Pacific Energy

Project # 034-S-076-1
Models: Super LE (formerly known as the Super (Series E)), aka:
Super Classic, and Alderlea T5
Type: Residential Non-catalytic Wood Fired Heater
March 31, 2017

EPA Test Method 28R for Certification and Auditing of Wood Heaters

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Revision 1: May 13, 2022, the following changes were made for appliance renewal:

- Added CO in grams/ minute
- Dual Train precision comparison calculated in both % and g/kg.
- Updated owners manual to include warranty information.
- Included unused run data Appendix A.
- Manufacturer operating instructions provided to lab added to Appendix A
- Added Firebox volume drawing

Revision 2: September 2, 2022, the following revisions were made upon request from EPA:

- Added fuel load density information to the fuel load data sheets, see Appendix A.
- Correct report firebox volume is several places to make consistent throughout the report, see fuel load sheets in Appendix A, and appliance dimensions on Page 22

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Affidavit:

Dirigo Laboratories, Inc. was contracted by Pacific Energy Fireplace Products Ltd. to provide testing services for the Super LE (formerly known as the Super (Series E)) aka: Super Heritage, Super Classic, and Alderlea T5 non-catalytic wood fired heater per EPA Method 28R for Certification and Auditing of Wood Heaters. All testing and associated procedures were conducted at Dirigo Laboratories, Inc. beginning on 2/28/2017 and ending on 3/11/2017. Upon completion of testing, the name of the appliance was changed from the Super (Series E) to the Super LE. No physical changes were made to the appliance and all test results for the formerly named Super (Series E) are valid for the Super LE. No additional testing was required. Dirigo Laboratories is located at 11785 SE Highway 212 – Suite 305, Clackamas, Oregon 97015. Testing procedures followed EPA Method 28R and ASTM E2780-10. Particulate sampling was performed per ASTM E2515-10 *Standard Test Method for Determination of Particulate Matter Emissions Collected by a Dilution Tunnel.*

Dirigo Laboratories 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. Dirigo holds EPA Accreditation Certificate Numbers 4 and 4M (mobile). Dirigo Laboratories, Inc. is accredited by A2LA to ISO 17020:2012 "Criteria for Bodies Performing Inspections, ISO 17025:2005 "Requirements for Testing Laboratories", and ISO 17065:2012 "Requirements for Bodies Operating Product Certification Systems". Dirigo holds A2LA Certificate Numbers 3726.01, 3726.02, and 3726.03. See Appendix E for Accreditations.

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

Jeremy Clark Signing For Ben Nelke

Ben Nelke, Test Technician

Doug Towne

Digitally signed by Doug Towne
DN: cn=Doug Towne, o=Dirigo, ou=QA/QC, email=dtowne@dirigolab.com, c=US
Date: 2017.05.15 12:28:01 -07'00'

Doug Towne, QA Manager

Introduction:

Pacific Energy Fireplace Products Ltd. of Duncan, BC, contracted with Dirigo Laboratories, Inc. to perform EPA certification testing on their Super LE (formerly known as the Super (Series E)) non-catalytic wood heater. The Super LE firebox is used in the Super Heritage, Super Classic, and Alderlea T5. Upon completion of testing, the name of the appliance was changed from the Super (Series E) to the Super LE. No physical changes were made to the appliance and all test results for the formerly named Super (Series E) are valid for the Super LE. No additional testing was required. All testing was performed at Dirigo Laboratories, Inc. Testing was performed by Mr. Ben Nelke.

Notes:

- 48 hours aging was performed on the appliance by the manufacturer prior to the test series. The additional 2 hours were achieved at Dirigo Laboratories, Inc. – See runs 1, 1A & 1B
- Prior to testing, the dilution tunnel was cleaned with a steel brush.
- Run #'s 1C, 2, 3 & 4 were performed with the convection blower in operation. The blower confirmation run, Run #5, was performed with the convection blower turned off.
- Front filters were changed on sample train A at one hour for all runs.
- Stove operating instructions provided by manufacturer added to appendix A
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Wood Heater Identification and Testing:

- Appliance Tested: ***Super LE (formerly known as the Super (Series E)), aka: Super Classic, and Alderlea T5***
- Serial Number: ***50230869***
- Manufacturer***: Pacific Energy Fireplace Products Ltd.***
- Catalyst: ***No***
- Heat exchange blower: ***Optional***
- Type: ***Wood Stove***
- Style: ***Free Standing***
- Date Received: ***Tuesday, January 24, 2017***
- Wood Heater Aging: ***December 13, 2016 - January 25, 2017***
- Testing Period – Start: ***Tuesday, February 28, 2017*** Finish: ***Saturday, March 11, 2017***
- Test Location: ***Dirigo Laboratories, Inc. 11785 SE HWY 212 - Suite 305, Clackamas, OR 97015***
- Elevation: **≈131** ***Feet above sea level***
- Test Technician(s): **Ben Nelke**
- Observers: ***Ken Davis***

Test Procedures and Equipment:

All Sampling and analytical procedures were performed by Ben Nelke. All procedures used are directly from EPA Method 28R, ASTM E2780-10 and ASTM E2515-10. See the list below for equipment used. See Appendix D for calibration data.

Equipment List:

1. Analyzer -California Analytical ZRE CO2/CO/O2 IR ANALYZER
2. Delmhorst J-2000 Wood Moisture Meter
3. Dayton 4c121 Blower for dilution tunnel -Emissions Booth #1
4. ScienTech Balance Scale
5. 10 lb Calibration Weight
6. DigiWeigh Bench Shipping Scale
7. APEX XC-60 Digital Emissions Sampling Box A
8. APEX XC-60 Digital Emissions Sampling Box B
9. APEX Ambient sampling box
10. Gast MOA-P122-AA Vacuum Pump
11. Rice Lake 3'x3' floor scale w/digital weight indicator

Results:

The weighted average emission rate is **1.8 g/hr** with a weighted average efficiency of **71.3%** and a weighted average CO **1.97 g/min.** The Pacific Energy Fireplace Products Ltd. Model Super LE non-catalytic wood heater meets the 2020 PM emission standard of ≤ 2.0 g/hr per CFR 40 part 60, §60.532 (b).

Detailed individual run data can be found in separate digital folders supplied with this report.

Emissions:

DIRIGO LABORATORIES INC.

