86	-0.070	13.20	0.48
83	12.919	0.150	1.03	89	2	96	85	-0.070	12.50	0.50
84	13.068	0.149	1.02	89	2	96	82	-0.070	12.27	0.50
85	13.217	0.149	1.03	90	2	96	81	-0.070	12.31	0.39
86	13.367	0.150	1.02	90	2	96	82	-0.070	12.33	0.39
87	13.516	0.149	1.03	90	2	96	84	-0.070	12.32	0.35
88	13.668	0.152	1.03	90	2	97	86	-0.070	12.44	0.35
89	13.816	0.148	1.05	90	2	95	85	-0.070	12.36	0.34
90	13.966	0.150	1.02	90	2	96	83	-0.070	12.53	0.36
91	14.114	0.148	1.02	90	2	95	81	-0.070	12.58	0.38
92	14.263	0.149	1.02	91	2	95	81	-0.070	12.53	0.31
93	14.411	0.148	1.01	91	2	95	84	-0.070	12.54	0.34
94	14.560	0.149	1.02	91	2	95	86	-0.060	12.43	0.36
95	14.709	0.149	1.01	91	2	95	85	-0.070	12.33	0.42

BOX B TEST DATA - ASTM E3053 / ASTM E2515

Client: Pacific Energy
Model: FP25
Run #: 3

Job #: 19-537
Tracking #: 0048
Technician: SJB
Date: 11/26/2019

	Particulate Sampling Data							Flue Gas Data		
Elapsed Time (min)	Gas Meter (ft^3)	Sample Rate (cfm)	Orifice dH (in H_2O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Filter (°F)	Flue Draft (in H_2O)	CO_2 (%)	CO (%)
96	14.858	0.149	1.03	91	2	95	83	-0.070	12.33	0.43
97	15.018	0.160	1.13	91	2	102	81	-0.070	12.44	0.43
98	15.176	0.158	1.13	91	2	101	81	-0.070	12.47	0.40
99	15.337	0.161	1.10	91	2	103	83	-0.070	12.42	0.39
100	15.496	0.159	1.12	91	2	102	86	-0.060	12.57	0.33
101	15.653	0.157	1.13	92	2	100	85	-0.060	12.73	0.32
102	15.813	0.160	1.12	92	2	102	83	-0.060	12.29	0.32
103	15.971	0.158	1.12	92	2	101	81	-0.070	12.27	0.34
104	16.130	0.159	1.10	92	2	101	80	-0.070	12.23	0.39
105	16.290	0.160	1.14	92	2	102	82	-0.070	12.29	0.41
106	16.445	0.155	1.12	92	2	99	85	-0.070	12.56	0.41
107	16.603	0.158	1.10	92	2	101	85	-0.060	12.65	0.41
108	16.762	0.159	1.11	92	2	101	83	-0.060	12.79	0.43
109	16.919	0.157	1.12	92	2	100	81	-0.070	13.00	0.40
110	17.080	0.161	1.10	92	2	103	80	-0.060	12.90	0.38
111	17.240	0.160	1.11	92	2	102	81	-0.060	13.03	0.39
112	17.398	0.158	1.11	93	2	101	84	-0.070	13.20	0.40
113	17.558	0.160	1.11	93	2	102	85	-0.070	13.10	0.38
114	17.716	0.158	1.11	93	2	101	84	-0.060	13.01	0.41
115	17.872	0.156	1.12	93	2	99	81	-0.060	12.94	0.54
116	18.029	0.157	1.11	93	2	100	80	-0.070	12.98	0.53
117	18.189	0.160	1.10	93	2	102	80	-0.070	13.03	0.38
118	18.347	0.158	1.12	93	2	101	83	-0.060	13.09	0.40
119	18.507	0.160	1.11	93	2	102	85	-0.070	13.01	0.39
120	18.665	0.158	1.10	93	2	101	84	-0.070	13.08	0.43
121	18.822	0.157	1.11	93	2	100	82	-0.070	12.99	0.43
122	18.981	0.159	1.11	93	2	101	80	-0.070	13.07	0.54
123	19.139	0.158	1.10	93	2	101	80	-0.070	13.43	0.53
124	19.299	0.160	1.11	93	2	102	82	-0.060	13.34	0.50
125	19.458	0.159	1.12	93	2	101	85	-0.070	13.57	0.55
126	19.617	0.159	1.12	93	2	101	85	-0.070	13.87	0.61
127	19.774	0.157	1.10	93	2	100	82	-0.070	13.93	0.67

BOX B TEST DATA - ASTM E3053 / ASTM E2515

Client: Pacific Energy
Model: FP25
Run #: 3

Job #: 19-537
Tracking #: 0048
Technician: SJB
Date: 11/26/2019

	Particulate Sampling Data							Flue Gas Data		
Elapsed Time (min)	Gas Meter (ft^3)	Sample Rate (cfm)	Orifice dH (in H_2O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Filter (°F)	Flue Draft (in H_2O)	CO_2 (%)	CO (%)
128	19.930	0.156	1.09	93	2	99	80	-0.070	14.11	0.76
129	20.091	0.161	1.10	93	2	102	80	-0.070	14.30	0.81
130	20.248	0.157	1.10	93	2	100	82	-0.070	14.26	0.84
131	20.407	0.159	1.09	93	2	101	84	-0.070	14.43	0.89
132	20.567	0.160	1.11	94	2	102	85	-0.070	14.44	0.81
133	20.722	0.155	1.11	94	2	98	82	-0.070	14.45	0.85
134	20.879	0.157	1.10	94	2	100	80	-0.070	14.43	0.93
135	21.039	0.160	1.10	94	2	102	80	-0.070	14.38	1.10
136	21.196	0.157	1.10	94	2	100	82	-0.070	14.52	1.11
137	21.354	0.158	1.10	94	2	100	85	-0.070	14.48	1.12
138	21.512	0.158	1.10	94	2	100	85	-0.060	14.36	1.16
139	21.671	0.159	1.09	94	2	101	83	-0.070	14.35	1.19
140	21.827	0.156	1.09	94	2	99	80	-0.060	14.42	1.23
141	21.984	0.157	1.09	94	2	100	80	-0.070	14.24	1.26
142	22.143	0.159	1.09	94	2	101	81	-0.070	14.18	1.24
143	22.300	0.157	1.10	94	2	100	84	-0.070	13.89	1.31
144	22.455	0.155	1.08	94	2	98	85	-0.070	13.82	1.35
145	22.614	0.159	1.09	94	2	101	84	-0.060	13.68	1.35
146	22.770	0.156	1.08	94	2	99	81	-0.060	13.54	1.33
147	22.926	0.156	1.10	94	2	99	80	-0.070	13.51	1.34
148	23.084	0.158	1.09	94	2	100	81	-0.070	13.44	0.79
149	23.244	0.160	1.09	94	2	102	83	-0.070	13.23	0.73
150	23.402	0.158	1.10	94	2	100	85	-0.060	13.11	0.71
151	23.558	0.156	1.09	94	2	99	84	-0.070	13.05	0.75
152	23.715	0.157	1.09	94	2	100	81	-0.070	12.95	0.65
153	23.874	0.159	1.10	94	2	101	80	-0.060	12.71	0.77
154	24.031	0.157	1.07	94	2	100	80	-0.060	12.86	0.66
155	24.185	0.154	1.08	94	2	98	83	-0.060	12.65	0.81
156	24.345	0.160	1.08	94	2	101	85	-0.070	12.56	1.00
157	24.503	0.158	1.11	94	2	100	84	-0.060	12.35	1.25
158	24.657	0.154	1.09	94	2	98	82	-0.070	12.56	1.36
159	24.812	0.155	1.07	94	2	98	80	-0.070	12.72	1.25

BOX B TEST DATA - ASTM E3053 / ASTM E2515

Client: Pacific Energy
Model: FP25
Run #: 3

Job #: 19-537
Tracking #: 0048
Technician: SJB
Date: 11/26/2019

	Particulate Sampling Data							Flue Gas Data		
Elapsed Time (min)	Gas Meter (ft^3)	Sample Rate (cfm)	Orifice dH (in H_2O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Filter (°F)	Flue Draft (in H_2O)	CO_2 (%)	CO (%)
160	24.970	0.158	1.08	94	2	100	80	-0.060	12.73	1.30
161	25.126	0.156	1.08	94	2	99	83	-0.060	12.64	1.28
162	25.284	0.158	1.09	94	2	100	85	-0.060	12.46	1.29
163	25.438	0.154	1.08	94	2	98	85	-0.060	12.54	1.18
164	25.594	0.156	1.08	94	2	99	82	-0.060	12.08	0.97
165	25.751	0.157	1.08	94	2	99	80	-0.060	11.58	0.84
166	25.908	0.157	1.07	94	2	99	80	-0.060	11.43	0.81
167	26.062	0.154	1.07	94	2	98	82	-0.060	11.04	0.84
168	26.218	0.156	1.09	94	2	99	85	-0.060	10.00	1.08
169	26.374	0.156	1.07	94	2	99	85	-0.060	9.75	1.23
170	26.531	0.157	1.08	94	2	99	83	-0.060	9.52	1.34
171	26.686	0.155	1.06	94	2	98	81	-0.060	9.43	1.37
172	26.841	0.155	1.06	94	2	98	80	-0.050	9.33	1.34
173	26.996	0.155	1.08	94	2	98	82	-0.050	9.26	1.22
174	27.150	0.154	1.06	94	2	97	84	-0.060	9.22	1.10
175	27.304	0.154	1.07	94	2	97	85	-0.060	9.15	1.09
176	27.459	0.155	1.06	94	2	98	84	-0.050	9.12	1.14
177	27.612	0.153	1.08	94	2	97	81	-0.050	9.04	1.24
178	27.766	0.154	1.07	94	2	97	80	-0.050	8.90	1.32
179	27.923	0.157	1.07	94	2	99	81	-0.060	8.91	1.43
180	28.077	0.154	1.07	94	2	97	83	-0.050	8.88	1.57
181	28.234	0.157	1.08	94	2	99	85	-0.050	8.89	1.61
182	28.388	0.154	1.06	94	2	97	84	-0.050	8.89	1.66
183	28.541	0.153	1.07	94	2	96	81	-0.050	8.92	1.70
184	28.695	0.154	1.06	94	2	97	80	-0.050	9.00	1.70
185	28.850	0.155	1.06	94	2	98	80	-0.050	8.99	1.72
186	29.005	0.155	1.07	94	2	98	83	-0.050	9.03	1.68
187	29.161	0.156	1.06	94	2	98	86	-0.050	9.08	1.65
188	29.315	0.154	1.06	94	2	97	85	-0.050	9.08	1.62
189	29.470	0.155	1.07	94	2	98	83	-0.050	8.95	1.68
190	29.625	0.155	1.06	94	2	98	80	-0.050	8.94	1.69
191	29.781	0.156	1.07	94	2	98	80	-0.050	9.02	1.61

BOX B TEST DATA - ASTM E3053 / ASTM E2515

Client: Pacific Energy
Model: FP25
Run #: 3

Job #: 19-537
Tracking #: 0048
Technician: SJB
Date: 11/26/2019

	Particulate Sampling Data							Flue Gas Data		
Elapsed Time (min)	Gas Meter (ft^3)	Sample Rate (cfm)	Orifice dH (in H_2O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Filter (°F)	Flue Draft (in H_2O)	CO_2 (%)	CO (%)
192	29.937	0.156	1.06	94	2	98	82	-0.050	9.04	1.66
193	30.092	0.155	1.06	94	2	98	85	-0.040	8.98	1.36
194	30.246	0.154	1.06	94	2	97	85	-0.040	9.00	1.31
195	30.400	0.154	1.06	94	2	97	83	-0.050	8.99	1.28
196	30.554	0.154	1.05	94	2	97	81	-0.040	9.07	1.27
197	30.710	0.156	1.06	94	2	98	80	-0.050	9.04	1.31
198	30.865	0.155	1.05	94	2	97	81	-0.050	9.14	1.32
199	31.021	0.156	1.06	94	2	98	84	-0.040	9.09	1.36
200	31.174	0.153	1.07	94	2	96	85	-0.050	9.09	1.38
201	31.329	0.155	1.05	94	2	97	84	-0.050	9.08	1.44
202	31.483	0.154	1.04	94	2	97	81	-0.050	9.07	1.51
203	31.636	0.153	1.06	94	2	96	80	-0.040	9.08	1.50
204	31.791	0.155	1.04	94	2	97	81	-0.040	9.03	1.59
205	31.946	0.155	1.06	94	2	97	83	-0.050	9.00	1.64
206	32.100	0.154	1.05	94	2	97	86	-0.050	9.02	1.64
207	32.253	0.153	1.07	94	2	96	85	-0.040	9.04	1.66
208	32.408	0.155	1.05	94	2	97	82	-0.040	8.92	1.64
209	32.564	0.156	1.05	94	2	98	80	-0.040	8.88	1.60
210	32.717	0.153	1.06	94	2	96	80	-0.050	8.94	1.56
211	32.872	0.155	1.06	94	2	97	83	-0.040	8.95	1.39
212	33.027	0.155	1.05	94	2	97	85	-0.040	8.98	1.34
213	33.180	0.153	1.06	94	2	96	85	-0.040	8.89	1.34
214	33.331	0.151	1.05	94	2	95	83	-0.050	8.84	1.38
215	33.485	0.154	1.03	94	2	97	80	-0.040	8.89	1.37
216	33.641	0.156	1.06	94	2	98	80	-0.040	8.84	1.39
217	33.794	0.153	1.06	94	2	96	82	-0.040	8.84	1.38
218	33.948	0.154	1.06	94	2	97	85	-0.040	8.89	1.35
219	34.101	0.153	1.05	94	2	96	85	-0.040	8.89	1.32
220	34.254	0.153	1.06	94	2	96	83	-0.040	8.84	1.29
221	34.407	0.153	1.05	94	2	96	81	-0.040	8.90	1.27
222	34.563	0.156	1.06	94	2	98	80	-0.040	8.95	1.26
223	34.717	0.154	1.05	94	2	97	81	-0.040	8.94	1.25

BOX B TEST DATA - ASTM E3053 / ASTM E2515

Client: Pacific Energy
Model: FP25
Run #: 3

Job #: 19-537
Tracking #: 0048
Technician: SJB
Date: 11/26/2019

	Particulate Sampling Data							Flue Gas Data		
Elapsed Time (min)	Gas Meter (ft^3)	Sample Rate (cfm)	Orifice dH (in H_2O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Filter (°F)	Flue Draft (in H_2O)	CO_2 (%)	CO (%)
224	34.872	0.155	1.04	94	2	97	84	-0.040	8.72	1.25
225	35.027	0.155	1.07	94	2	97	85	-0.040	8.25	1.25
226	35.183	0.156	1.05	94	2	98	84	-0.040	8.21	1.21
227	35.337	0.154	1.04	94	2	97	81	-0.040	8.27	1.24
228	35.492	0.155	1.04	94	2	97	80	-0.040	8.01	1.28
229	35.645	0.153	1.04	94	2	96	81	-0.040	7.96	1.21
230	35.798	0.153	1.06	94	2	96	83	-0.040	7.85	1.27
231	35.951	0.153	1.06	94	2	96	85	-0.040	7.82	1.29
232	36.104	0.153	1.04	94	2	96	84	-0.040	7.76	1.31
233	36.258	0.154	1.05	94	2	97	82	-0.040	7.95	1.19
234	36.412	0.154	1.06	94	2	97	80	-0.040	8.02	1.20
235	36.566	0.154	1.06	94	2	97	80	-0.040	7.97	1.20
236	36.719	0.153	1.06	94	2	96	82	-0.040	7.97	1.22
237	36.872	0.153	1.05	94	2	96	85	-0.040	7.94	1.26
238	37.025	0.153	1.05	94	2	96	85	-0.040	7.99	1.28
239	37.179	0.154	1.06	94	2	97	83	-0.040	7.96	1.25
240	37.333	0.154	1.05	95	2	96	80	-0.040	7.95	1.23
241	37.488	0.155	1.03	95	2	97	80	-0.040	7.97	1.24
242	37.641	0.153	1.06	95	2	96	82	-0.040	8.01	1.28
243	37.796	0.155	1.05	95	2	97	85	-0.030	8.17	1.27
244	37.950	0.154	1.06	95	2	96	85	-0.040	8.10	1.27
245	38.103	0.153	1.04	95	2	96	83	-0.030	8.18	1.27
246	38.263	0.160	1.13	95	2	100	81	-0.030	8.19	1.23
247	38.423	0.160	1.13	95	2	100	80	-0.040	8.21	1.21
248	38.583	0.160	1.13	95	2	100	81	-0.030	8.21	1.19
249	38.745	0.162	1.14	95	2	101	84	-0.040	8.22	1.19
250	38.906	0.161	1.12	95	2	101	85	-0.040	8.20	1.17
251	39.068	0.162	1.13	95	2	101	84	-0.040	8.25	1.15
252	39.229	0.161	1.12	95	2	101	82	-0.030	8.24	1.14
253	39.387	0.158	1.13	95	2	99	80	-0.030	8.24	1.10
254	39.550	0.163	1.13	95	2	102	81	-0.040	8.23	1.06
255	39.709	0.159	1.12	95	2	99	83	-0.030	8.28	1.02