EPA Method 28 - Weighted Average

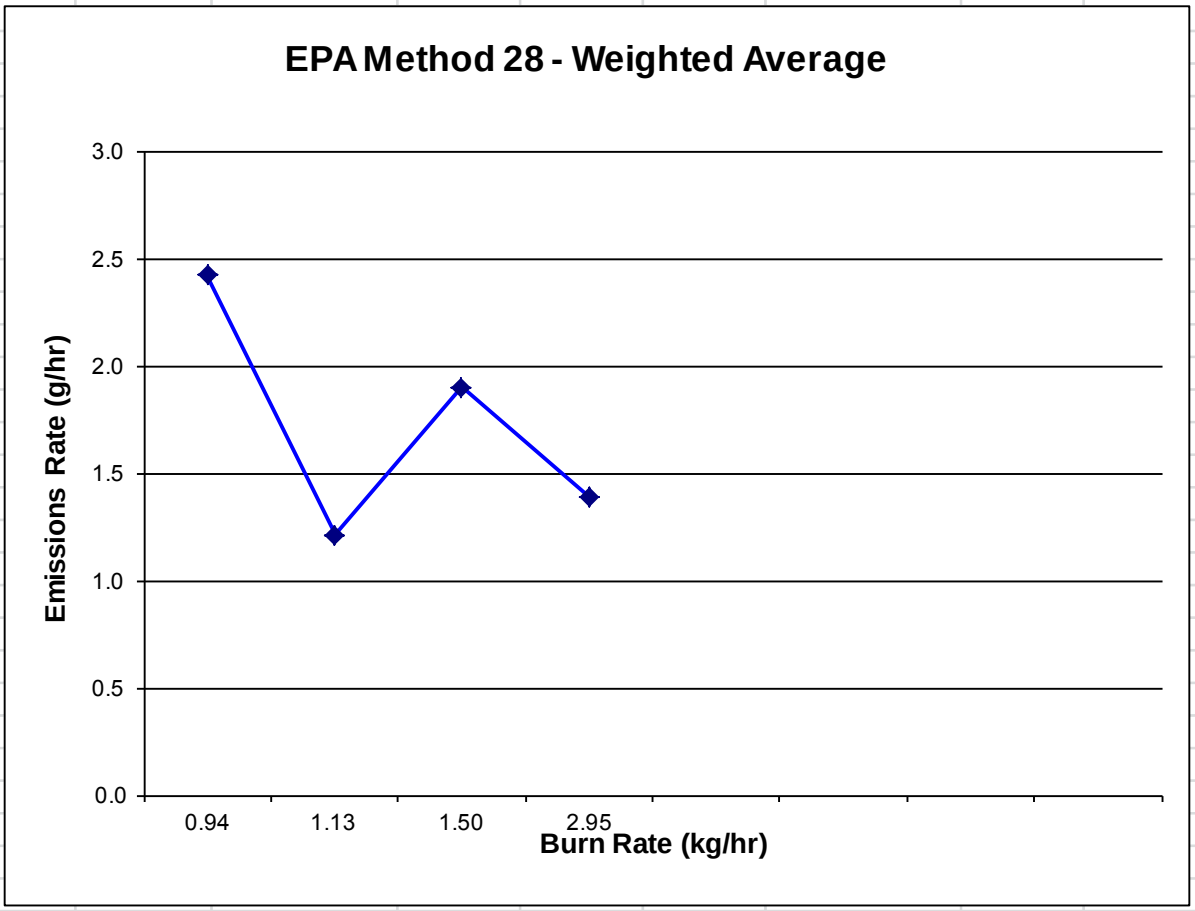
Weighted Average: 1.80 (g/hr)

Client:	Pacific Energy
Model:	Super (Series E)
Tracking No.:	76
Project No.:	034-S-076-1
Test Dates:	2/28/17 - 3/11/17

Burn Rate Category	2	Burn Rate Category	2
Burn Rate (kg/hr-dry)	0.94	Burn Rate (kg/hr-dry)	1.13
Emissions Rate (g/hr)	2.4	Emissions Rate (g/hr)	1.2
Emissions Rate Cap (g/hr)	15	Emissions Rate Cap (g/hr)	15
Weighting Factor	28.77%	Weighting Factor	25.73%
Run Number	1C	Run Number	2
Burn Rate Category	3	Burn Rate Category	4
Burn Rate (kg/hr-dry)	1.50	Burn Rate (kg/hr-dry)	2.95
Emissions Rate (g/hr)	1.9	Emissions Rate (g/hr)	1.4
Emissions Rate Cap (g/hr)	15	Emissions Rate Cap (g/hr)	18
Weighting Factor	30.45%	Weighting Factor	15.05%
Run Number	3	Run Number	4

EPA Method 28 - Weighted Average

Client:	Pacific Energy
Model:	Super (Series E)
Tracking No.:	76
Project No.:	034-S-076-1
Test Dates:	2/28/17 - 3/11/17



Efficiency:

All efficiency values use the HHV.