BOX B TEST DATA - ASTM E3053 / ASTM E2515

Client: Pacific Energy
Model: FP25
Run #: 3

Job #: 19-537
Tracking #: 0048
Technician: SJB
Date: 11/26/2019

	Particulate Sampling Data							Flue Gas Data		
Elapsed Time (min)	Gas Meter (ft^3)	Sample Rate (cfm)	Orifice dH (in H_2O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Filter (°F)	Flue Draft (in H_2O)	CO_2 (%)	CO (%)
256	39.871	0.162	1.12	95	2	101	85	-0.040	8.32	1.01
257	40.031	0.160	1.13	95	2	100	84	-0.030	8.39	1.00
258	40.190	0.159	1.12	95	2	99	82	-0.030	8.45	0.99
259	40.352	0.162	1.12	95	2	101	80	-0.030	8.44	0.97
260	40.511	0.159	1.12	95	2	99	80	-0.030	8.43	0.98
261	40.673	0.162	1.13	95	2	101	83	-0.030	8.50	0.97
262	40.832	0.159	1.12	95	2	99	85	-0.040	8.49	0.96
263	40.992	0.160	1.13	95	2	100	84	-0.030	8.50	0.95
264	41.155	0.163	1.10	95	2	102	82	-0.040	8.48	0.95
265	41.313	0.158	1.14	95	2	99	80	-0.040	8.50	0.93
266	41.475	0.162	1.12	95	2	101	80	-0.030	8.48	0.94
267	41.634	0.159	1.13	95	2	99	82	-0.030	8.44	0.94
268	41.797	0.163	1.13	95	2	102	85	-0.030	8.49	0.92
269	41.958	0.161	1.13	95	2	101	85	-0.030	8.46	0.92
270	42.119	0.161	1.14	95	2	101	83	-0.040	8.53	0.94
271	42.280	0.161	1.12	95	2	101	80	-0.030	8.50	0.95
272	42.439	0.159	1.15	95	2	99	80	-0.030	8.54	0.94
273	42.602	0.163	1.13	95	2	102	82	-0.030	8.59	0.93
274	42.763	0.161	1.13	95	2	101	84	-0.030	8.46	0.98
275	42.925	0.162	1.14	95	2	101	85	-0.040	8.39	1.00
276	43.087	0.162	1.13	95	2	101	83	-0.040	8.40	1.00
277	43.247	0.160	1.13	95	2	100	81	-0.040	8.41	1.00
278	43.410	0.163	1.12	95	2	102	80	-0.030	8.42	1.00
279	43.569	0.159	1.12	95	2	99	81	-0.040	8.40	1.01
280	43.731	0.162	1.13	95	2	101	84	-0.030	8.42	1.06
281	43.891	0.160	1.13	95	2	100	85	-0.030	8.45	1.03
282	44.053	0.162	1.13	95	2	101	83	-0.030	8.50	1.02
283	44.214	0.161	1.12	95	2	100	81	-0.030	8.39	1.01
284	44.373	0.159	1.13	95	2	99	80	-0.040	8.45	1.00
285	44.537	0.164	1.13	95	2	102	81	-0.040	8.44	0.98
286	44.697	0.160	1.14	95	2	100	84	-0.040	8.49	0.98
287	44.859	0.162	1.12	95	2	101	85	-0.040	8.43	0.97

BOX B TEST DATA - ASTM E3053 / ASTM E2515

Client: Pacific Energy
Model: FP25
Run #: 3

Job #: 19-537
Tracking #: 0048
Technician: SJB
Date: 11/26/2019

	Particulate Sampling Data							Flue Gas Data		
Elapsed Time (min)	Gas Meter (ft^3)	Sample Rate (cfm)	Orifice dH (in H_2O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Filter (°F)	Flue Draft (in H_2O)	CO_2 (%)	CO (%)
288	45.021	0.162	1.12	95	2	101	84	-0.030	8.46	0.97
289	45.183	0.162	1.13	95	2	101	81	-0.030	8.43	0.98
290	45.345	0.162	1.13	95	2	101	80	-0.030	8.41	0.98
291	45.504	0.159	1.12	95	2	99	81	-0.030	8.42	0.96
292	45.668	0.164	1.13	95	2	102	83	-0.030	8.45	0.95
293	45.827	0.159	1.12	95	2	99	85	-0.030	8.44	0.94
294	45.989	0.162	1.12	95	2	101	84	-0.030	8.41	0.94
295	46.149	0.160	1.14	95	2	100	82	-0.030	8.42	0.93
296	46.307	0.158	1.12	95	2	99	80	-0.030	8.52	0.93
297	46.471	0.164	1.13	95	2	102	80	-0.040	8.41	0.95
298	46.631	0.160	1.13	95	2	100	83	-0.030	8.43	0.94
299	46.795	0.164	1.12	95	2	102	85	-0.030	8.48	0.93
300	46.954	0.159	1.11	95	2	99	85	-0.040	8.47	0.94
301	47.114	0.160	1.13	95	2	100	82	-0.030	8.50	0.96
302	47.276	0.162	1.13	95	2	101	80	-0.030	8.53	0.98
303	47.436	0.160	1.14	95	2	100	80	-0.030	8.43	0.99
304	47.599	0.163	1.12	95	2	102	82	-0.030	8.43	0.96
305	47.756	0.157	1.12	95	2	98	85	-0.030	8.46	0.95
306	47.918	0.162	1.12	95	2	101	85	-0.030	8.43	0.94
307	48.079	0.161	1.12	95	2	100	83	-0.030	8.45	0.92
308	48.238	0.159	1.13	95	2	99	81	-0.030	8.38	0.91
309	48.399	0.161	1.13	95	2	100	80	-0.030	8.50	0.92
310	48.558	0.159	1.13	95	2	99	81	-0.030	8.49	0.91
311	48.719	0.161	1.12	95	2	100	84	-0.030	8.52	0.90
312	48.878	0.159	1.13	95	2	99	85	-0.030	8.55	0.89
313	49.039	0.161	1.13	95	2	100	84	-0.030	8.47	0.89
314	49.200	0.161	1.13	95	2	100	81	-0.030	8.49	0.88
315	49.358	0.158	1.12	95	2	99	80	-0.030	8.46	0.87
316	49.520	0.162	1.13	95	2	101	81	-0.030	8.44	0.86
317	49.679	0.159	1.12	95	2	99	83	-0.030	8.37	0.90
318	49.840	0.161	1.12	95	2	100	85	-0.030	8.41	0.91
319	50.000	0.160	1.13	95	2	100	84	-0.040	8.38	0.89

BOX B TEST DATA - ASTM E3053 / ASTM E2515

Client: Pacific Energy
Model: FP25
Run #: 3

Job #: 19-537
Tracking #: 0048
Technician: SJB
Date: 11/26/2019

	Particulate Sampling Data							Flue Gas Data		
Elapsed Time (min)	Gas Meter (ft^3)	Sample Rate (cfm)	Orifice dH (in H_2O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Filter (°F)	Flue Draft (in H_2O)	CO_2 (%)	CO (%)
320	50.157	0.157	1.12	95	2	98	82	-0.040	8.35	0.89
321	50.317	0.160	1.13	95	2	100	80	-0.030	8.19	0.86
322	50.475	0.158	1.13	95	2	99	80	-0.030	8.14	0.86
323	50.636	0.161	1.11	95	2	100	83	-0.030	8.11	0.85
324	50.799	0.163	1.11	95	2	102	85	-0.030	8.17	0.86
325	50.957	0.158	1.13	95	2	99	85	-0.030	8.11	0.86
326	51.120	0.163	1.12	95	2	102	82	-0.030	8.12	0.84
327	51.278	0.158	1.14	95	2	99	80	-0.030	8.08	0.84
328	51.440	0.162	1.12	95	2	101	80	-0.030	8.10	0.84
329	51.600	0.160	1.13	95	2	100	82	-0.040	8.14	0.84
330	51.758	0.158	1.13	95	2	99	85	-0.030	8.09	0.84
331	51.918	0.160	1.13	95	2	100	85	-0.030	8.07	0.84
332	52.076	0.158	1.12	95	2	99	83	-0.030	8.08	0.82
333	52.238	0.162	1.13	95	2	101	80	-0.030	8.07	0.84
334	52.397	0.159	1.13	95	2	99	80	-0.030	8.13	0.84
335	52.558	0.161	1.13	95	2	100	81	-0.030	8.10	0.84
336	52.719	0.161	1.12	95	2	100	84	-0.030	8.17	0.82
337	52.880	0.161	1.12	95	2	100	85	-0.030	7.66	0.85
338	53.043	0.163	1.13	95	2	102	83	-0.030	7.67	0.88
339	53.202	0.159	1.12	95	2	99	81	-0.030	7.69	0.87
340	53.362	0.160	1.11	95	2	100	80	-0.030	7.65	0.88
341	53.523	0.161	1.11	95	2	100	81	-0.030	7.62	0.87
342	53.684	0.161	1.12	95	2	100	84	-0.030	7.69	0.88
343	53.845	0.161	1.13	95	2	100	85	-0.030	7.66	0.88
344	54.004	0.159	1.15	95	2	99	84	-0.020	7.68	0.88
345	54.163	0.159	1.13	95	2	99	81	-0.030	7.69	0.90
346	54.323	0.160	1.12	95	2	100	80	-0.020	7.72	0.91
347	54.483	0.160	1.11	95	2	100	80	-0.030	7.75	0.94
348	54.643	0.160	1.12	95	2	100	83	-0.030	7.70	0.95
349	54.803	0.160	1.11	95	2	100	85	-0.030	7.76	0.97
350	54.964	0.161	1.13	94	2	101	84	-0.030	7.78	1.00
351	55.124	0.160	1.13	95	2	100	82	-0.030	7.76	1.02

BOX B TEST DATA - ASTM E3053 / ASTM E2515

Client: Pacific Energy
Model: FP25
Run #: 3

Job #: 19-537
Tracking #: 0048
Technician: SJB
Date: 11/26/2019

	Particulate Sampling Data							Flue Gas Data		
Elapsed Time (min)	Gas Meter (ft^3)	Sample Rate (cfm)	Orifice dH (in H_2O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Filter (°F)	Flue Draft (in H_2O)	CO_2 (%)	CO (%)
352	55.283	0.159	1.11	95	2	99	80	-0.030	7.77	1.03
353	55.444	0.161	1.13	95	2	100	80	-0.020	7.77	1.04
354	55.604	0.160	1.11	95	2	100	82	-0.030	7.74	1.05
355	55.766	0.162	1.13	95	2	101	85	-0.030	7.73	1.09
356	55.926	0.160	1.13	95	2	100	85	-0.030	7.75	1.09
357	56.089	0.163	1.12	95	2	102	83	-0.020	7.79	1.10
358	56.249	0.160	1.13	95	2	100	80	-0.030	7.77	1.10
359	56.408	0.159	1.13	94	2	99	80	-0.040	7.74	1.11
360	56.570	0.162	1.13	95	2	101	81	-0.030	7.81	1.11
361	56.729	0.159	1.12	94	2	99	84	-0.030	7.82	1.11
362	56.889	0.160	1.12	94	2	100	85	-0.030	7.82	1.10
363	57.050	0.161	1.14	94	2	101	83	-0.030	7.77	1.08
364	57.211	0.161	1.11	94	2	101	81	-0.030	7.78	1.08
365	57.375	0.164	1.13	94	2	102	80	-0.030	7.83	1.08
366	57.533	0.158	1.13	94	2	99	81	-0.030	7.81	1.06
367	57.694	0.161	1.14	94	2	101	84	-0.030	7.84	1.05
368	57.856	0.162	1.11	94	2	101	85	-0.020	7.65	0.97
369	58.016	0.160	1.12	94	2	100	84	-0.020	7.68	0.96
370	58.177	0.161	1.13	94	2	101	81	-0.030	7.66	0.94
371	58.336	0.159	1.13	94	2	99	80	-0.020	7.71	0.93
372	58.498	0.162	1.13	94	2	101	81	-0.020	7.64	0.92
373	58.658	0.160	1.14	94	2	100	83	-0.030	7.65	0.89
374	58.818	0.160	1.12	94	2	100	85	-0.030	7.63	0.90
375	58.977	0.159	1.12	94	2	99	84	-0.030	7.63	0.87
376	59.136	0.159	1.12	94	2	99	82	-0.030	7.61	0.88
377	59.298	0.162	1.14	94	2	101	80	-0.030	7.56	0.89
378	59.458	0.160	1.11	94	2	100	80	-0.030	7.56	0.87
379	59.619	0.161	1.13	94	2	101	82	-0.030	7.25	0.83
380	59.780	0.161	1.13	94	2	101	85	-0.030	7.26	0.84
381	59.938	0.158	1.13	94	2	99	85	-0.030	7.21	0.83
382	60.098	0.160	1.12	94	2	100	82	-0.020	7.20	0.81
383	60.257	0.159	1.12	94	2	99	80	-0.030	7.08	0.74

BOX B TEST DATA - ASTM E3053 / ASTM E2515

Client: Pacific Energy
Model: FP25
Run #: 3

Job #: 19-537
Tracking #: 0048
Technician: SJB
Date: 11/26/2019

	Particulate Sampling Data							Flue Gas Data		
Elapsed Time (min)	Gas Meter (ft^3)	Sample Rate (cfm)	Orifice dH (in H_2O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Filter (°F)	Flue Draft (in H_2O)	CO_2 (%)	CO (%)
384	60.417	0.160	1.12	94	2	100	80	-0.030	7.07	0.73
385	60.578	0.161	1.13	94	2	101	82	-0.030	7.09	0.72
386	60.738	0.160	1.12	94	2	100	85	-0.030	7.07	0.72
387	60.900	0.162	1.12	94	2	101	85	-0.030	7.11	0.70
388	61.060	0.160	1.13	94	2	100	83	-0.030	7.11	0.70
389	61.222	0.162	1.13	94	2	101	80	-0.020	7.10	0.70
390	61.383	0.161	1.12	94	2	101	80	-0.030	7.09	0.71
391	61.543	0.160	1.11	94	2	100	81	-0.030	7.08	0.70
392	61.702	0.159	1.13	94	2	99	84	-0.020	7.03	0.69
393	61.861	0.159	1.13	94	2	99	85	-0.030	7.04	0.70
394	62.024	0.163	1.12	94	2	102	83	-0.030	7.08	0.69
395	62.183	0.159	1.12	94	2	99	81	-0.030	7.04	0.70
396	62.342	0.159	1.12	94	2	99	80	-0.030	7.04	0.69
397	62.503	0.161	1.13	94	2	100	81	-0.030	7.06	0.68
398	62.661	0.158	1.12	94	2	99	84	-0.030	7.01	0.67
399	62.824	0.163	1.13	94	2	102	85	-0.030	7.10	0.68
400	62.985	0.161	1.13	94	2	100	84	-0.020	7.06	0.67
401	63.147	0.162	1.11	94	2	101	81	-0.020	7.07	0.67
402	63.307	0.160	1.11	94	2	100	80	-0.030	7.03	0.67
403	63.467	0.160	1.12	94	2	100	81	-0.030	7.07	0.67
404	63.629	0.162	1.13	94	2	101	83	-0.020	7.00	0.67
405	63.790	0.161	1.12	94	2	100	85	-0.030	6.99	0.68
406	63.953	0.163	1.12	94	2	102	84	-0.030	7.08	0.67
407	64.114	0.161	1.12	94	2	100	82	-0.020	6.94	0.67
408	64.274	0.160	1.11	94	2	100	80	-0.020	6.94	0.65
409	64.437	0.163	1.12	94	2	102	80	-0.020	6.95	0.65
410	64.597	0.160	1.13	94	2	100	83	-0.020	6.91	0.65
411	64.759	0.162	1.13	94	2	101	85	-0.030	6.95	0.66
412	64.919	0.160	1.13	94	2	100	85	-0.030	6.94	0.65
413	65.081	0.162	1.13	94	2	101	82	-0.030	6.88	0.65
414	65.243	0.162	1.11	94	2	101	80	-0.030	6.90	0.65
415	65.403	0.160	1.13	94	2	100	80	-0.030	6.88	0.66

BOX B TEST DATA - ASTM E3053 / ASTM E2515

Client: Pacific Energy
Model: FP25
Run #: 3

Job #: 19-537
Tracking #: 0048
Technician: SJB
Date: 11/26/2019

	Particulate Sampling Data							Flue Gas Data		
Elapsed Time (min)	Gas Meter (ft^3)	Sample Rate (cfm)	Orifice dH (in H_2O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Filter (°F)	Flue Draft (in H_2O)	CO_2 (%)	CO (%)
416	65.565	0.162	1.13	94	2	101	82	-0.030	6.90	0.68
417	65.724	0.159	1.13	94	2	99	85	-0.020	6.91	0.68
418	65.886	0.162	1.12	94	2	101	85	-0.030	6.89	0.68
419	66.045	0.159	1.14	94	2	99	83	-0.020	6.93	0.68
420	66.205	0.160	1.13	94	2	100	80	-0.020	6.92	0.68
421	66.367	0.162	1.12	94	2	101	80	-0.030	6.88	0.67
422	66.526	0.159	1.13	94	2	99	81	-0.020	6.86	0.67
423	66.688	0.162	1.12	94	2	101	84	-0.020	6.83	0.65
424	66.846	0.158	1.12	94	2	99	85	-0.030	6.81	0.64
425	67.006	0.160	1.12	94	2	100	84	-0.030	6.80	0.65
426	67.167	0.161	1.11	94	2	100	81	-0.020	6.79	0.65
427	67.325	0.158	1.12	94	2	99	80	-0.020	6.81	0.66
428	67.485	0.160	1.12	94	2	100	81	-0.020	6.84	0.66
429	67.645	0.160	1.13	94	2	100	83	-0.030	6.80	0.65
430	67.805	0.160	1.12	94	2	100	85	-0.030	6.82	0.65
431	67.967	0.162	1.12	94	2	101	84	-0.020	6.78	0.65
432	68.126	0.159	1.12	94	2	99	81	-0.020	6.76	0.68
433	68.288	0.162	1.14	94	2	101	80	-0.020	6.73	0.66
434	68.448	0.160	1.12	94	2	100	80	-0.020	6.71	0.68
435	68.610	0.162	1.12	94	2	101	83	-0.020	6.74	0.70
436	68.770	0.160	1.14	94	2	100	85	-0.020	6.75	0.68
437	68.928	0.158	1.12	94	2	99	85	-0.030	6.67	0.71
438	69.090	0.162	1.13	94	2	101	82	-0.030	6.72	0.69
439	69.250	0.160	1.12	94	2	100	80	-0.020	6.64	0.69
440	69.410	0.160	1.12	94	2	100	80	-0.020	6.65	0.68
441	69.569	0.159	1.12	94	2	99	82	-0.020	6.62	0.65
442	69.727	0.158	1.11	94	2	99	85	-0.020	6.63	0.66
443	69.892	0.165	1.12	94	2	103	85	-0.020	6.60	0.65
444	70.052	0.160	1.12	94	2	100	83	-0.020	6.63	0.65
445	70.214	0.162	1.13	94	2	101	80	-0.030	6.49	0.64
446	70.373	0.159	1.12	94	2	99	80	-0.020	6.47	0.63
447	70.532	0.159	1.11	94	2	99	81	-0.020	6.50	0.64

BOX B TEST DATA - ASTM E3053 / ASTM E2515

Client: Pacific Energy
Model: FP25
Run #: 3

Job #: 19-537
Tracking #: 0048
Technician: SJB
Date: 11/26/2019

	Particulate Sampling Data							Flue Gas Data		
Elapsed Time (min)	Gas Meter (ft^3)	Sample Rate (cfm)	Orifice dH (in H_2O)	Meter Temp (°F)	Meter Vacuum (in Hg)	Pro. Rate (%)	Filter (°F)	Flue Draft (in H_2O)	CO_2 (%)	CO (%)
448	70.695	0.163	1.12	94	2	102	84	-0.030	6.44	0.61
449	70.853	0.158	1.14	94	2	99	85	-0.020	6.55	0.64
450	71.016	0.163	1.12	94	2	102	84	-0.020	6.55	0.62
451	71.174	0.158	1.12	94	2	99	81	-0.020	6.48	0.63
452	71.336	0.162	1.12	94	2	101	80	-0.020	6.50	0.63
453	71.498	0.162	1.13	94	2	101	81	-0.020	6.49	0.63
454	71.657	0.159	1.11	94	2	99	83	-0.020	6.44	0.62
455	71.819	0.162	1.13	94	2	101	85	-0.020	6.47	0.62
456	71.978	0.159	1.13	94	2	99	84	-0.020	6.43	0.62
457	72.139	0.161	1.12	94	2	100	81	-0.020	6.24	0.63
458	72.298	0.159	1.12	94	2	99	80	-0.020	6.25	0.64
459	72.459	0.161	1.13	94	2	100	80	-0.020	6.21	0.63
Avg/Tot	72.459	0.158	1.10	91	2.00	100	83	-0.047	10.00	0.90

WOODSTOVE SURFACE TEMPERATURE DATA

Client: Pacific Energy
Model: FP25
Run #: 3

Job #: 19-537
Tracking #: 0048
Technician: SJB
Date: 11/26/2019

	Temperature Data (°F)						
Elapsed Time (min)	FB Left	FB Right	FB Back	FB Top	FB Bottom	Stove Surface Average	Catalyst Exit
0	415	407	484	649	528	496.6	N/A
1	423	415	492	644	529	500.6	N/A
2	432	424	498	640	531	505.0	N/A
3	439	432	499	646	532	509.6	N/A
4	444	439	498	666	533	516.0	N/A
5	449	445	497	695	534	524.0	N/A
6	452	450	495	729	534	532.0	N/A
7	455	454	493	756	534	538.4	N/A
8	457	457	491	778	533	543.2	N/A
9	459	459	489	794	532	546.6	N/A
10	460	461	487	807	531	549.2	N/A
11	453	455	475	805	529	543.4	N/A
12	441	444	461	800	527	534.6	N/A
13	428	433	448	793	525	525.4	N/A
14	416	421	434	784	523	515.6	N/A
15	405	411	420	774	521	506.2	N/A
16	396	402	408	765	518	497.8	N/A
17	389	393	397	756	516	490.2	N/A
18	382	386	386	746	513	482.6	N/A
19	375	379	377	738	510	475.8	N/A
20	369	373	368	729	508	469.4	N/A
21	364	367	361	722	505	463.8	N/A
22	359	363	353	715	502	458.4	N/A
23	355	358	347	708	499	453.4	N/A
24	351	354	341	702	496	448.8	N/A
25	346	350	335	697	493	444.2	N/A
26	343	347	330	692	490	440.4	N/A
27	339	343	325	687	486	436.0	N/A
28	336	340	320	682	483	432.2	N/A
29	332	338	316	677	480	428.6	N/A
30	329	335	312	673	477	425.2	N/A
31	326	333	308	669	474	422.0	N/A
32	323	331	305	665	472	419.2	N/A
33	320	328	302	661	469	416.0	N/A
34	318	326	298	657	466	413.0	N/A
35	315	324	295	654	463	410.2	N/A
36	312	322	293	651	460	407.6	N/A
37	310	321	290	648	457	405.2	N/A
38	308	320	288	645	455	403.2	N/A
39	306	318	285	643	452	400.8	N/A
40	304	317	283	640	450	398.8	N/A
41	301	316	281	638	447	396.6	N/A
42	300	315	279	636	445	395.0	N/A
43	298	314	277	634	442	393.0	N/A
44	297	313	275	633	440	391.6	N/A
45	295	312	274	632	438	390.2	N/A
46	294	311	272	631	435	388.6	N/A
47	292	311	271	630	433	387.4	N/A

WOODSTOVE SURFACE TEMPERATURE DATA

Client: Pacific Energy
Model: FP25
Run #: 3

Job #: 19-537
Tracking #: 0048
Technician: SJB
Date: 11/26/2019

	Temperature Data (°F)						
Elapsed Time (min)	FB Left	FB Right	FB Back	FB Top	FB Bottom	Stove Surface Average	Catalyst Exit
48	291	310	270	629	431	386.2	N/A
49	290	309	269	628	428	384.8	N/A
50	290	309	268	626	426	383.8	N/A
51	289	309	267	624	424	382.6	N/A
52	289	309	266	623	422	381.8	N/A
53	288	309	265	621	421	380.8	N/A
54	289	309	264	620	419	380.2	N/A
55	288	309	264	618	417	379.2	N/A
56	288	309	263	616	415	378.2	N/A
57	288	309	262	615	413	377.4	N/A
58	288	309	262	614	412	377.0	N/A
59	288	309	261	613	410	376.2	N/A
60	288	308	260	613	408	375.4	N/A
61	288	308	260	613	406	375.0	N/A
62	288	308	260	613	404	374.6	N/A
63	288	308	259	614	403	374.4	N/A
64	288	308	259	615	401	374.2	N/A
65	289	307	259	615	399	373.8	N/A
66	289	307	258	613	398	373.0	N/A
67	289	307	258	611	396	372.2	N/A
68	289	307	258	609	394	371.4	N/A
69	290	306	258	607	393	370.8	N/A
70	290	306	258	605	392	370.2	N/A
71	290	306	258	602	390	369.2	N/A
72	290	305	258	599	389	368.2	N/A
73	290	305	257	595	388	367.0	N/A
74	290	304	258	591	387	366.0	N/A
75	291	304	257	587	385	364.8	N/A
76	291	303	257	583	384	363.6	N/A
77	292	302	257	579	383	362.6	N/A
78	293	301	257	575	382	361.6	N/A
79	294	301	257	573	381	361.2	N/A
80	295	300	257	570	380	360.4	N/A
81	295	299	257	568	379	359.6	N/A
82	296	298	257	566	378	359.0	N/A
83	297	297	256	564	378	358.4	N/A
84	297	296	256	562	377	357.6	N/A
85	298	296	255	559	376	356.8	N/A
86	298	295	255	557	375	356.0	N/A
87	298	294	254	555	375	355.2	N/A
88	299	294	254	553	374	354.8	N/A
89	298	293	254	551	373	353.8	N/A
90	298	293	253	549	373	353.2	N/A
91	298	293	253	547	372	352.6	N/A
92	298	292	253	545	372	352.0	N/A
93	298	292	252	544	372	351.6	N/A
94	297	292	252	542	371	350.8	N/A
95	297	292	252	540	371	350.4	N/A

WOODSTOVE SURFACE TEMPERATURE DATA

Client: Pacific Energy
Model: FP25
Run #: 3

Job #: 19-537
Tracking #: 0048
Technician: SJB
Date: 11/26/2019

	Temperature Data (°F)						
Elapsed Time (min)	FB Left	FB Right	FB Back	FB Top	FB Bottom	Stove Surface Average	Catalyst Exit
96	296	292	252	538	370	349.6	N/A
97	296	293	252	535	370	349.2	N/A
98	295	293	251	534	370	348.6	N/A
99	295	293	251	532	370	348.2	N/A
100	295	293	251	530	370	347.8	N/A
101	294	293	251	529	370	347.4	N/A
102	293	293	251	528	370	347.0	N/A
103	293	293	250	527	370	346.6	N/A
104	292	293	250	526	370	346.2	N/A
105	292	293	250	525	370	346.0	N/A
106	292	293	250	524	370	345.8	N/A
107	291	293	249	523	370	345.2	N/A
108	290	293	249	522	370	344.8	N/A
109	290	294	249	522	370	345.0	N/A
110	290	293	249	523	370	345.0	N/A
111	289	294	249	524	370	345.2	N/A
112	289	294	249	525	370	345.4	N/A
113	289	294	249	527	370	345.8	N/A
114	289	295	249	528	370	346.2	N/A
115	288	295	250	530	370	346.6	N/A
116	288	296	250	531	370	347.0	N/A
117	288	296	250	531	370	347.0	N/A
118	289	296	250	532	371	347.6	N/A
119	288	297	251	533	371	348.0	N/A
120	288	297	251	533	371	348.0	N/A
121	288	298	251	533	371	348.2	N/A
122	289	298	251	533	371	348.4	N/A
123	288	298	251	533	372	348.4	N/A
124	288	299	252	534	372	349.0	N/A
125	288	299	252	536	372	349.4	N/A
126	288	300	252	538	373	350.2	N/A
127	288	300	253	541	373	351.0	N/A
128	288	301	253	544	373	351.8	N/A
129	288	301	254	548	374	353.0	N/A
130	289	302	255	551	374	354.2	N/A
131	289	303	255	554	375	355.2	N/A
132	289	303	256	558	375	356.2	N/A
133	289	304	257	561	375	357.2	N/A
134	290	305	258	564	376	358.6	N/A
135	290	306	260	566	377	359.8	N/A
136	290	306	261	568	377	360.4	N/A
137	291	307	262	570	378	361.6	N/A
138	292	308	263	572	378	362.6	N/A
139	292	309	264	572	379	363.2	N/A
140	293	309	266	573	380	364.2	N/A
141	294	310	267	574	381	365.2	N/A
142	295	311	269	574	381	366.0	N/A
143	295	312	270	574	382	366.6	N/A