CSA B415.1-10 Weighted Average

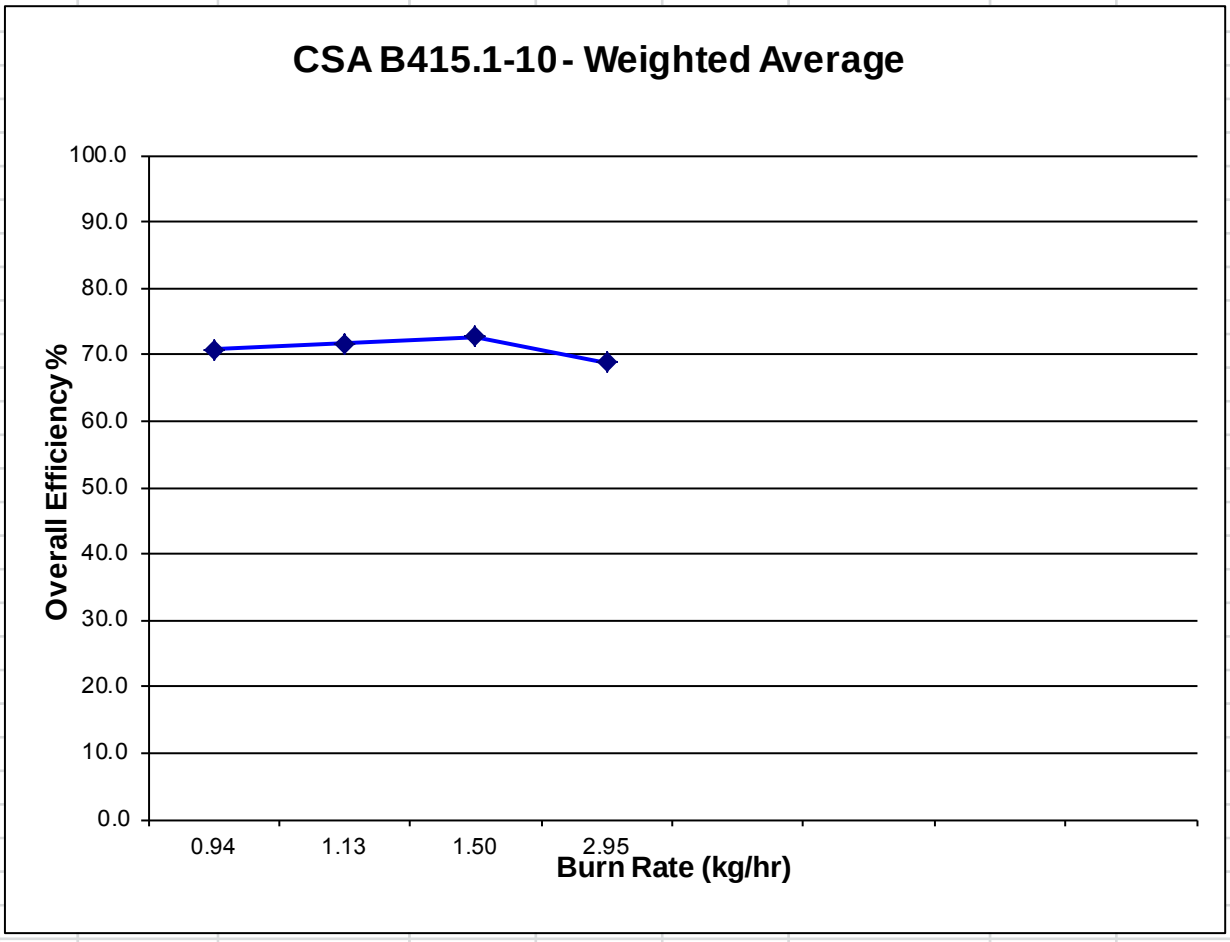
Weighted Average: 71.3 %

Client:	Pacific Energy
Model:	Super (Series E)
Tracking No.:	76
Project No.:	034-S-076-1
Test Dates:	2/28/17 - 3/11/17

Burn Rate Category	2	Burn Rate Category	2
Burn Rate (kg/hr-dry)	0.94	Burn Rate (kg/hr-dry)	1.13
OA Efficiency %	70.8	OA Efficiency %	71.6
Emissions Rate Cap (g/hr)	15	Emissions Rate Cap (g/hr)	15
Weighting Factor	28.77%	Weighting Factor	25.73%
Run Number	1C	Run Number	2
Burn Rate Category	3	Burn Rate Category	4
Burn Rate (kg/hr-dry)	1.50	Burn Rate (kg/hr-dry)	2.95
OA Efficiency %	72.7	OA Efficiency %	68.8
Emissions Rate Cap (g/hr)	15	Emissions Rate Cap (g/hr)	18
Weighting Factor	30.45%	Weighting Factor	15.05%
Run Number	3	Run Number	4

CSA B415.1-10 - Weighted Average

Client:	Pacific Energy
Model:	Super (Series E)
Tracking No.:	76
Project No.:	034-S-076-1
Test Dates:	2/28/17 - 3/11/17



Summary Table:

	Category 2 < 1.00 kg/hr	Category 0.80 to 1.25 kg/hr	Category 3 1.25 to 1.90 kg/hr	Category 4 Maximum
Date	3/7/17	3/8/17	3/9/17	3/10/17
Run Number	1C	2	3	4
PM Emission Rate (g/hr)	2.42	1.21	1.90	1.39
Burn Rate (kg/hr)	0.94	1.13	1.5	2.95
Heat Output (BTU/hr)	12,518	15,210	20,539	38,177
HHV Efficiency (%)	70.8	71.6	72.7	68.8
LHV Efficiency (%)	76.5	77.4	78.6	74.4
CO Emissions (g/MJ output)	11.62	9.11	6.3	0.96
CO Emissions (g/kg dry fuel)	163.0	129.2	90.77	13.07
CO Emissions (g/min)	2.55	2.43	2.27	0.64
1st Hour Emission Rate (g/hr)	11.3	5.2	5.6	2.2
Weighting Factor (%)	28.77	25.73	30.45	15.05
Weighted particulate emission average of 4 test runs: 1.8 grams per hour.				
Weighted average HHV efficiency of 4 test runs: 71.3%.				
Average CO emission rate for 4 test runs: 1.97 grams per minute				

Run 1:

Run 1, performed on 2/28/17, was an attempt at a category II (<1.00) burn rate. During the course of the run, a loud “pop” was heard by the Dirigo Labs Test Technician. The run continued but the burn characteristics did not resemble anything the Test Technician had observed in all previous assessment runs. The client was contacted for their input and guidance. The client decided to send their representative, Ken Davis, to inspect the appliance prior to additional certification runs.

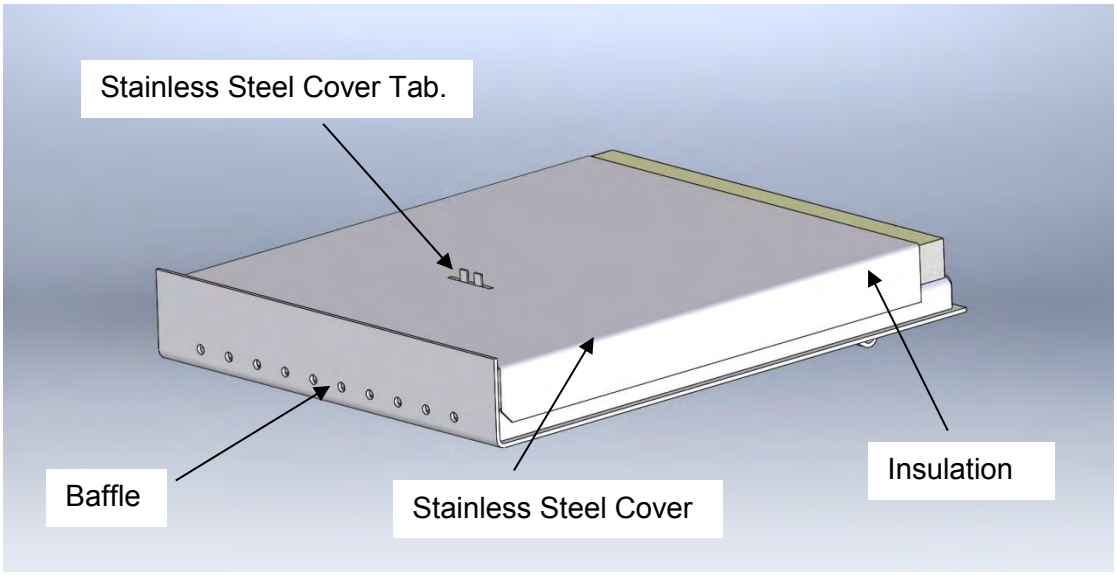
Run 1A:

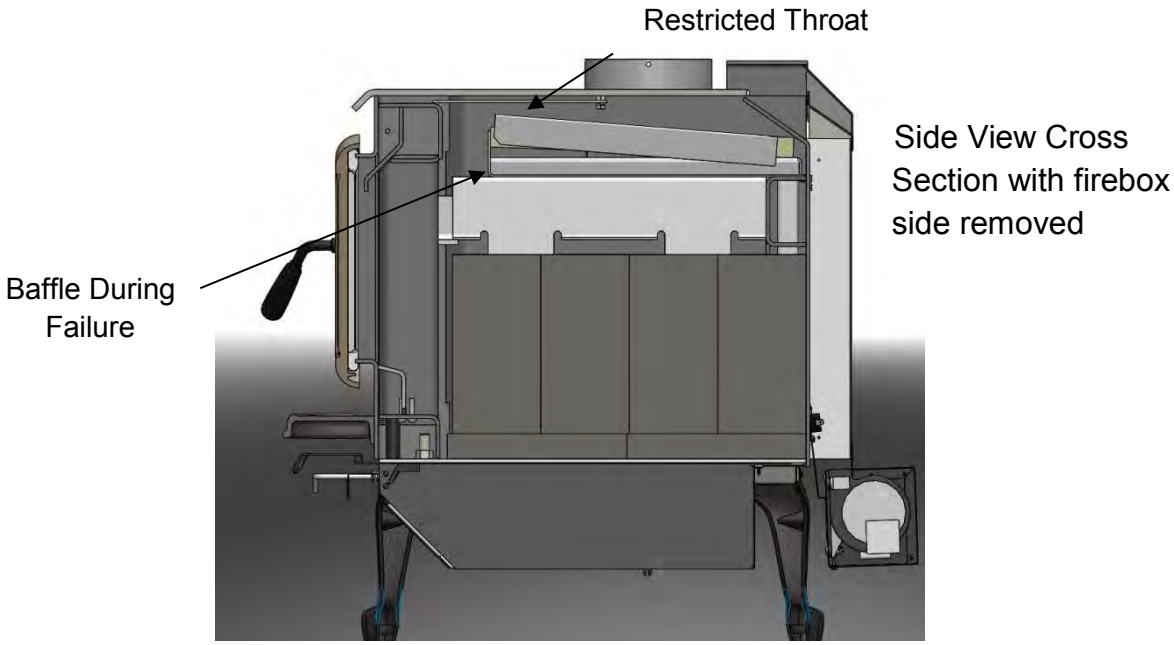
On 3/2/17 the stove was inspected by Ken Davis. Mr. Davis was unable to find any obvious problems with the stove. Based on information from Run 1, Mr. Davis made the decision to make a design change to the stove to increase the minimum stop from 0.250” to 0.266”. Run 1A was started and the primary was set to fully closed 5 minutes into the test run. During the run Mr. Davis observed that the burn characteristics

continued to be very different than what was expected from previous R&D runs (performed by Pacific Energy) and assessment runs. The test run also exceeded allowable Delta T (134°).

Friday March 3, 2017:

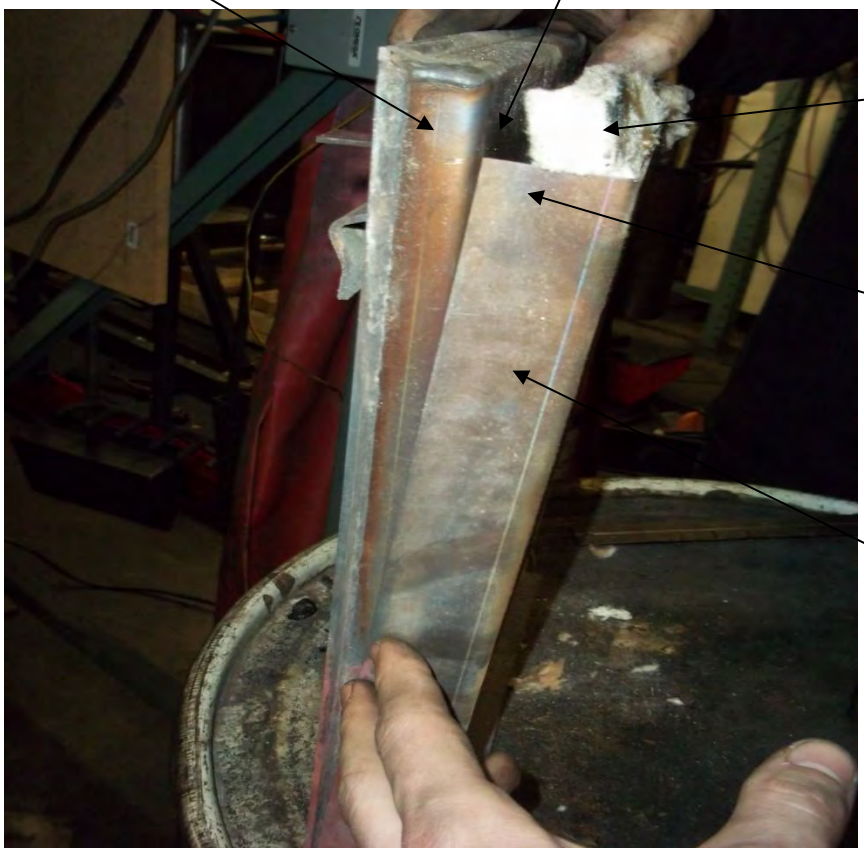
During Run 1A, Mr. Davis had observed that the Super LE was not performing as expected. The Super LE baffle was removed from the appliance. It was discovered that the stainless steel cover holding the baffle insulation in place had failed at the Tab causing combustion to occur between the baffle and the insulation cover. This caused the baffle to bow and warp at this position which pushed the baffle insulation cover up into the throat area thus restricting the outlet of the stove.