WOODSTOVE SURFACE TEMPERATURE DATA

Client: Pacific Energy
Model: FP25
Run #: 3

Job #: 19-537
Tracking #: 0048
Technician: SJB
Date: 11/26/2019

	Temperature Data (°F)						
Elapsed Time (min)	FB Left	FB Right	FB Back	FB Top	FB Bottom	Stove Surface Average	Catalyst Exit
144	296	314	271	573	383	367.4	N/A
145	297	314	273	572	384	368.0	N/A
146	298	315	275	571	384	368.6	N/A
147	298	316	276	568	385	368.6	N/A
148	299	316	277	566	386	368.8	N/A
149	299	317	279	563	387	369.0	N/A
150	300	317	280	559	388	368.8	N/A
151	300	317	281	555	389	368.4	N/A
152	301	318	282	550	390	368.2	N/A
153	302	317	284	546	391	368.0	N/A
154	303	317	285	541	391	367.4	N/A
155	304	317	285	536	392	366.8	N/A
156	305	317	286	532	393	366.6	N/A
157	305	317	287	529	394	366.4	N/A
158	306	317	288	525	395	366.2	N/A
159	307	317	289	523	396	366.4	N/A
160	307	318	290	520	397	366.4	N/A
161	308	318	291	519	397	366.6	N/A
162	308	318	292	517	398	366.6	N/A
163	308	319	293	515	399	366.8	N/A
164	309	319	294	513	400	367.0	N/A
165	308	318	294	511	401	366.4	N/A
166	308	318	295	508	402	366.2	N/A
167	308	317	296	504	403	365.6	N/A
168	307	317	297	499	404	364.8	N/A
169	307	316	298	492	405	363.6	N/A
170	307	316	298	485	406	362.4	N/A
171	307	315	299	478	406	361.0	N/A
172	306	314	299	469	407	359.0	N/A
173	306	313	300	461	407	357.4	N/A
174	306	312	300	453	408	355.8	N/A
175	305	312	300	445	409	354.2	N/A
176	304	311	300	437	410	352.4	N/A
177	304	310	300	430	411	351.0	N/A
178	303	309	300	423	411	349.2	N/A
179	302	308	300	416	412	347.6	N/A
180	301	308	299	409	412	345.8	N/A
181	299	306	299	403	413	344.0	N/A
182	298	305	299	397	413	342.4	N/A
183	296	304	299	392	414	341.0	N/A
184	294	303	299	386	414	339.2	N/A
185	293	303	299	381	415	338.2	N/A
186	291	302	299	377	416	337.0	N/A
187	290	301	299	372	416	335.6	N/A
188	288	301	299	368	417	334.6	N/A
189	287	300	298	364	417	333.2	N/A
190	285	299	298	361	417	332.0	N/A
191	283	298	298	357	418	330.8	N/A

WOODSTOVE SURFACE TEMPERATURE DATA

Client: Pacific Energy
Model: FP25
Run #: 3

Job #: 19-537
Tracking #: 0048
Technician: SJB
Date: 11/26/2019

	Temperature Data (°F)						
Elapsed Time (min)	FB Left	FB Right	FB Back	FB Top	FB Bottom	Stove Surface Average	Catalyst Exit
192	282	298	298	354	418	330.0	N/A
193	280	297	297	351	419	328.8	N/A
194	279	297	297	348	419	328.0	N/A
195	278	296	297	345	420	327.2	N/A
196	277	295	296	343	420	326.2	N/A
197	276	295	296	340	420	325.4	N/A
198	275	294	295	338	420	324.4	N/A
199	273	292	295	335	420	323.0	N/A
200	272	292	294	333	421	322.4	N/A
201	271	291	294	331	421	321.6	N/A
202	271	290	293	329	421	320.8	N/A
203	269	289	292	327	422	319.8	N/A
204	268	289	292	325	422	319.2	N/A
205	267	288	291	324	422	318.4	N/A
206	266	287	291	322	422	317.6	N/A
207	265	286	290	320	422	316.6	N/A
208	264	285	290	319	422	316.0	N/A
209	263	284	290	317	421	315.0	N/A
210	262	283	289	316	421	314.2	N/A
211	262	283	289	314	421	313.8	N/A
212	261	282	289	313	421	313.2	N/A
213	260	281	289	311	421	312.4	N/A
214	259	280	289	310	421	311.8	N/A
215	259	279	289	309	421	311.4	N/A
216	258	278	289	307	421	310.6	N/A
217	257	278	288	306	421	310.0	N/A
218	257	277	288	304	421	309.4	N/A
219	256	276	288	303	420	308.6	N/A
220	255	275	288	302	420	308.0	N/A
221	255	274	287	300	420	307.2	N/A
222	254	274	287	299	419	306.6	N/A
223	254	272	287	298	419	306.0	N/A
224	253	272	286	296	418	305.0	N/A
225	252	270	286	295	418	304.2	N/A
226	252	269	285	294	418	303.6	N/A
227	251	269	285	293	417	303.0	N/A
228	251	266	284	292	417	302.0	N/A
229	250	266	283	291	417	301.4	N/A
230	250	265	282	290	416	300.6	N/A
231	249	264	282	289	416	300.0	N/A
232	248	262	281	288	416	299.0	N/A
233	248	261	280	287	416	298.4	N/A
234	247	260	279	286	415	297.4	N/A
235	246	259	278	285	415	296.6	N/A
236	245	258	277	284	415	295.8	N/A
237	245	257	276	283	415	295.2	N/A
238	244	256	275	282	415	294.4	N/A
239	243	255	275	281	415	293.8	N/A

WOODSTOVE SURFACE TEMPERATURE DATA

Client: Pacific Energy
Model: FP25
Run #: 3

Job #: 19-537
Tracking #: 0048
Technician: SJB
Date: 11/26/2019

	Temperature Data (°F)						
Elapsed Time (min)	FB Left	FB Right	FB Back	FB Top	FB Bottom	Stove Surface Average	Catalyst Exit
240	243	254	274	279	415	293.0	N/A
241	242	253	273	278	415	292.2	N/A
242	242	251	272	277	415	291.4	N/A
243	241	250	272	276	415	290.8	N/A
244	241	249	271	275	414	290.0	N/A
245	240	248	270	274	414	289.2	N/A
246	239	247	270	273	414	288.6	N/A
247	239	246	269	272	414	288.0	N/A
248	238	246	268	271	413	287.2	N/A
249	237	245	268	270	413	286.6	N/A
250	237	244	267	269	413	286.0	N/A
251	236	243	267	268	412	285.2	N/A
252	235	242	267	267	412	284.6	N/A
253	235	241	266	266	411	283.8	N/A
254	234	240	266	265	411	283.2	N/A
255	233	239	265	264	411	282.4	N/A
256	233	239	265	264	410	282.2	N/A
257	232	238	265	263	410	281.6	N/A
258	232	237	265	262	409	281.0	N/A
259	231	237	264	261	409	280.4	N/A
260	231	236	264	260	408	279.8	N/A
261	230	236	264	260	408	279.6	N/A
262	230	235	264	259	408	279.2	N/A
263	229	234	264	259	407	278.6	N/A
264	229	234	264	258	407	278.4	N/A
265	228	234	264	257	406	277.8	N/A
266	228	233	264	257	406	277.6	N/A
267	228	232	264	256	405	277.0	N/A
268	227	232	264	256	405	276.8	N/A
269	227	231	264	255	404	276.2	N/A
270	226	231	264	255	404	276.0	N/A
271	226	230	264	254	403	275.4	N/A
272	226	230	265	254	403	275.6	N/A
273	226	229	265	254	402	275.2	N/A
274	225	229	265	253	402	274.8	N/A
275	225	229	265	253	401	274.6	N/A
276	225	228	265	253	401	274.4	N/A
277	225	228	266	252	400	274.2	N/A
278	224	227	266	252	400	273.8	N/A
279	224	227	266	252	400	273.8	N/A
280	224	227	266	251	399	273.4	N/A
281	223	226	266	251	399	273.0	N/A
282	223	226	267	251	398	273.0	N/A
283	223	225	267	250	398	272.6	N/A
284	223	225	267	250	397	272.4	N/A
285	222	225	267	250	397	272.2	N/A
286	222	224	267	250	397	272.0	N/A
287	222	224	267	249	396	271.6	N/A

WOODSTOVE SURFACE TEMPERATURE DATA

Client: Pacific Energy
Model: FP25
Run #: 3

Job #: 19-537
Tracking #: 0048
Technician: SJB
Date: 11/26/2019

	Temperature Data (°F)						
Elapsed Time (min)	FB Left	FB Right	FB Back	FB Top	FB Bottom	Stove Surface Average	Catalyst Exit
288	222	223	267	249	396	271.4	N/A
289	221	223	267	249	396	271.2	N/A
290	221	223	267	249	395	271.0	N/A
291	221	223	267	249	395	271.0	N/A
292	221	222	268	248	394	270.6	N/A
293	220	222	268	248	394	270.4	N/A
294	220	221	268	248	393	270.0	N/A
295	220	221	268	248	393	270.0	N/A
296	220	221	268	248	393	270.0	N/A
297	219	220	268	247	392	269.2	N/A
298	219	220	268	247	392	269.2	N/A
299	219	220	268	247	391	269.0	N/A
300	219	220	268	247	391	269.0	N/A
301	219	220	268	246	390	268.6	N/A
302	219	219	268	246	390	268.4	N/A
303	219	219	268	246	390	268.4	N/A
304	218	219	268	246	389	268.0	N/A
305	218	219	268	246	389	268.0	N/A
306	218	219	267	246	389	267.8	N/A
307	218	218	267	246	389	267.6	N/A
308	218	218	267	246	388	267.4	N/A
309	218	218	267	246	388	267.4	N/A
310	218	218	267	246	388	267.4	N/A
311	218	218	267	246	387	267.2	N/A
312	218	218	266	246	387	267.0	N/A
313	218	217	266	246	387	266.8	N/A
314	218	217	266	246	386	266.6	N/A
315	217	217	266	246	386	266.4	N/A
316	217	217	266	246	386	266.4	N/A
317	217	217	265	246	385	266.0	N/A
318	217	217	265	245	385	265.8	N/A
319	217	217	265	245	385	265.8	N/A
320	217	216	264	245	384	265.2	N/A
321	217	216	264	245	384	265.2	N/A
322	217	216	263	245	383	264.8	N/A
323	217	216	263	245	383	264.8	N/A
324	217	216	262	245	383	264.6	N/A
325	217	215	262	245	382	264.2	N/A
326	217	215	261	245	382	264.0	N/A
327	217	215	260	245	381	263.6	N/A
328	216	215	260	244	381	263.2	N/A
329	216	214	259	244	381	262.8	N/A
330	216	215	259	244	380	262.8	N/A
331	216	214	258	244	380	262.4	N/A
332	215	214	258	243	379	261.8	N/A
333	215	213	257	243	379	261.4	N/A
334	215	213	257	243	378	261.2	N/A
335	215	213	256	243	378	261.0	N/A

WOODSTOVE SURFACE TEMPERATURE DATA

Client: Pacific Energy
Model: FP25
Run #: 3

Job #: 19-537
Tracking #: 0048
Technician: SJB
Date: 11/26/2019

	Temperature Data (°F)						
Elapsed Time (min)	FB Left	FB Right	FB Back	FB Top	FB Bottom	Stove Surface Average	Catalyst Exit
336	215	213	256	242	377	260.6	N/A
337	215	213	256	242	377	260.6	N/A
338	215	212	255	242	376	260.0	N/A
339	214	212	255	241	376	259.6	N/A
340	214	212	254	241	375	259.2	N/A
341	214	211	254	240	375	258.8	N/A
342	214	211	253	240	374	258.4	N/A
343	214	211	252	239	374	258.0	N/A
344	213	211	252	239	373	257.6	N/A
345	213	210	251	238	373	257.0	N/A
346	213	210	251	237	372	256.6	N/A
347	213	210	251	237	372	256.6	N/A
348	213	210	250	236	371	256.0	N/A
349	212	209	250	236	370	255.4	N/A
350	212	209	250	235	370	255.2	N/A
351	212	208	249	235	369	254.6	N/A
352	212	208	249	234	369	254.4	N/A
353	211	208	249	234	368	254.0	N/A
354	211	208	249	234	367	253.8	N/A
355	211	207	249	233	367	253.4	N/A
356	210	207	249	233	366	253.0	N/A
357	210	206	249	233	366	252.8	N/A
358	210	206	249	232	365	252.4	N/A
359	210	206	249	232	365	252.4	N/A
360	210	205	248	232	364	251.8	N/A
361	210	205	248	232	364	251.8	N/A
362	210	205	248	231	364	251.6	N/A
363	209	205	248	231	363	251.2	N/A
364	209	205	248	231	363	251.2	N/A
365	209	204	248	231	363	251.0	N/A
366	209	204	248	231	362	250.8	N/A
367	208	204	248	230	362	250.4	N/A
368	208	204	248	230	361	250.2	N/A
369	208	203	248	230	361	250.0	N/A
370	208	203	247	230	361	249.8	N/A
371	207	203	247	229	360	249.2	N/A
372	207	203	247	229	360	249.2	N/A
373	207	203	247	229	359	249.0	N/A
374	207	202	247	228	359	248.6	N/A
375	207	202	246	228	358	248.2	N/A
376	206	202	246	228	358	248.0	N/A
377	206	202	246	228	357	247.8	N/A
378	206	202	245	227	357	247.4	N/A
379	206	201	245	227	356	247.0	N/A
380	206	201	245	227	356	247.0	N/A
381	205	201	245	226	355	246.4	N/A
382	205	201	244	226	355	246.2	N/A
383	205	201	244	225	354	245.8	N/A

WOODSTOVE SURFACE TEMPERATURE DATA

Client: Pacific Energy
Model: FP25
Run #: 3

Job #: 19-537
Tracking #: 0048
Technician: SJB
Date: 11/26/2019

	Temperature Data (°F)						
Elapsed Time (min)	FB Left	FB Right	FB Back	FB Top	FB Bottom	Stove Surface Average	Catalyst Exit
384	204	200	244	225	354	245.4	N/A
385	204	200	243	224	353	244.8	N/A
386	204	200	243	224	353	244.8	N/A
387	204	199	243	223	352	244.2	N/A
388	203	199	242	223	352	243.8	N/A
389	203	199	242	222	351	243.4	N/A
390	202	198	242	221	350	242.6	N/A
391	202	198	241	221	350	242.4	N/A
392	201	198	241	220	349	241.8	N/A
393	201	198	241	220	349	241.8	N/A
394	200	197	240	219	348	240.8	N/A
395	200	197	240	219	347	240.6	N/A
396	200	197	239	218	347	240.2	N/A
397	200	196	239	217	346	239.6	N/A
398	199	196	239	217	346	239.4	N/A
399	199	196	238	217	345	239.0	N/A
400	198	196	238	216	345	238.6	N/A
401	198	195	238	216	344	238.2	N/A
402	198	195	237	215	343	237.6	N/A
403	197	195	237	215	343	237.4	N/A
404	197	194	237	214	342	236.8	N/A
405	197	194	236	213	342	236.4	N/A
406	196	194	236	213	341	236.0	N/A
407	196	193	236	213	341	235.8	N/A
408	196	193	235	212	340	235.2	N/A
409	195	193	235	212	340	235.0	N/A
410	195	192	235	211	339	234.4	N/A
411	194	192	234	211	339	234.0	N/A
412	194	192	234	210	338	233.6	N/A
413	194	191	234	210	338	233.4	N/A
414	194	191	233	209	337	232.8	N/A
415	193	191	233	209	337	232.6	N/A
416	193	191	233	209	336	232.4	N/A
417	193	190	232	208	336	231.8	N/A
418	192	190	232	208	335	231.4	N/A
419	192	190	232	207	335	231.2	N/A
420	192	190	231	207	334	230.8	N/A
421	192	189	231	207	334	230.6	N/A
422	191	189	231	206	333	230.0	N/A
423	191	189	230	206	333	229.8	N/A
424	191	189	230	205	332	229.4	N/A
425	190	188	230	205	332	229.0	N/A
426	190	188	229	205	331	228.6	N/A
427	190	188	229	204	331	228.4	N/A
428	190	187	229	204	330	228.0	N/A
429	190	187	228	204	329	227.6	N/A
430	189	187	228	203	329	227.2	N/A
431	189	187	228	203	328	227.0	N/A

WOODSTOVE SURFACE TEMPERATURE DATA

Client: Pacific Energy
Model: FP25
Run #: 3

Job #: 19-537
Tracking #: 0048
Technician: SJB
Date: 11/26/2019

	Temperature Data (°F)						
Elapsed Time (min)	FB Left	FB Right	FB Back	FB Top	FB Bottom	Stove Surface Average	Catalyst Exit
432	189	186	228	203	328	226.8	N/A
433	189	186	227	202	327	226.2	N/A
434	189	186	227	202	326	226.0	N/A
435	189	186	226	202	326	225.8	N/A
436	189	186	226	201	325	225.4	N/A
437	188	185	226	201	324	224.8	N/A
438	188	185	226	201	324	224.8	N/A
439	188	185	225	201	323	224.4	N/A
440	188	184	225	200	322	223.8	N/A
441	188	184	225	200	322	223.8	N/A
442	188	184	225	200	321	223.6	N/A
443	188	184	224	199	321	223.2	N/A
444	187	183	224	199	320	222.6	N/A
445	187	183	224	199	319	222.4	N/A
446	188	183	223	199	319	222.4	N/A
447	187	182	223	198	318	221.6	N/A
448	187	182	222	198	318	221.4	N/A
449	187	182	222	198	317	221.2	N/A
450	187	182	222	197	317	221.0	N/A
451	187	181	221	197	316	220.4	N/A
452	187	181	221	197	315	220.2	N/A
453	187	181	221	197	315	220.2	N/A
454	187	180	220	196	314	219.4	N/A
455	187	180	220	196	314	219.4	N/A
456	186	180	220	196	314	219.2	N/A
457	186	180	219	195	313	218.6	N/A
458	186	179	219	195	313	218.4	N/A
459	186	179	219	195	312	218.2	N/A
Average	258	263	272	385	393	314	N/A

LAB SAMPLE DATA - ASTM E2515

Client: Pacific Energy
Model: FP25
Run #: 3

Job #: 19-537
Tracking #: 0048
Technician: SJB
Date: 11/26/2019

	Sample ID	Tare, mg	Total, mg	Final, mg	Catch, mg
Train A Filters - First Hour	T380	86.7	86.7	88.6	1.9
Train A Filters - Remainder	T381	86.4	172.6	173.9	1.3
	T382	86.2			
Train A Probe	1A	115628.4	115628.4	115628.3	0.0*
Train A O-Rings	1A	3567.8	3567.8	3567.9	0.1
Train B Filters	T383	86.2	259.2	262.5	3.3
	T384	86.2			
	T385	86.8			
Train B Probe	1B	115901.4	115901.4	115901.3	0.0*
Train B O-Rings	1B	3556.2	3556.2	3556.6	0.4
Background Filter			0.0	0.0	

**Negative value corrected to zero*

Placed in Dessicator on:	11/27 - 7:30

Train A Filters - First Hour	88.5	12/2 8:10	88.6	12/2 15:22				
Train A Filters - Remainder	173.9	12/2 8:11	173.9	12/2 15:22				
Train A Probe	115628.3	12/2 8:11	115628.3	12/2 15:22				
Train A O-Rings	3567.9	12/2 8:11	3567.9	12/2 15:22				
Train B Filters	262.5	12/2 8:11	262.5	12/2 15:23				
Train B Probe	115901.5	12/2 8:11	115901.3	12/2 15:23				
Train B O-Rings	3556.5	12/2 8:11	3556.6	12/2 15:23				
Background Filter								

1st hour Sub-Total, mg:	1.9
Remainder Sub-Total, mg:	1.4
Train 1 Aggregate, mg:	**3.3**
Train 2 Aggregate, mg:	**3.7**
Ambient Aggregate, mg:	0.0

ASTM E3053 Wood Heater Run Sheets

Client: Pacific Energy | Job Number: 19-537 | Tracking #: 0048
Model: FP25 | Run Number: 3 | Test Date: 11/26/2019

Wood Heater Run Notes

Pre-Test Notes
Pre-Test Start Time: 9:52
Air Control Setting: Fully Open

Time	Notes
0 min	Started with 2.0 lbs of kindling, ignited with propane torch for 60 seconds. Door left cracked open ~4".
2 min	Closed door to 1" open.
3 min	Closed door.
10 min	@0.9 lbs, added remaining kindling pieces (1.0 lbs) and a couple start-up fuel pieces (1.4 lbs), door cracked open 1".
13 min	Door closed.
19 min	@1.4 lbs, loaded remaining start-up fuel pieces, door closed within 1 min
28 min	@2.1 lbs, leveled coal bed and loaded high fire fuel load, door closed within 60 seconds
32 min	Fan turned on.
113 min	@4.0 lbs, leveled coal bed, zeroed scale, turned off fan in preparation of fuel loading.

Test Notes
Test Burn Start Time: 11:46
Air Control Setting: 3/16" open from Fully Closed

Time	Notes
0 min	Loaded test fuel in 30 seconds, door closed within 1 minute.
5 min	Set air to test setting
10 min	Turned fan on
60 min	Changed 1-hr filter
75 min	Changed Train B front filter due to clogging
459 min	End of Test

Test Burn End Time: 19:25

Flue Gas Concentration Measurement

Calibration Gas Values: Span Gas CO_2 (%): 16.93 CO (%): 4.330
Mid Gas CO_2 (%): 10.00 CO (%): 2.51

Calibration Results:

	Pre Test			Post Test		
	Zero	Mid	Span	Zero	Mid	Span
Time	10:38	10:41	10:40	11/27 – 6:29	11/27 – 6:31	11/27 – 6:30
CO_2	0.00	10.00	16.99	0.01	9.84	16.82
CO	0.000	2.499	4.303	0.003	2.472	4.241

Flue Gas Probe Leak Check: Initial: No Leakage Final: No Leakage

Technician Signature: Date: 11/27/2019

ASTM E3053 Wood Heater Run Sheets

Client: Pacific Energy | Job Number: 19-537 | Tracking #: 0048
Model: FP25 | Run Number: 3 | Test Date: 11/26/2019

Test Photos

Kindling Fuel Load

Start-up Fuel Load

High Fire Fuel Load

Residual Start-up Fuel Coal Bed

Technician Signature: _____ Date: 11/27/2019

ASTM E3053 Wood Heater Run Sheets

Client: Pacific Energy | Job Number: 19-537 | Tracking #: 0048
Model: FP25 | Run Number: 3 | Test Date: 11/26/2019

High Fire Fuel Loaded

Residual High Fire Load Coal Bed

Medium Fire Fuel Load

Medium Fire Fuel Loaded

Technician Signature: _____ Date: 11/27/2019

ASTM E2515 - TX Filters

Sample	Weight 1	Weight 2	Weigth 3	Weight 4	Initial	Project	Run
T359	–	–	–	–	–	–	–
T360	–	–	–	–	–	–	–
T361	–	–	–	–	–	–	–
T362	–	–	–	–	–	–	–
T363	–	–	–	–	–	–	–
T364	87.3	87.4	–	–	SB	19-514	3
T365	86.4	86.2	–	–	SB	↓	↓
T366	87.2	87.3	–	–	SB		
T367	87.2	87.2	–	–	SB	19-537	1
T368	86.6	86.8	–	–	SB		
T369	87.1	87.1	–	–	SB		
T370	86.4	86.6	–	–	SB		
T371	86.5	86.6	–	–	SB	↓	↓
T372	86.8	86.7	–	–	SB	19-537	2
T373	87.3	87.2	–	–	SB		
T374	87.3	87.4	–	–	SB		
T375	87.0	87.1	–	–	SB		
T376	87.7	87.8	–	–	SB	↓	↓

Weight 1 Date/Time:
10/7 - 9:00
Weight 2 Date/Time:
10/8 - 8:00
Weight 3 Date/Time:
Weight 4 Date/Time:

Sample	Weight 1	Weight 2	Weigth 3	Weight 4	Initial	Project	Run
T377	86.8	86.8	-	-	A	19-537	#1
T378	86.6	86.8	-	-	A	↓	↓
T379	87.2	87.2	-	-	A	19-537	#2
T380	86.7	86.7	-	-	A	19-537	#3
T381	86.5	86.84	-	-	A		
T382	86.3	86.2	-	-	A		
T383	86.2	86.2	-	-	A		
T384	86.12	86.2	-	-	A		
T385	86.89	86.8	-	-	A	↓	↓
T386	87.7	87.6	-	-	A		
T387	86.8	86.7	-	-	A		
T388	86.3	86.2	-	-	A		
T389	86.3	86.3	-	-	A		
T390	46.3	86.1	-	-	A		
T391	87.5	87.4	-	-	A		
T392	86.8	86.8	-	-	A		
T393	85.7	95.8	-	-	A		
T394	86.4	86.3	-	-	A		

Weight 1 Date/Time:
11/11 11:30
Weight 2 Date/Time:
11/13 13:00
Weight 3 Date/Time:
Weight 4 Date/Time:

ASTM E2515 - Probes

Sample	Weight 1	Weight 2	Weigth 3	Weight 4	Initial	Project	Run
1A	115631.7	115631.8	-	-	SB	19-517	#1
1B	115905.6	115905.8	-	-	SB		
2A	116241.8	116241.8	-	-	SB	19-524	#1
2B	116331.7	116331.6	-	-	SB		
3A	116077.4	116077.4	-	-	SB	19-524	#2
3B	116342.8	116343.0	-	-	SB		
4A	116186.7	116186.8	-	-	SB	19-524	#3
4B	116369.7	116369.7	-	-	SB		
5A	116769.4	116769.6	-	-	SB	19-519	#1
5B	116877.4	116877.5	-	-	SB		

Weight 1 Date/Time:
9/26 - 14:00

Weight 2 Date/Time:
9/30 - 7:30

Weight 3 Date/Time:

Weight 4 Date/Time:

Sample	Weight 1	Weight 2	Weigth 3	Weight 4	Initial	Project	Run
6A	116545.7	116545.9	-	-	SB	19-519	#2
6B	116119.3	116119.4	-	-	SB		
7A	116741.3	116741.4	-	-	SB	19-519	#3
7B	117289.6	117289.4	-	-	SB		
8A	116823.8	116824.0	-	-	SB	19-531	#1
8B	116826.4	116826.6	-	-	SB		
9A	-						
9B	-						
10A	-						
10B	-						

Weight 1 Date/Time:
10/3 7:30

Weight 2 Date/Time:
10/4 - 8:00

Weight 3 Date/Time:

Weight 4 Date/Time:

Sample	Weight 1	Weight 2	Weigth 3	Weight 4	Initial	Project	Run
11A	117036.4	117036.02	-	-	L	19-531	#2
11B	117490.6	117490.2	117490.1	-	L		
12A	116889.9	116889.7	-	-	L	19-546	#1
12B	117957.9	117957.7	-	-	L		
13A	117456.1	117456.3	-	-	L	19-546	#2
13B	117054.9	117054.9	-	-	L		
14A	116818.3	116818.1	116818.0	-	L	19-537	#1
14B	116772.1	116771.6	116771.6	-	L		
15A	117418.8	117418.3	117418.3	-	L	19-537	#2
15B	116905.6	116904.9	116905.1	-	L		

Weight 1 Date/Time:
11/11 11:30

Weight 2 Date/Time:
11/12 13:00

Weight 3 Date/Time:
11/13 13:00

Weight 4 Date/Time:

ASTM E2515 - Probes

Sample	Weight 1	Weight 2	Weigth 3	Weight 4	Initial	Project	Run
1A	115628.6	115628.4	–	–	SB	14.537	#3
1B	115901.6	115901.4	–	–	SB		
2A	116241.4	116240.8	116241.5	116241.7	A		
2B	116330.0	116329.8	–	–	SB		
3A	116076.1	116075.9	–	–	SB		
3B	116340.1	116339.9	–	–	SB		
4A	116183.4	116183.0	116183.5	116183.7	A		
4B	116367.1	116367.0	–	–	SB		
5A	116767.3	116766.9	116767.1	–	A		
5B	116875.0	116874.6	116875.0	116875.2	A		

Weight 1 Date/Time:
11/21 16:08

Weight 2 Date/Time:
11/25 – 7:30

Weight 3 Date/Time:
11/26 - 7:30

Weight 4 Date/Time:
11/27 - 10:00

Sample	Weight 1	Weight 2	Weigth 3	Weight 4	Initial	Project	Run
6A	116545.4	116545.6	–	–	A		
6B	116119.3	116119.5	–	–	A		
7A	116740.2	116740.3	–	–	A		
7B	117287.4	117287.6	–	–	A		
8A	116825.4	116824.4	116824.3	–	X		
8B	116826.4	116827.0	–	–	A		
9A	116714.3	116714.2	–	–	A		
9B	117919.4	117920.0	–	–	A		
10A	116819.9	116820.4	116819.8				
10B	117905.6	117905.6	–	–	A		

Weight 1 Date/Time:
11/26 - 7:45

Weight 2 Date/Time:

Weight 3 Date/Time:

Weight 4 Date/Time:

Sample	Weight 1	Weight 2	Weigth 3	Weight 4	Initial	Project	Run
11A							
11B							
12A							
12B							
13A							
13B							
14A							
14B							
15A							
15B							

Weight 1 Date/Time:

Weight 2 Date/Time:

Weight 3 Date/Time:

Weight 4 Date/Time:

ASTM E2515 - O-Rings

Sample	Weight 1	Weight 2	Weigth 3	Weight 4	Initial	Project	Run
1A	3567.9	3567.8	-	-	SB	19-517	#1
1B	3555.8	3555.8	-	-	SB		
2A	3553.5	3553.6	-	-	SB	19-524	#1
2B	3572.2	3572.1	-	-	SB		
3A	3580.9	3580.8	-	-	SB	19-524	#3
3B	3569.1	3569.1	-	-	SB		
4A	3624.6	3624.7	-	-	SB	19-524	#3
4B	3581.0	3581.1	-	-	SB		
5A	3535.9	3535.9	-	-	SB	19-514	#1
5B	3531.9	3531.9	-	-	SB		

Weight 1 Date/Time:
9/26 - 14:00

Weight 2 Date/Time:
9/27 - 8:00

Weight 3 Date/Time:

Weight 4 Date/Time:

Sample	Weight 1	Weight 2	Weigth 3	Weight 4	Initial	Project	Run
6A	3616.4	3616.3	-	-	SB	19-514	#2
6B	3397.7	3397.6	-	-	SB		
7A	3523.7	3523.3	-	-	SB	19-514	#3
7B	3522.7	3522.9	-	-	SB		
8A	3552.5	3552.5	-	-	SB	19-531	#1
8B	3586.1	3586.3	-	-	SB		
9A	-						
9B	-						
10A	-						
10B	-						

Weight 1 Date/Time:
10/3 - 7:30

Weight 2 Date/Time:
10/4 - 8:00

Weight 3 Date/Time:

Weight 4 Date/Time:

Sample	Weight 1	Weight 2	Weigth 3	Weight 4	Initial	Project	Run
11A	3424.2	3424.1	-	-	A	19-531	#2
11B	4234.4	4234.5	-	-	A		
12A	3396.6	3396.5	-	-	A	19-546	#1
12B	3407.0	3407.1	-	-	A		
13A	3361.3	3361.3	-	-	A	19-546	#2
13B	3446.3	3446.4	-	-	A		
14A	3367.6	3367.7	-	-	A	19-537	#1
14B	3341.8	3341.9	-	-	A		
15A	3569.9	3570.1	-	-	A	19-537	#2
15B	3570.8	3570.8	-	-	A		

Weight 1 Date/Time:
11/1 11:30

Weight 2 Date/Time:
11/2 13:00

Weight 3 Date/Time:

Weight 4 Date/Time:

ASTM E2515 - O-Rings

Sample	Weight 1	Weight 2	Weigth 3	Weight 4	Initial	Project	Run
1A	3568.0	3567.8	-	-	SB	19-537	#3
1B	3556.4	3556.2	-	-	SB		
2A	3553.7	3553.3	3553.3	-	AV		
2B	3572.9	3572.5	3572.5	-	A		
3A	3581.2	3581.0	-	-	SB		
3B	3569.6	3569.2	3569.0	-	A		
4A	3264.7	3624.1	3624.3	-	A		
4B	3581.4	3581.0	3581.0	-	A		
5A	3536.1	3565.9	-	-	SB		
5B	3531.7	3531.7	-	-	SB		

Weight 1 Date/Time:
11/21 16:00

Weight 2 Date/Time:
11/25 - 7:30

Weight 3 Date/Time:
11/26 - 7:10

Weight 4 Date/Time:

Sample	Weight 1	Weight 2	Weigth 3	Weight 4	Initial	Project	Run
6A	3616.0	3616.1	-	-	A		
6B	3307.4	3307.4	-	-	A		
7A	3573.7	3573.6	-	-	A		
7B	3523.5	3522.9	3522.8	-	A		
8A	3552.2	3552.2	-	-	A		
8B	3586.0	3586.0	-	-	A		
9A	3581.9	3581.8	-	-	A		
9B	3524.7	3524.6	-	-	A		
10A	3432.0	3431.8	-	-	A		
10B	3571.0	3571.0	-	-	A		

Weight 1 Date/Time:
11/26 - 7:10

Weight 2 Date/Time:

Weight 3 Date/Time:

Weight 4 Date/Time:

Sample	Weight 1	Weight 2	Weigth 3	Weight 4	Initial	Project	Run
11A							
11B							
12A							
12B							
13A							
13B							
14A							
14B							
15A							
15B							

Weight 1 Date/Time:

Weight 2 Date/Time:

Weight 3 Date/Time:

Weight 4 Date/Time:

Established 1974

QUALITY CONTROL SERVICES

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A2LA ACCREDITED
CERTIFICATE #1550.01

PFS Teco
11785 SE Hwy 212 STE#305
Clackamas, OR 97015

Report Number: DIRI01A05026191031

A2LA ACCREDITED
CERTIFICATE OF CALIBRATION WITH DATA

INSTRUMENT INFORMATION

Item	Make	Model	Serial Number	Customer ID	Location
Scale	Rice Lake	IQ+355E-2A x 100(	A05026	#041	Lab
Units	**Readability**	**SOP**	**Cal Date**	**Last Cal Date**	**Cal Due Date**
lbs	0.1	QC033	10/31/19	6/10/19	6/2020

FUNCTIONAL CHECKS

SHIFT TEST	LINEARITY	REPEATABILITY	ENVIRONMENTAL CONDITIONS
Test Wt: 250 Tol: 0.3	Test Wt: HB44 Tol: HB44	Test Wt: 100 Tol: 0.1	☐ Good ☑ Fair ☐ Poor
As-Found: Pass:☑ Fail:☐	As-Found: Pass:☑ Fail:☐	As-Found: Pass:☑ Fail:☐	Temperature: 10°C
As-Left: Pass:☑ Fail:☐	As-Left: Pass:☑ Fail:☐	As-Left: Pass:☑ Fail:☐	

CALIBRATION DATA

Standard	As-Found	As-Left	Expanded Uncertainty
1000	1001.2	1000.4	0.12
700	700.4	700.1	0.12
500	500.2	499.9	0.08
300	300.0	299.9	0.08
100	100.0	99.9	0.05
50	50.0	50.0	0.05

CALIBRATION STANDARDS

Item	Make	Model	Serial Number	Cal Date	Cal Due Date	NIST ID
Weight Set	Rice Lake	.001 to 10lb	PW0990	10/4/18	10/2020	20181977

Permanent Information Concerning this Equipment:
10/19 New platform. Rice Lake sn# 128929

Comments/Information Concerning this Calibration
10/19 RH = 40%.

Report prepared/reviewed by: R. B. **Date:** 10-31-19 **Technician:** R. Butcher
Signature: R Butcher

THIS CERTIFICATE SHALL NOT BE REPRODUCED, EXCEPT IN FULL, WITHOUT THE APPROVAL OF QUALITY CONTROL SERVICES, INC.

The uncertainty is calculated according to the ISO Guide to the Expression of Uncertainty in Measurement and includes the uncertainty of standards used combined with the observed standard deviation of the unit under test. The uncertainty is expanded with a k factor of 2 for an approximate 95% level of confidence. Instruments listed above were calibrated using standards traceable to the National Institute of Standards and Technology (NIST). Calibration data reflect results at the time and location of calibration. Calibration data should be reviewed to insure that the instrument is performing to its required accuracy.

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CERTIFICATE #1550.01

PFS Teco
11785 SE Hwy 212 STE#305
Clackamas, OR 97015

Report Number: DIRI01D01487W16P190610

A2LA ACCREDITED
CERTIFICATE OF CALIBRATION WITH DATA

INSTRUMENT INFORMATION

Item	Make	Model	Serial Number	Customer ID	Location
Scale	Digi-Weigh	DWP-440 400 x 0.1	D01487W16P	N/A	Lab
Units	**Readability**	**SOP**	**Cal Date**	**Last Cal Date**	**Cal Due Date**
lbs	0.1	QC033	6/10/19	N/A	6/2020

FUNCTIONAL CHECKS

SHIFT TEST	LINEARITY	REPEATABILITY	ENVIRONMENTAL CONDITIONS
Test Wt: 100 Tol: 0.5	Test Wt: HB44 Tol: HB44	Test Wt: 50 Tol: 0.1	☐ Good ☑ Fair ☐ Poor
As-Found: Pass:☑ Fail:☐	As-Found: Pass:☑ Fail:☐	As-Found: Pass:☑ Fail:☐	Temperature: 20.6°C
As-Left: Pass:☑ Fail:☐	As-Left: Pass:☑ Fail:☐	As-Left: Pass:☑ Fail:☐	

CALIBRATION DATA

Standard	As-Found	As-Left	Expanded Uncertainty
400	400.22	400.00	0.08
300	300.19	300.00	0.08
200	200.15	200.00	0.08
100	100.09	100.00	0.05
50	50.04	50.00	0.05
25	25.02	25.00	0.05

CALIBRATION STANDARDS

Item	Make	Model	Serial Number	Cal Date	Cal Due Date	NIST ID
Avoirdupois Cast W	Rice Lake	25 and 50lb	PWO990-CA	11/24/17	11/2019	20172265

Permanent Information Concerning this Equipment:
12 month calibration cycle

Comments/Information Concerning this Calibration
6/19 RH= 47%. Adjusted span.

Report prepared/reviewed by: ServiceTechX **Date:** 6/11/19

Technician: J. Colacchio
Signature:

THIS CERTIFICATE SHALL NOT BE REPRODUCED, EXCEPT IN FULL, WITHOUT THE APPROVAL OF QUALITY CONTROL SERVICES, INC.

The uncertainty is calculated according to the ISO Guide to the Expression of Uncertainty in Measurement and includes the uncertainty of standards used combined with the observed standard deviation of the unit under test. The uncertainty is expanded with a k factor of 2 for an approximate 95% level of confidence. Instruments listed above were calibrated using standards traceable to the National Institute of Standards and Technology (NIST). Calibration data reflect results at the time and location of calibration. Calibration data should be reviewed to insure that the instrument is performing to its required accuracy.

Dry Gas Meter Calibration

Meter Manufacturer:	Apex
Model:	XC-50-DIR
Lab ID #:	129
Serial #:	1906005
Calibration Date:	11/7/2019
Calibration Expiration:	5/7/2020
Barometric Pressure:	30.05 in. Hg

Reference Standard DGM	
Manufacturer:	Apex
Model:	SK25DA
Lab ID#:	47
Serial #:	1101001
Calibration Expiration Date:	3/13/2020
Calibration γ Factor:	0.998

Unit Under Test Previous Calibration	
Date	N/A
γ Factor:	0.998
Allowable Deviation (±5%):	0.0499
Actual Deviation:	0.01
Result:	PASS

Calibration Data	Run 1	Run 2	Run 3
Standard DGM Initial Volume (L)	0.000	0.000	0.000
Standard DGM Final Volume (L)	147.116	145.062	172.045
Standard DGM Temperature (°F)	73.0	74.0	78.0
Standard DGM Pressure (in H_2O)	0.00	0.00	0.0
DGM Initial Volume (ft^3)	0.000	0.000	0.000
DGM Final Volume (ft^3)	5.226	5.281	6.334
DGM Temperature (°F)	78.0	88.0	96.0
DGM Pressure (in H_2O)	2.00	1.00	0.5
Time (min)	22.0	34.0	66.0
Net Volume for Standard DGM (ft^3)	5.195	5.123	6.076
Net Volume for DGM (ft^3)	5.226	5.281	6.334

Dry Gas Meter γ Factor	0.997	0.991	0.988
γ Factor Deviation From Average	0.997	0.991	0.988

Average Gas Meter γ Factor: 0.992

Calculations:

1. Deviation = |Average value for all runs - current run value|
2. $\gamma = [V_{std} \times (\gamma_{Std}) \times (P_{bar}+P_{std}/13.6) \times (T_{DGM} + 460)] / [V_{DGM} \times (T_{std} + 460) \times (P_{bar} + P_{DGM}/ 13.6)]$

Standard Reference Meter is calibrated to NIST traceable standards. Uncertainty of measurement is ±0.5%.

 *Technician:*_____

Dry Gas Meter Calibration

Meter Manufacturer:	Apex
Model:	XC-50-DIR
Lab ID #:	130
Serial #:	1906006
Calibration Date:	11/7/2019
Calibration Expiration:	5/7/2020
Barometric Pressure:	30.05 in. Hg

Reference Standard DGM	
Manufacturer:	Apex
Model:	SK25DA
Lab ID#:	47
Serial #:	1101001
Calibration Expiration Date:	3/13/2020
Calibration γ Factor:	0.998

Unit Under Test Previous Calibration	
Date	N/A
γ Factor:	1.000
Allowable Deviation (±5%):	0.05
Actual Deviation:	0.00
Result:	PASS

Calibration Data	Run 1	Run 2	Run 3
Standard DGM Initial Volume (L)	0.000	0.000	0.000
Standard DGM Final Volume (L)	350.400	174.679	145.366
Standard DGM Temperature (°F)	78.0	78.0	75.0
Standard DGM Pressure (in H_2O)	0.00	0.00	0.0
DGM Initial Volume (ft^3)	0.000	0.000	0.000
DGM Final Volume (ft^3)	12.680	6.344	5.174
DGM Temperature (°F)	98.0	98.0	80.0
DGM Pressure (in H_2O)	2.00	1.10	0.5
Time (min)	55.0	40.0	78.0
Net Volume for Standard DGM (ft^3)	12.374	6.169	5.134
Net Volume for DGM (ft^3)	12.680	6.344	5.174

Dry Gas Meter γ Factor	1.005	1.004	0.998
γ Factor Deviation From Average	1.005	1.004	0.998

Average Gas Meter γ Factor: 1.002

Calculations:

1. Deviation = |Average value for all runs - current run value|
2. $\gamma = [V_{std} \times (\gamma_{Std}) \times (P_{bar}+P_{std}/13.6) \times (T_{DGM} + 460)] / [V_{DGM} \times (T_{std} + 460) \times (P_{bar} + P_{DGM}/ 13.6)]$

Standard Reference Meter is calibrated to NIST traceable standards. Uncertainty of measurement is ±0.5%.

Certificate of Calibration

Certificate Number: **712600**

JJ Calibrations, Inc.
7724 SE Aspen Summit Drive
Portland, OR 97266-9217
Phone 503.786.3005
FAX 503.786.2994

PFS TECO
11785 SE Hwy 212
Suite 305
Clackamas, OR 97015

0723.01
Calibration

PO: **john.steinest.PFSTECO.co**
Order Date: 11/06/2019
Authorized By: **N/A**

Property #: **064**
User: **N/A**
Department: **N/A**
Make: **Control Company**
Model: **4198**
Serial #: **80531676**
Description: **Digital Temp. / Barometer**
Procedure: **404323**
Accuracy: **±1°C ±0.2362Hg(±8mb)**

Calibrated on: 11/15/2019
*Recommended Due: 11/15/2020
Environment: **21** °C **48** % RH
* As Received: **Within Tolerance**
* As Returned: **Within Tolerance**
Action Taken: **Calibrated**
Technician: **146**

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

Standards Used

Std ID	Manufacturer	Model	Nomenclature	Due Date	Trace ID
644A	Thunder Scientific	1200	Two Pressure Humidity Generator	10/14/2020	710583
847A	Fluke	RPM4	Reference Pressure Monitor	11/21/2019	688957

Measurement Data

Parameter / Measurement Description	Range Unit	Reference	Min	Max	ᵏError	UUT	Uncertainty
Before/After							Accredited = ✓
Temperature							
	°C	20.00	19.0	21.0	0.1	20.1 °C	8.1E-02 ✓
	°C	30.00	29.0	31.0	0.8	29.2 °C	8.1E-02 ✓
	°C	40.00	39.0	41.0	0.2	39.8 °C	8.1E-02 ✓
Barometer							
	mbar	1010.70	1002.7	1018.7	0.7	1010.0 mbar	

This instrument has been calibrated in accordance with the JJ Calibrations Quality Assurance Manual and is traceable to either the SI or to National Institute of Standards and Technology (NIST). The quality system and this certificate are in compliance with ANSI/NCSL Z540-1-1994, ISO/IEC 17025-2017, ISO 10012-1, the ISO 9000 family and QS 9000. The expanded uncertainties of measurements for this calibration are based upon 95% (2 sigma) confidence limits. Unless stated in the comments, certificates reflect the "Simple Acceptance Rule" as specified by JCGM 106:2012. Unless otherwise stated, a test accuracy ration (TAR) of 4:1, if achievable, is maintained. The results reported herein apply only to the calibration of the item described above. This report may not be reproduced, except in full, without written approval of JJ Calibrations.

Reviewer

3 Issued 11/16/2019 Rev # 15

Inspector

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ACCREDITED

Calibration Services

Certificate Number 1550.01

Laboratory code: 115953

Report of Calibration

Firm: Dirigo Laboratories
Address: 11785 SE Hwy 212, Ste 305
City/State/Zip: Clackamas, OR 97015

Test Completed: 03/21/17
Submitted By: John Steiner
Traceable Number: 20170468

Test Item: 200mg and 100mg Individual Weights
Serial No.: Listed in Table

Manufacturer: Troemner

Material	Assumed Density	Range	Tolerance Class
Stainless Steel	7.95 g/cm^3	200mg & 100mg	ASTM Class 1

Method and Traceability
The procedure used for this calibration is NIST IR 6969 SOP 4 Double Substitution Weighing Design. Standards used for comparison are traceable to the National Institute of Standards and Technology (reports on file) and are part of a comprehensive measurement assurance program for ensuring continued accuracy and traceability within the level of uncertainty reported. The Traceable Number listed above is Traceable to National Standards through an unbroken chain of comparison each having stated uncertainties.

Standards Used:
100g to 1mg Working Standards Were Calibrated: 03/03/17 Due: 03/31/18 Standards ID: 723318
Mass Comparators Used: MET-05 **Tested by:** D. Thompson

Conventional Mass: "The conventional value of the result of weighing a body in air is equal to the mass of a standard, of conventionally chosen density, at a conventionally chosen temperature, which balances this body at this reference temperature in air of conventionally chosen density. International Recommendation 33 (OIML IR 33 1973, 1979). "Conventional Value of the Result of Weighing in Air" **(Previously known as "Apparent Mass vs. 8.0g/cm^3).**

Uncertainty Statement: The uncertainty conforms to the ISO Guide to the Expressions of Uncertainty in Measurement. Uncertainty as reported is based on a coverage factor k=2 for an approximate 95 percent level of uncertainty. Uncertainty components include the standard deviation of the process, the uncertainty of the standard used, an uncertainty component associated with the potential drift of the standard used, and the estimated uncertainty related to measuring and determining the air buoyancy effect.

Conventional Mass Values are listed on page 2 of this report.

Quality Control Services, Inc.
Metrology Laboratory Manager
E-mail dthompson@qc-services.com

Date: 03/21/17

Signature David S. Thompson

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ACCREDITED

Calibration Services

Certificate Number: 1550.01

Laboratory code: 115953

Report of Calibration

Firm: Dirigo Laboratories
Address: 11785 SE Hwy 212, Ste 305
City/State/Zip: Clackamas, OR 97015

Test Completed: 03/21/17
Submitted By: John Steiner
Traceable Number: 20170468

Test Item: 200mg and 100mg Individual Weights
Serial No.: Listed in Table

Manufacturer: Troemner

Laboratory Environment at time of test

Temperature °C	Pressure mmHg	Humidity %RH
21.967	753.44	49.44

Conventional Mass Value

Nominal Value	As Found grams	As Found Correction* (mg)	Uncertainty (mg)	Tolerance (mg)
200mg SN 1000101395	0.2000061	0.0061	0.0026	0.01
100mg SN 1000126267	0.1000046	0.0046	0.0028	0.01

*Correction is the difference between the conventional mass value of a weight and its nominal value.