Baffle

Separation between Baffle and Insulation/Cover



Insulation

Baffle Removed from test unit. Stainless Cover separating from Baffle

Stainless Steel Cover

Baffle Tab

Baffle Tab damaged during operation leaving large gap between cover and tab

A new Baffle was installed on March 3, 2017 and an assessment run was performed on the appliance (Assessment #14).

Run 1B:

On March 4, 2017, certification of the Super LE wood heater began again with an attempt at a low burn. As in Run 1A, the test exceeded allowable Delta T (133°). However, the stove appeared to be burning as expected.

Run 1C:

Run 1C was a category II burn rate (<1.00 kg/hr per 8.1.1.3.2 of Method 28 Note) performed on 3/7/17. The test duration was 5 hours 40 minutes. The fuel weight was 14.1 lbs. There was an average particulate emissions rate of 2.42 g/hr. The run had an overall efficiency of 70.8%. The A filter was changed at 1 hr. The 1-hour filter catch was 10.7 mg. All test results were appropriate and valid. The burn rate category was achieved. There were no anomalies and all criteria were met.

Run 2:

Run 2 was a category II burn rate performed on 3/8/17. The test duration was 4 hours 40 minutes. The fuel weight was 14.0 lbs. There was an average particulate emissions rate of 1.21 g/hr. The run had an overall efficiency of 71.6%. The A filter was changed

at 1 hr. The 1-hour filter catch was 4.9 mg. All test results were appropriate and valid. The burn rate category was achieved. There were no anomalies and all criteria were met.

Run 3:

Run 3 was a category III burn rate performed on 3/9/17. The test duration was 3 hours 30 minutes. The fuel weight was 14.0 lbs. There was an average particulate emissions rate of 1.90 g/hr. The run had an overall efficiency of 72.7%. The A filter was changed at 1 hr. The 1-hour filter catch was 5.6 mg. All test results were appropriate and valid. The burn rate category was achieved. There were no anomalies and all criteria were met.

Run 4:

Run 4 was a category IV burn rate performed on 3/10/17. The test duration was 1 hour 50 minutes. The fuel weight was 14.4 lbs. There was an average particulate emissions rate of 1.39 g/hr. The run had an overall efficiency of 68.8%. The A filter was changed at 1 hr. The 1-hour filter catch was 2.1 mg. All test results were appropriate and valid. The burn rate category was achieved. There were no anomalies and all criteria were met.

Run 5:

Run 5 was a fan confirmation run performed on 3/11/17. The test duration was 4 hours 40 minutes. The fuel weight was 14.0 lbs. There was an average particulate emissions rate of 3.28 g/hr. Per Method 28 & ASTM E2515-10 a category II run was performed with the fan in the off position. The emission rate resulting from this test run without the blower operating is equal to or less than the emissions rate plus 1.0 g/h for the test run in the medium burn rate category with the blower operating. Because of this, the wood heater is considered to have the same average emissions rate with or without the blower operating. Additional test runs without the blower operating are unnecessary.

Precision:

Dual Train Comparison (ASTM E2515 11.7 - If either criterion (7.5% of average or 0.5 g/kg difference) is met, the run is valid.									
Run #	Train A % of avg.	Train B % of avg.	Max Dif.	<7.5% of average?		Train A g/kg	Train B g/kg	Dif.	<0.5 g/kg from each other?
1C	100.8	99.2	1.6	**Yes**	**Or**	2.595	2.552	0.043	**Yes**
2	102.0	98.0	4	**Yes**		1.096	1.053	0.043	**Yes**
3	94.4	105.6	11.2	**No**		1.197	1.338	0.141	**Yes**
4	96.9	103.1	6.2	**Yes**		0.456	0.485	0.029	**Yes**

One Hour Particulate Data:

Run Number	Total Estimated PM Emissions at 1 hour
1C	11.3 g/hr
2	5.2 g/hr
3	5.6 g/hr
4	2.2 g/hr

Filter Catch:

Run 1C:

Project #	034-S-076-1				MFG	Pacifc Energy											
Run #	1C				Model	Super (Series E)											
Date	3/16/17																
Train A	Front	Rear	Filter #	Tare	Final	Net			**Train B**	Front	Rear	Filter #	Tare	Final	Net		
First Hour	☑	☐	3076	0.1170	0.1277	0.0107				☑	☐	3078					
	☐	☑	3077							☐	☑	3079	0.2351	0.2470			
	☑	☐	3081	0.2349	0.2369					☑	☐	O ring					
	☑	☐	O Ring							☐	☑	O ring	3.5667	3.5674	0.0126		
	☐	☑	O Ring	3.5781	3.5785	0.0024											
						13.1	mg								12.6	mg	
Nozzle									Nozzle								
#	TARE		FINAL		Net				#	TARE		FINAL		Net			
7A	116.7487		116.7487		0.0000	0.0			7B	117.3036		117.3037		0.0001	0.1		
Train A Total Catch						13.1	mg		Train B Total Catch						12.7	mg	
Ambient ☑	Filter #		Tare	Final	Net	Vol (liter)											
	3080		0.1176	0.1178	0.0002	1794.925											
	O ring		1.6711	1.6715	0.0004												
				Total	0.6	mg											
Notes:	Train A Total: 13.1mg		Train B Total: 12.7mg		Ambient Total: 0.6mg		1 Hour Catch: 10.7mg										

Run 2:

Project #	034-S-076-1				MFG	Pacific Energy											
Run #	2				Model	Super (Series E)											
Date	3/16/17																
Train A	Front	Rear	Filter #	Tare	Final	Net			**Train B**	Front	Rear	Filter #	Tare	Final	Net		
First Hour	☑	☐	3082	0.1190	0.1239	0.0049				☑	☐	3084					
	☐	☑	3083							☐	☑	3085	0.2346	0.2394			
	☑	☐	3087	0.2367	0.2371					☑	☐	O ring					
	☑	☐	O Ring							☐	☑	O ring	3.5350	3.5353	0.0051		
	☐	☑	O Ring	3.5705	3.5707	0.0006											
						5.5	mg								5.1	mg	
Nozzle									Nozzle								
#	TARE		FINAL		Net				#	TARE		FINAL		Net			
8A	116.8293		116.8294		0.0001	0.1			8B	116.8247		116.8249		0.0002	0.2		
Train A Total Catch						5.6	mg		Train B Total Catch						5.3	mg	
Ambient	Filter #		Tare	Final	Net	Vol (liter)											
	3086		0.1189	0.1190	0.0001	1479.872											
	O ring		1.6809	1.6812	0.0003												
				Total	0.4	mg											
Notes:	Train A Total: 5.6mg		Train B Total: 5.3mg		Ambient Total: 0.4mg		1 Hour Catch: 4.9mg										

Run 3:

Project #	034-S-076-1				MFG	Pacific Energy											
Run #	3				Model	Super (Series E)											
Date	3/16/17																
Train A	Front	Rear	Filter #	Tare	Final	Net		**Train B**	Front	Rear	Filter #	Tare	Final	Net			
First Hour	☑		3088	0.1180	0.1236	0.0056			☑	☐	3090						
	☐	☑	3089						☐	☑	3091	0.2344	0.2403				
	☑	☐	3093	0.2363	0.2366				☑	☐	O ring						
	☑	☐	O Ring						☐	☑	O ring	3.5100	3.5105	0.0064			
	☐	☑	O Ring	3.5746	3.5746	0.0003											
						5.9	mg									6.4	mg
Nozzle								Nozzle									
#	TARE		FINAL		Net			#	TARE		FINAL		Net				
11A	117.0348		117.0350		0.0002	0.2		11B	116.6735		116.6737		0.0002	0.2			
Train A Total Catch						6.1	mg	Train B Total Catch								6.6	mg
Ambient ☑	Filter #		Tare	Final	Net	Vol (liter)											
	3092		0.1188	0.1188	0.0000	1109.120											
	O ring		1.6530	1.6532	0.0002												
				Total	0.2	mg											
Notes:	Train A Total: 6.1mg		Train B Total: 6.6mg		Ambient Total: 0.2mg		1 Hour Catch: 5.6mg										

Run 4:

Project #	034-S-076-1				MFG	Pacific Energy											
Run #	4				Model	Super (Series E)											
Date	3/16/17																
Train A	Front	Rear	Filter #	Tare	Final	Net		**Train B**	Front	Rear	Filter #	Tare	Final	Net			
First Hour	☑		3094	0.1183	0.1204	0.0021			☑	☐	3096						
	☐	☑	3095						☐	☑	3097	0.2369	0.2391				
	☑	☐	3099	0.2367	0.2369				☑	☐	O ring						
	☑	☐	O Ring						☐	☑	O ring	3.5422	3.5425	0.0025			
	☐	☑	O Ring	3.5888	3.5889	0.0003											
						2.4	mg									2.5	mg
Nozzle								Nozzle									
#	TARE		FINAL		Net			#	TARE		FINAL		Net				
1A	115.6265		115.6265		0.0000	0.0		1B	115.9014		115.9014		0.0000	0.0			
Train A Total Catch						2.4	mg	Train B Total Catch								2.5	mg
Ambient ☑	Filter #		Tare	Final	Net	Vol (liter)											
	3098		0.1172	0.1173	0.0001	580.408											
	O ring		1.6704	1.6704	0.0000												
				Total	0.1	mg											
Notes:	Train A Total: 2.4mg		Train B Total: 2.5mg		Ambient Total: 0.1mg		1 Hour Total: 2.1mg										

Run 5 – Fan Confirmation:

	Project #	034-S-076-1			MFG	Pacific Energy											
	Run #	5			Model	Super (Series E)											
	Date	3/16/17															
	Train A	Front	Rear	Filter #	Tare	Final	Net		**Train B**	Front	Rear	Filter #	Tare	Final	Net		
	First Hour	☑		3100	0.1179	0.1292	0.0113			☑	☐	3102					
		☐	☑	3101						☐	☑	3103	0.2354	0.2489			
		☑	☐	3105	0.2366	0.2391				☑	☐	O ring					
		☑	☐	O Ring						☐	☑	O ring	3.5529	3.5531	0.0137		
		☐	☑	O Ring	3.5140	3.5142	0.0027										
							14.0	mg							13.7	mg	
	Nozzle								Nozzle								
	#	TARE		FINAL		Net			#	TARE		FINAL		Net			
	5A	116.7688		116.7692		0.0004	0.4		5B	116.8791		116.8795		0.0004	0.4		
	Train A Total Catch						14.4	mg	Train B Total Catch						14.1	mg	
	Ambient ☑	Filter #		Tare	Final	Net	Vol (liter)										
		3104		0.1173	0.1177	0.0004	1476.277										
		O ring		1.6462	1.6462	0.0000											
					Total	0.4	mg										
Notes:	Train A Total: 14.4g Train B Total: 14.1mg Ambient Total: 0.4mg 1 Hour Catch: 11.3mg																

Test Condition Summary:

All testing conditions for all runs fell within allowable specifications of EPA Method 28R, ASTM E2780-10 and ASTM E2515-10. A summary of facility conditions, temperature averages, fuel burned and run times is listed below.

Runs	Ambient (Deg. F)		Barometric Pressure (In. Hg.)	Test Fuel Burned (Lbs.)	Test Fuel Moisture (Dry Basis)	Run Time (Min.)
	Pre	Post				
1C	72	72	30.10	14.1	20.0	340
2	71	70	30.15	14.0	20.4	280
3	69	69	30.08	14.0	20.8	210
4	72	73	30.20	14.4	20.7	110
5	70	71	30.11	14.0	19.7	280