Comments: These weights were new from the manufacturer and were within ASTM Class 1 tolerances As Found. No adjustments or changes were made so As Found values should be considered to be As Left values.

Accredited by the American Association for Laboratory Accreditation (A2LA) under Calibration Laboratory Code 115953 and Certificate Number 1550.01. This laboratory meets the requirements of ISO/IEC 17025:2005 *General Requirements for the Competence of Testing and Calibration Laboratories.* This laboratory also meets the requirements of ANSI/NCSL Z540-1-1994 and any additional program requirements in the field of calibration.

Quality Control Services, Inc.
Metrology Laboratory Manager
E-mail dthompson@qc-services.com

Date: 03/21/17

Signature David S. Thompson

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ACCREDITED
CERTIFICATE #1550.01

PFS Teco
11785 SE Hwy 212 STE#305
Clackamas, OR 97015

Report Number: DIRI0134307497190610

A2LA ACCREDITED
CERTIFICATE OF CALIBRATION WITH DATA

INSTRUMENT INFORMATION

Item	Make	Model	Serial Number	Customer ID	Location
Balance	Sartorius	ENTRIS224-1S	34307497	#107	Lab
Units	**Readability**	**SOP**	**Cal Date**	**Last Cal Date**	**Cal Due Date**
g	0.0001	QC012	6/10/19	12/18/18	12/2019

FUNCTIONAL CHECKS

ECCENTRICITY
Test Wt: 100 Tol: 0.0003
As-Found: Pass: ☑ Fail: ☐
As-Left: Pass: ☑ Fail: ☐

LINEARITY
Test Wt: 50 x 4 Tol: 0.0002
As-Found: Pass: ☑ Fail: ☐
As-Left: Pass: ☑ Fail: ☐

STANDARD DEVIATION
Test Wt: 100 Tol: 0.0001

1. 99.9999	5. 100.0000	9. 100.0000
2. 99.9999	6. 100.0000	10. 100.0000
3. 99.9999	7. 99.9999	**Result**
4. 99.9999	8. 100.0000	0.00005

ENVIRONMENTAL CONDITIONS
☐ Good ☑ Fair ☐ Poor
Temperature: 20.4°C

A2LA ACCREDITED SECTION OF REPORT

Standard	As-Found	As-Left	Expanded Uncertainty
200	199.9986	200.0000	0.00015
100	99.9996	99.9999	0.00015
50	49.9998	50.0000	0.00015
20	19.9999	20.0000	0.00015
1	1.0000	1.0000	0.00015
0.1	0.1000	0.1000	0.00015

CALIBRATION STANDARDS

Item	Make	Model	Serial Number	Cal Date	Cal Due Date	NIST ID
Weight Set	R.L./Troemner	10kg to 1mg	G782	1/25/19	1/2020	20190189

Permanent Information Concerning this Equipment:
6 month calibration cycle.

Comments/Info Concerning this Calibration:
6/19 RH= 55%. Adjusted span.

Report prepared/reviewed by: ServiceTech C **Date:** 6/11/19

Technician: R.Kauble Signed Jake Colacchio

Signature:

THIS CERTIFICATE SHALL NOT BE REPRODUCED WITHOUT THE APPROVAL OF QUALITY CONTROL SERVICES, INC.

The uncertainty is calculated according to the ISO Guide to the Expression of Uncertainty in Measurement and includes the uncertainty of standards used combined with the observed standard deviation and readability of the unit under test. The uncertainty is expanded with a k factor of 2 for an approximate 95% level of confidence. Instruments listed above were calibrated using standards traceable to the National Institute of Standards and Technology (NIST). Calibration data reflect results at the time and location of calibration. Calibration data should be reviewed to insure that the instrument is performing to its required accuracy. Calibrations comply with ISO/IEC 17025 and ANSI/Z540-1-1994 quality standards.

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ACCREDITED
Calibration Services
Certificate Number: 1550.01
Laboratory code: 115953

Report of Calibration

Firm: Dirigo Laboratories
Address: 11785 SE Hwy 212, Ste 305
City/State/Zip: Clackamas, OR 97015

Test Completed: 01/15/16
Purchase Order: 1001
Traceable Number: 20152489

Test Item: 20lb and 10lb Individual Grip Handle Weights
Serial No.: Listed in Table

Manufacturer: Unknown

Material	Assumed Density	Range	Tolerance Class
Cast Iron	7.2 g/cm^3	20lb to 10lb	NIST HB 105-1 (F)

Method and Traceability
The procedure used for this calibration is NIST IR 6969 SOP 7 Single Substitution Weighing Design. Standards used for comparison are traceable to the National Institute of Standards and Technology (reports on file) and are part of a comprehensive measurement assurance program for ensuring continued accuracy and traceability within the level of uncertainty reported. The Traceable Number listed above is Traceable to National Standards through an unbroken chain of comparison each having stated uncertainties.

Standards Used:
Avoirdupois Working Standards were calibrated: 06/18/2014 Due: 06/18/2016 Standards ID: 34AA
Mass Comparators Used: MET-09, 20 **Tested by:** D. Thompson

Conventional Mass: "The conventional value of the result of weighing a body in air is equal to the mass of a standard, of conventionally chosen density, at a conventionally chosen temperature, which balances this body at this reference temperature in air of conventionally chosen density. International Recommendation 33 (OIML IR 33 1973, 1979). "Conventional Value of the Result of Weighing in Air" **(Previously known as "Apparent Mass vs. 8.0g/cm^3).**

Uncertainty Statement: The uncertainty conforms to the ISO Guide to the Expressions of Uncertainty in Measurement. Uncertainty as reported is based on a coverage factor K=2 for an approximate 95 percent level of uncertainty. Uncertainty components include the standard deviation of the process, the uncertainty of the standard used, an uncertainty component associated with the potential drift of the standard used, and the estimated uncertainty related to measuring and determining the air buoyancy effect.

Conventional Mass Values are listed on page 2 of this report.

Quality Control Services, Inc.
Metrology Laboratory Manager
E-mail dthompson@qc-services.com

Date: 01/15/16

Signature David S. Thompson

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ACCREDITED
Calibration Services
Certificate Number: 1550.01
Laboratory code: 115953

Report of Calibration

Firm: Dirigo Laboratories
Address: 11785 SE Hwy 212, Ste 305
City/State/Zip: Clackamas, OR 97015

Test Completed: 01/15/16
Purchase Order: 1001
Traceable Number: 20152489

Test Item: 20lb and 10lb Individual Grip Handle Weights
Serial No.: Listed in Table

Manufacturer: Unknown

Laboratory Environment at time of test

Temperature °C	Pressure mmHg	Humidity %RH
21.448	760.64	44.58

Conventional Mass Value

Nominal Value	As Found pounds	As Found Correction* (mg)	Uncertainty (mg)	Tolerance (mg)
20lb #098	19.9995450	-206.4	6.4	910
10lb #097	10.0006510	295.3	5.1	450
10lb #051	10.0003421	155.2	5.1	450

*Correction is the difference between the conventional mass value of a weight and its nominal value.

Comments: These weights were received in good condition and were within NIST Handbook 105-1 Class F tolerances As Found. No adjustments or changes were made so As Found values should be considered to be As Left values.

Accredited by the American Association for Laboratory Accreditation (A2LA) under Calibration Laboratory Code 115953 and Certificate Number 1550.01. This laboratory meets the requirements of ISO/IEC 17025:2005 *General Requirements for the Competence of Testing and Calibration Laboratories.* This laboratory also meets the requirements of ANSI/NCSL Z540-1-1994 and any additional program requirements in the field of calibration.

Quality Control Services, Inc.
Metrology Laboratory Manager
E-mail dthompson@qc-services.com

Date: 01/15/16

Signature David S. Thompson

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CERTIFICATE #1550.01

Report of Calibration

Firm: PFS Teco
Address: 11785 SE Hwy 212, Ste 305
City/State/Zip: Clackamas, OR 97015

Test Completed: 08/27/18
Submitted By: John Steinert
Traceable Number: 20181772

Test Item: 5 lb Individual Grip Handle Weight
Serial No.: 10744

Manufacturer: Rice Lake

Material	Assumed Density	Range	Tolerance Class
Cast Iron	7.2 g/cm^3	5 lb	ASTM Class 7

Method and Traceability
The procedure used for this calibration is NIST IR 6969 SOP 7 Single Substitution Weighing Design. Standards used for comparison are traceable to the National Institute of Standards and Technology (reports on file) and are part of a comprehensive measurement assurance program for ensuring continued accuracy and traceability within the level of uncertainty reported. The Traceable Number listed above is Traceable to National Standards through an unbroken chain of comparison each having stated uncertainties.

Standards Used:
20 kg to 200 g Working Standards Were Calibrated: 03/22/18 Due: 03/31/19 Standards ID: 75388
100 g to 1 mg Working Standards Were Calibrated: 04/04/18 Due: 04/30/19 Standards ID: 723318
Mass Comparators Used: MET-08 **Tested by:** D. Thompson

Conventional Mass: "The conventional value of the result of weighing a body in air is equal to the mass of a standard, of conventionally chosen density, at a conventionally chosen temperature, which balances this body at this reference temperature in air of conventionally chosen density. International Recommendation 33 (OIML IR 33 1973, 1979). "Conventional Value of the Result of Weighing in Air" **(Previously known as "Apparent Mass vs. 8.0 g/cm^3).**

Uncertainty Statement: The uncertainty conforms to the ISO Guide to the Expressions of Uncertainty in Measurement. Uncertainty as reported is based on a coverage factor k=2 for an approximate 95 percent level of uncertainty. Uncertainty components include the standard deviation of the process, the uncertainty of the standard used, an uncertainty component associated with the potential drift of the standard used, and the estimated uncertainty related to measuring and determining the air buoyancy effect.

Conventional Mass Values are listed on page 2 of this report.

Quality Control Services, Inc.
Metrology Laboratory Manager
E-mail dthompson@qc-services.com

Date: 08/28/18

Signature David S. Thompson

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ACCREDITED
CERTIFICATE #1550.01

Report of Calibration

Firm: PFS Teco
Address: 11785 SE Hwy 212, Ste 305
City/State/Zip: Clackamas, OR 97015

Test Completed: 08/27/18
Submitted By: John Steinert
Traceable Number: 20181772

Test Item: 5 lb Individual Grip Handle Weight
Serial No.: 10744

Manufacturer: Rice Lake

Laboratory Environment at time of test

Temperature °C	Pressure mmHg	Humidity %RH
21.838	762.06	52.23

Conventional Mass Value

Nominal Value	As Found pounds	As Found Correction* (mg)	Uncertainty (mg)	Tolerance (mg)
5 lb	5.0006085	276.0	2.0	760

*Correction is the difference between the conventional mass value of a weight and its nominal value.

Comments: This weight was new from the manufacturer and was within ASTM Class 7 tolerances As Found. No adjustments or changes were made so As Found values should be considered to be As Left values.

Accredited by the American Association for Laboratory Accreditation (A2LA) under Calibration Laboratory Code 115953 and Certificate Number 1550.01. This laboratory meets the requirements of ISO/IEC 17025:2005 *General Requirements for the Competence of Testing and Calibration Laboratories*. This laboratory also meets the requirements of ANSI/NCSL Z540-1-1994 and any additional program requirements in the field of calibration.

Quality Control Services, Inc.
Metrology Laboratory Manager
E-mail dthompson@qc-services.com

Date: 08/28/18

Signature David S. Thompson

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Member: National Conference of Standards Laboratories and Weights & Measures

Verification of Standardization

of

Tape Measure

by

Advanced Calibration Technologies
28111 S.E. Wally Road
Boring, OR 97009
1-800-259-5058

A2LA ACCREDITED
Calibration
Cert# 1342.01

Customer:	PFS Teco, Inc	Street:	11785 Southeast Highway 212 Suite 305
City:	Clackamas State: OR	Zip:	97015 Location: In House
Machine Manufacturer:	Dewalt	Model:	16' Tape Measure
Capacity:	0.000 - 192.000 inches 0.125 Divisions	Serial #:	090
Calibration Cycle:	12 Months	Lab ID#:	#090
Previous Calibration Date:	January 2019	Calibration Procedure:	Ad-Tek SR
Equipment Used:	Gauge Blocks S/N: ADGB002	Action Recommended:	
If Other, Explain:			

Verification Data

Purpose:
This method provides instructions for checking the critical dimensions of the equipment.
Tolerance:
Equipment shall meet the dimensional tolerances specified in the applicable test method.
Procedure:
Verified using manufacturer's procedures.

Actual Dimensions (inches)	Unit Under Test As Found (inches)	Unit Under Test As Left (inches)	Difference (inches)
0.0000	0.000	0.000	0.000
0.1250	0.050	0.050	-0.075
0.2500	0.250	0.250	0.000
0.5000	0.500	0.500	0.000
0.7500	0.750	0.750	0.000
1.0000	1.000	1.000	0.000
3.0000	3.000	3.000	0.000
5.0000	5.000	5.000	0.000
7.0000	7.000	7.000	0.000
9.0000	9.000	9.000	0.000
12.0000	12.000	12.000	0.000

The overall condition of the device as found:	Within Specification
The overall condition of the device as left:	Within Specification
The measurement of uncertainty (MU) was calculated to be:	0.00060

File No: PFS-101666-0119D0120-AH-SR-090

Temperature: 72.1°F Humidity: 41.1%

The equipment used in the verification of this instrument has been calibrated and is NIST traceable.
The uncertainty of calibration was estimated at the 95% confidence level, coverage factor (k=2).

Remarks:

This certificate of verification is issued as a statement of fact that on the date of verification the above instrument had an accuracy as indicated and was calibrated to meet the requirements of the manufacturer's specifications. This certificate should not be construed or regarded as a guarantee or warranty of any kind that the instrument will retain the same percentage of accuracy as determined on the date when the verification was performed and reported. Ad-Tek, Inc. hereby expressly disclaims any and all liability for damage or loss by all parties arising or resulting from deterioration, obsolescence, malfunction, subsequent calibration performed by another agency or substandard performance of said instrument.

This report and certificate of verification shall not be reproduced except in full, without the written approval of Ad-Tek, Inc.

Service Technician: Alisa Houser Date of Service: January 16, 2019

Technical Manager: Nicole Ostrowski Date Next Due: January 2020

We sincerely appreciate your business and thank you for selecting Advanced Calibration Technologies, Inc. for servicing your equipment.
To reschedule, please call (800) 259-5058. Thank You.

Verification of Standardization

of

Calipers

by

Advanced Calibration Technologies
28111 S.E. Wally Road
Boring, OR 97009
1-800-259-5058

A2LA ACCREDITED
Calibration
Cert# 1342.01

Customer:	PFS Teco, Inc	Street:	11785 Southeast Highway 212 Suite 305
City:	Clackamas State: OR	Zip:	97015 Location: In House
Machine Manufacturer:	General	Model:	6" Digital Caliper
Capacity:	0.0000 - 6.0000 inches 0.0005 Divisions	Serial #:	092
Calibration Cycle:	12 Months	Lab ID#:	092
Previous Calibration Date:	January 2018	Calibration Procedure:	Ad-Tek DC
Equipment Used:	Gauge Blocks S/N: ADGB002	Action Recommended:	
If Other, Explain:			

Verification Data

Purpose:

This method provides instructions for checking the critical dimensions of the inside diameter of the equipment.

Tolerance:

Equipment shall meet the dimensional tolerances specified by the manufacturer for the inside diameter.

Procedure:

Verified using the procedure to meet manufacturer's tolerance for inside diameter.

Actual Dimensions (inches)	Unit Under Test As Found (inches)	Unit Under Test As Left (inches)	Difference (inches)
0.0000	0.0000	0.0000	0.0000
0.0500	0.0500	0.0500	0.0000
0.1000	0.1000	0.1000	0.0000
0.1010	0.1010	0.1010	0.0000
0.1050	0.1050	0.1050	0.0000
0.1100	0.1100	0.1100	0.0000
0.1500	0.1500	0.1500	0.0000
0.5000	0.5000	0.5000	0.0000
1.0000	1.0000	1.0000	0.0000
3.0000	2.9995	2.9995	-0.0005
5.0000	4.9990	4.9990	-0.0010

The overall condition of the device as found:	Within Specification
The overall condition of the device as left:	Within Specification
The measurement of uncertainty (MU) was calculated to be:	0.00062

This certificate does not reflect meausrements for inside jaws, step height, or depth.

File No: PFS-101666-0119D0120-AH-DC-092

Temperature: 68.2°F Humidity: 41.6%

The equipment used in the verification of this instrument has been calibrated and is NIST traceable.
The uncertainty of calibration was estimated at the 95% confidence level, coverage factor (k=2).

Remarks:

This certificate of verification is issued as a statement of fact that on the date of verification the above instrument had an accuracy as indicated and was calibrated to meet the requirements of the manufacturer's specifications. This certificate should not be construed or regarded as a guarantee or warranty of any kind that the instrument will retain the same percentage of accuracy as determined on the date when the verification was performed and reported. Ad-Tek, Inc. hereby expressly disclaims any and all liability for damage or loss by all parties arising or resulting from deterioration, obsolescence, malfunction, subsequent calibration performed by another agency or substandard performance of said instrument.

This report and certificate of verification shall not be reproduced except in full, without the written approval of Ad-Tek, Inc.

Service Technician: Alisa Houser Date of Service: January 15, 2019

Technical Manager: Nicole Ostrowski Date Next Due: January 2020

We sincerely appreciate your business and thank you for selecting Advanced Calibration Technologies, Inc. for servicing your equipment.
To reschedule, please call (800) 259-5058. Thank You.

DICK MUNNS COMPANY
LIQUID & GAS FLOW CALIBRATION

ISO 17025 IAS ACCREDITED
CL-122

CERTIFICATE OF CALIBRATION

CUSTOMER:	**PFS-TECO :** CLACKAMAS, OR	**CALIBRATION DATE:**	03/14/2019
PO NUMBER:	N/A	**CALIBRATION DUE:**	03/14/2020
INST. MANUFACTURER:	DWYER	**PROCEDURE:**	T.O.33K6-4-1769-1
INST. DESCRIPTION:	VELOMETER	**CALIBRATION FLUID:**	AIR @ 14.7 PSIA 70°F
MODEL NUMBER:	471	**RECEIVED CONDITION:**	WITHIN MFG. SPECS.
SERIAL NUMBER:	CP288559 (ID# 095)	**LEFT CONDITION:**	WITHIN MFG. SPECS.
RATED UNCERTAINTY:	SEE NOTES BELOW.	**AMBIENT CONDITIONS:**	762 mm HGA 43% RH 69°F
UNCERTAINTY GIVEN:	± .20% RD ; k=2	**CERTIFICATE FILE #:**	490265.2019

NOTES: ± 3% FS (0-500 / 0-1500) *** ± 4% F.S. (0-5000) ***± 5% F.S. (0-15000) *** ± 2 °F

NOTES CONT. : Q.MANUAL IM 1.5 REV 2017.1 DATED 7-18-2017

UUT INDICATED FT/MIN	DM.STD. ACTUAL FT/MIN	UUT INDICATED DEG. F	DM STD. ACTUAL DEG. F
64	65	0 TO 200°F	0 TO 200°F
110	112	43.4	43.5
206	210	69.0	68.9
498	509	99.4	99.2
503	505		
1049	1058		
1497	1514		
509	513		
3419	3460		
4992	5068		
5136	5235		
13928	14232		

STANDARDS USED:		
A220: 12" WIND TUNNEL 0 - 8000 FPM | CMC ± .203% RD | TRACE# 1520423238	DUE	05/23/2019
A24: HART SCIENTIFIC TEMP. STANDARD | ±.024 F | TRACE# 1520423238	DUE	03/07/2020

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

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

Date: 3/14/2019

Approved By:

Calibration Technician: D. C.

Model 1430 Microtector® Electronic Point Gage

Installation and Operating Instructions

Model 1430 Microtector® Portable Electronic Point Gage combines modern, solid-state integrated circuit electronics with a time-proven point gage manometer to provide fast, accurate pressure measurements.

SPECIFICATIONS AND FEATURES

- Accurate and repeatable to ± .00025 inches water column
- Pressure range: 0 - 2″ w.c., positive, negative, or differential pressures
- Non-toxic and inexpensive gage fluid consists of distilled water mixed with a small amount of fluorescein green color concentrate
- Convenient, portable, lightweight and self-contained, the unit requires no external power connections and is operated by a 1.5 volt penlight cell
- A.C. detector current eliminates point plating, fouling and erosion
- Micrometers are manufactured in accordance with ASME B89.1.13-2001, and are traceable to a standard at the National Institute of Standards and Technology
- Three-point mounting, dual leveling adjustment, and circular level vial assure rapid setup
- Durablock® precision-machined acrylic plastic gage body
- Sensitive 0 - 50 microamp D.C. meter acts as a detector and also indicates battery and probe condition
- Heavy 2″ thick steel base plate provides steady mounting
- Top-quality glass epoxy circuit board and solid-state, integrated circuit electronics
- Electronic enclosure of tough, molded styrene acrylonitrile provides maximum protection to components yet allows easy access to battery compartment
- Rugged sheet steel cover and carrying case protects the entire unit when not in use
- Accessories included are (2) 3-foot lengths Tygon® tubing, (2) 1/8″ pipe thread adapters and 3/4 oz. bottle of fluorescein green color concentrate with wetting agent

Maximum pressure: 100 psig with optional pipe thread connections.

Tygon® is a registered trademark of Saint-Gobain Corporation

DWYER INSTRUMENTS, INC.
P.O. BOX 373
MICHIGAN CITY, INDIANA 46361,U.S.A
Phone: 219/879-8000
Fax: 219/872-9057
www.dwyer-inst.com
e-mail: info@dwyer-inst.com

J-2000

owner's manual

DELMHORST®
INSTRUMENT CO.

WHEN ACCURACY IS THE POINT.™

PRAXAIR
Making our planet more productive

DocNumber: 225861

Praxair Distribution, Inc.
5700 S. Alameda Street
Los Angeles CA 90058
Tel: 323-585-2154
Fax: 714-542-6689
PGVP ID: F22018

CERTIFICATE OF ANALYSIS / EPA PROTOCOL GAS

Customer & Order Information

PXPKG TUALATIN OR H
10450 SW TUALATIN SHERWOOD ROAD
TUALATIN OR 97062

Certificate Modification Date: 10/01/2018
Praxair Order Number: 70743165
Part Number: NI CD17CO8E-AS

Fill Date: 09/26/2018
Lot Number: 70086826911
Cylinder Style & Outlet. AS CGA 590
Cylinder Pressure and Volume. 1290 psig 140 ft3

Certified Concentration

ProSpec EZ Cert

Expiration Date:	10/01/2026	NIST Traceable
Cylinder Number:	SA17187	Expanded Uncertainty
17.00 %	Carbon dioxide	± 0.3 %
4.31 %	Carbon monoxide	± 0.6 %
16.99 %	Oxygen	± 0.2 %
Balance	Nitrogen	

Certification Information:

Certification Date: 10/01/2018 *Term:* 96 Months *Expiration Date:* 10/01/2026

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.
CO2 responses have been corrected for Oxygen IR Broadening effect. O2 responses have been corrected for CO2 interference.

Analytical Data:

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

1. *Component:* **Carbon dioxide**

Requested Concentration: 17 %
Certified Concentration: 17.00 %
Instrument Used: Horiba VIA-510 S/N 20C194WK
Analytical Method: NDIR
Last Multipoint Calibration: 09/21/2018

First Analysis Data: **Date** 10/01/2018

Z:	0	R:	20.1	C:	17	Conc:	17
R:	20.1	Z:	0	C:	17	Conc:	17
Z:	0	C:	17.01	R:	20.11	Conc:	17.01

UOM: % **Mean Test Assay:** 17 %

Reference Standard: Type / Cylinder #: GMIS / CC187238
Concentration / Uncertainty: 20.10 % ±0.24%
Expiration Date: 06/07/2026
Traceable to: SRM # / Sample # / Cylinder #: RGM#CC193512 / N/A / RGM#CC193512
SRM Concentration / Uncertainty: 26.99% / ±0.05%
SRM Expiration Date: 05/15/2023

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:** %

2. *Component:* **Carbon monoxide**

Requested Concentration: 4.25 %
Certified Concentration: 4.31 %
Instrument Used: Horiba VIA-510 S/N UB9UCSYX
Analytical Method: NDIR
Last Multipoint Calibration: 09/21/2018

First Analysis Data: **Date** 10/01/2018

Z:	0	R:	5	C:	4.31	Conc:	4.31
R:	5	Z:	0	C:	4.3	Conc:	4.3
Z:	0	C:	4.32	R:	5.01	Conc:	4.32

UOM: % **Mean Test Assay:** 4.31 %

Reference Standard: Type / Cylinder #: GMIS / CC242633
Concentration / Uncertainty: 5.00 % ±0.543%
Expiration Date: 04/03/2025
Traceable to: SRM # / Sample # / Cylinder #: SRM 2642a / 51-D-23 / FF23106
SRM Concentration / Uncertainty: 7.859% / ±0.039%
SRM Expiration Date: 07/15/2019

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:** %

3. *Component:* **Oxygen**

Requested Concentration: 17 %
Certified Concentration: 16.99 %
Instrument Used: OXYMAT 5E
Analytical Method: Paramagnetic
Last Multipoint Calibration: 09/04/2018

First Analysis Data: **Date** 10/01/2018

Z:	0	R:	20.86	C:	16.99	Conc:	16.99
R:	20.86	Z:	0	C:	16.99	Conc:	16.99
Z:	0	C:	16.99	R:	20.86	Conc:	16.99

UOM: % **Mean Test Assay:** 16.99 %

Reference Standard: Type / Cylinder #: GMIS / CC75874
Concentration / Uncertainty: 20.86 % ±0.111%
Expiration Date: 11/07/2025
Traceable to: SRM # / Sample # / Cylinder #: SRM 2659a / 71-E-19 / FF22331
SRM Concentration / Uncertainty: 20.863% / ±0.021%
SRM Expiration Date 08/23/2021

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:** %

Analyzed By **Jose Vasquez**

Certified By **Danielle Burns**

Information contained herein has been prepared at your request by qualified experts within Praxair Distribution, Inc. While we believe that the information is accurate within the limits of the analytical methods employed and is complete to the extent of the specific analyses performed, we make no warranty or representation as to the suitability of the use of the information for any purpose. The information is offered with the understanding that any use of the information is at the sole discretion and risk of the user. In no event shall the liability of Praxair Distribution, Inc., arising out of the use of the information contained herein exceed the fee established for providing such information.

PRAXAIR
Making our planet more productive

DocNumber: 223791

Praxair Distribution, Inc.
5700 S. Alameda Street
Los Angeles CA 90058
Tel: 323-585-2154
Fax: 714-542-6689
PGVP ID: F22018

CERTIFICATE OF ANALYSIS / EPA PROTOCOL GAS

Customer & Order Information

PXPKG TUALATIN OR H
10450 SW TUALATIN SHERWOOD ROAD
TUALATIN OR 97062

Certificate Modification Date: 09/05/2018
Praxair Order Number: 70716136
Part Number: NI CD10CO33E-AS

Fill Date: 08/31/2018
Lot Number: 70086824308
Cylinder Style & Outlet: AS CGA 590
Cylinder Pressure and Volume: 2000 psig 140 ft3

Certified Concentration

ProSpec EZ Cert

Expiration Date:	09/05/2026	NIST Traceable
Cylinder Number:	CC170624	Expanded Uncertainty
10.00 %	Carbon dioxide	± 0.3 %
2.51 %	Carbon monoxide	± 0.7 %
10.50 %	Oxygen	± 0.6 %
Balance	Nitrogen	

Certification Information:

Certification Date: 09/05/2018 *Term:* 96 Months *Expiration Date:* 09/05/2026

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.

CO responses have been corrected for CO2 interference. CO2 responses have been corrected for Oxygen IR Broadening effect. O2 responses have been corrected for CO2 interference

Analytical Data:

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

1. ***Component:*** **Carbon dioxide**

Requested Concentration: 10 %
Certified Concentration: 10.00 %
Instrument Used: Horiba VIA-510 S/N 20C194WK
Analytical Method NDIR
Last Multipoint Calibration: 08/20/2018

First Analysis Data:						Date	09/05/2018
Z:	0	R:	14.02	C:	10	Conc:	10
R:	14.02	Z:	0	C:	10	Conc:	10
Z:	0	C:	10	R:	14.02	Conc:	10
UOM:	%			Mean Test Assay:		10	%

Reference Standard: Type / Cylinder # GMIS / CC141375
Concentration / Uncertainty: 14.02 % ±0.3%
Expiration Date: 06/11/2026
Traceable to: SRM # / Sample # / Cylinder #: SRM 1675b / 6-F-51 / CAL014538
SRM Concentration / Uncertainty: 13.963% / ±0.034%
SRM Expiration Date: 05/16/2022

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:			%

2. ***Component:*** **Carbon monoxide**

Requested Concentration: 2.5 %
Certified Concentration: 2.51 %
Instrument Used: Horiba VIA-510 S/N UB9UCSYX
Analytical Method NDIR
Last Multipoint Calibration: 08/20/2018

First Analysis Data:						Date	09/05/2018
Z:	0	R:	2.48	C:	2.51	Conc:	2.51
R:	2.48	Z:	0	C:	2.51	Conc:	2.51
Z:	0	C:	2.51	R:	2.48	Conc:	2.51
UOM:	%			Mean Test Assay:		2.51	%

Reference Standard: Type / Cylinder #: GMIS / CC102045
Concentration / Uncertainty: 2.48 % ±0.448%
Expiration Date: 04/03/2025
Traceable to: SRM # / Sample # / Cylinder #: SRM 2641a / 52-D-30 / CAL017193
SRM Concentration / Uncertainty: 4.009% / ±0.017%
SRM Expiration Date: 07/15/2019

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:			%

3. ***Component:*** **Oxygen**

Requested Concentration: 10.5 %
Certified Concentration: 10.50 %
Instrument Used OXYMAT 5E
Analytical Method: Paramagnetic
Last Multipoint Calibration: 09/04/2018

First Analysis Data:						Date	09/05/2018
Z:	0	R:	9.88	C:	10.49	Conc:	10.49
R:	9.88	Z:	0	C:	10.5	Conc:	10.5
Z:	0	C:	10.5	R:	9.88	Conc:	10.5
UOM:	%			Mean Test Assay:		10.5	%

Reference Standard: Type / Cylinder #: NTRM / DT0010402
Concentration / Uncertainty 9.88 % ±0.4%
Expiration Date 11/18/2022
Traceable to: SRM # / Sample # / Cylinder #: NTRM #170701 / N/A / NTRM #DT0010402
SRM Concentration / Uncertainty: 9.875% / ±0.040%
SRM Expiration Date: 11/18/2022

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:			%

Analyzed By Danielle Burns

Certified By Jose Vasquez

Information contained herein has been prepared at your request by qualified experts within Praxair Distribution, Inc. While we believe that the information is accurate within the limits of the analytical methods employed and is complete to the extent of the specific analyses performed, we make no warranty or representation as to the suitability of the use of the information for any purpose. The information is offered with the understanding that any use of the information is at the sole discretion and risk of the user. In no event shall the liability of Praxair Distribution, Inc., arising out of the use of the information contained herein exceed the fee established for providing such information.