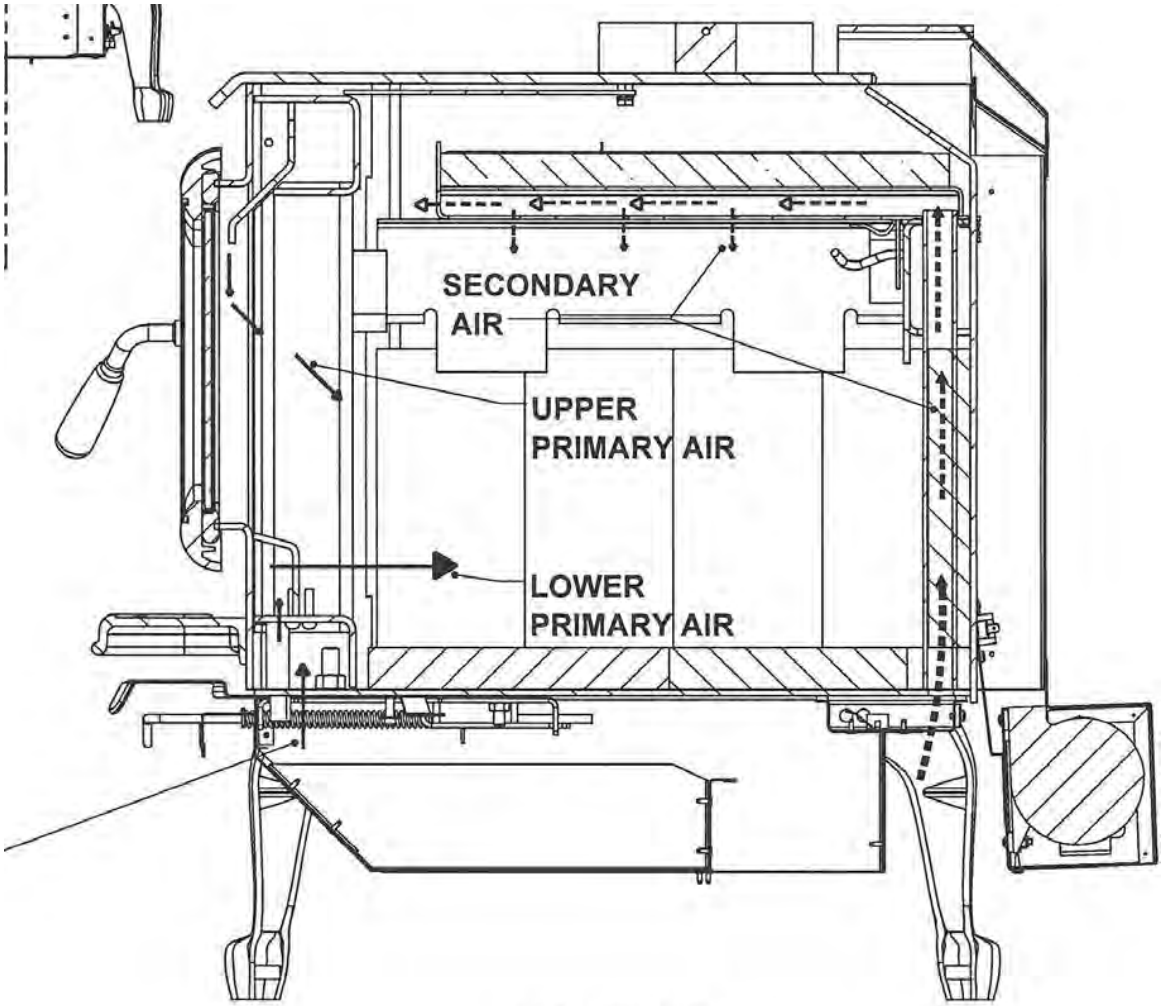
Heater Specifications:

Dimensions, firebox configuration, air supply locations, air introduction locations, and baffle locations of the wood heater are referenced below and on the following page.

Heater Dimensions

Heater Dimensions				
Height	Width	Depth	Firebox Volume	Weight
12.250”	15.125”	16.875”	2.15 ft^3	330 lbs

Air Flow Schematic

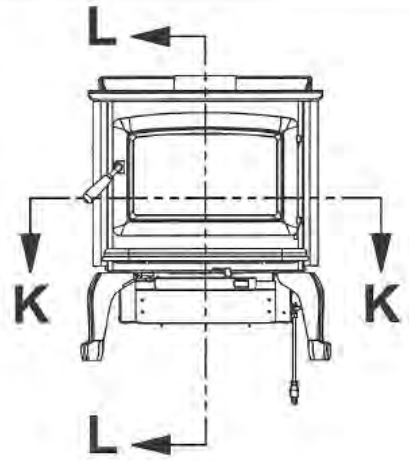


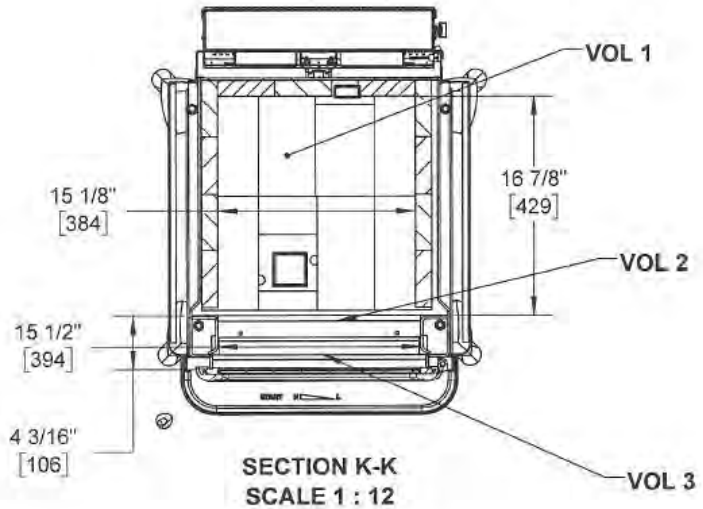
SECTION M-M
SCALE 1 : 6

Firebox Volume:

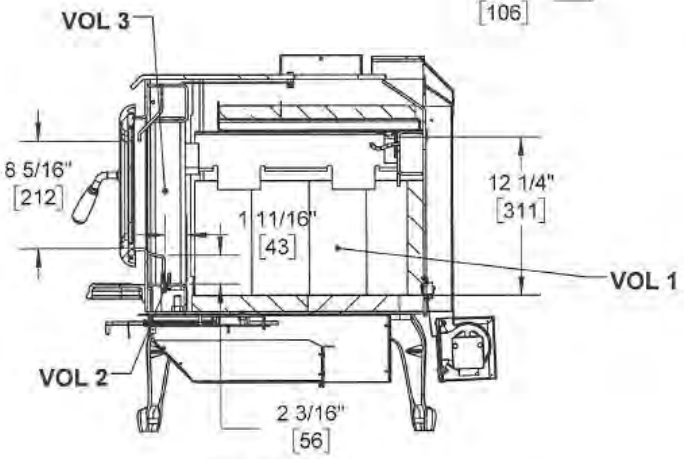
DESCRIPTION:
FIREBOX VOLUME CALCULATION

MODEL: **Super LE**
SERIES: A
DRAWING # SUPLE DWG# 11





SECTION K-K
SCALE 1 : 12



SECTION L-L
SCALE 1 : 12

VOL 1 = 16 7/8" X 15 1/8" X 12 1/4" = 3254.24 in^3
Volume 1 = 1.81 ft^3

VOL 2 = 4 3/16" X 15 1/2" X 12 5/16" = 539.53 in^3
Volume 2 = 0.31 ft^3

VOL 3 = 2 3/16" X 15 1/2" X 12 11/16" = 57.22 in^3
Volume 3 = 0.03 ft^3

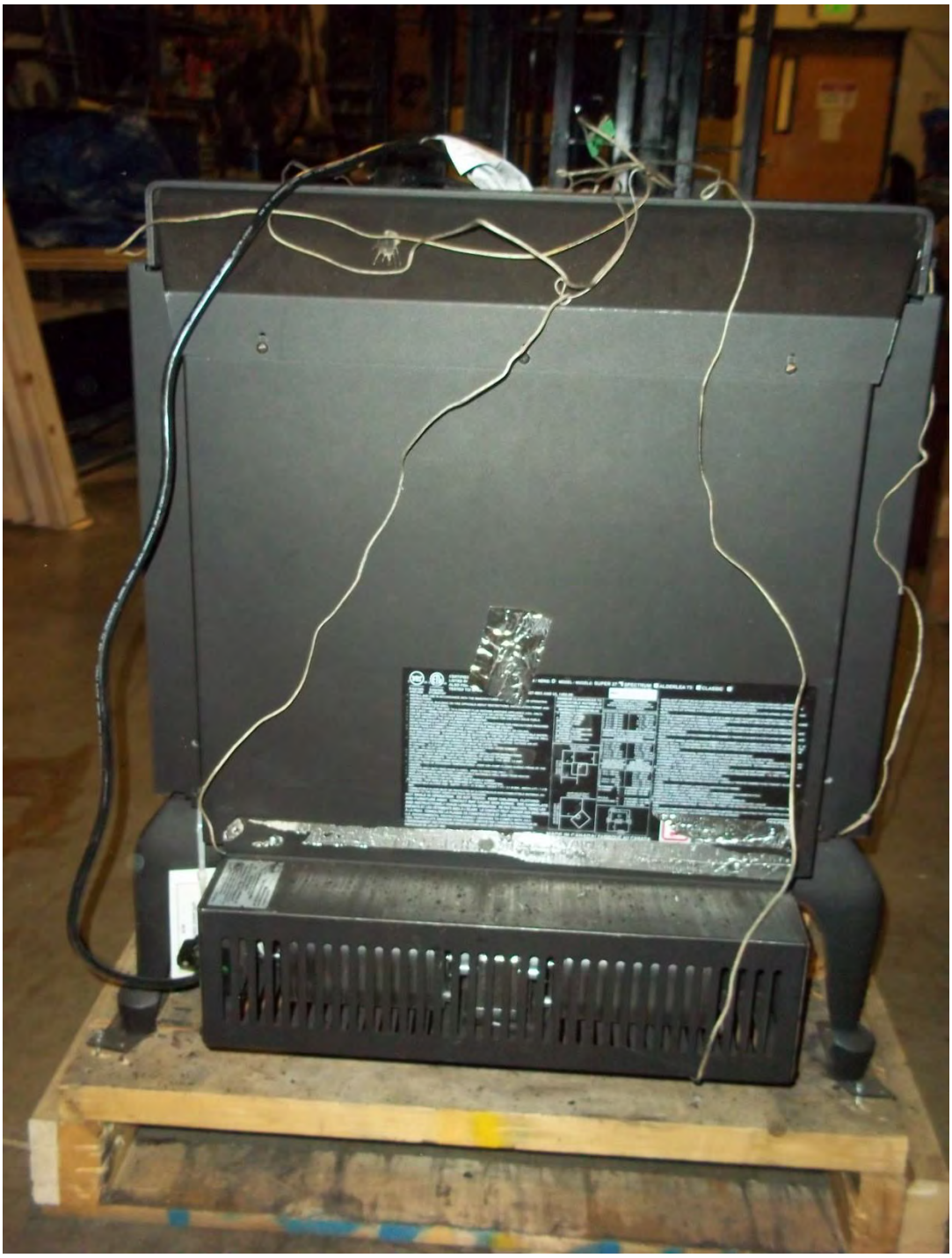
USEABLE FIREBOX VOLUME = VOL1 + VOL2 + VOL 3
USEABLE FIREBOX VOLUME = 2.15 FT^3

Front

Left

Right

Rear



Process Operations and Description:

The appliance was operated according to procedures as described in the Operations Manual. Detailed run information can be found in corresponding digital folders submitted with this report.

Settings & Run Notes

	Run Notes	
	Pre-Burn	**Test Run**
Run 1C	Primary fully closed. Start at 1314	Category II (<1.00 kg/hr). Test start: 1418 - Door open 1 minute 10 seconds, Primary fully open, fan off. Primary set to fully closed at 5 minutes into test. Fan set to high at 1432. Front Filter change at 1518. END test: 1958 – Run time 5 hours, 40 minutes.
Run 2	Primary set to $^{5}/_{16}$". Start at 1248	Category II. Test start: 1354 - Door open 1 minute, Primary fully open, fan off. At 5 mins Primary air set to $^{5}/_{16}$", fan off. Fan set to high at 1409. Front Filter change at 1454. END test: 1834 – Run time 4 hours, 40 minutes.
Run 3	Primary set to 0.400". Start at 1345	Category III: Test start: 1453 – Door open 1 minute, Primary fully open, fan off. At 5 mins Primary set to 0.400", fan off. Fan set to high at 1503. Front filter change at 1553. END Test: 1823 - Run time 3 hours 30 minutes.
Run 4	Primary set to 1 ½". Start at 1246	Category IV: Test start: 1353. Door Open 1 minute, Primary air fully open and left open for entire run. Fan on high. Front filter changed at 1453. END test: 1543 - Run Time: 1 hours 50 minutes.
Run 5	Primary fully closed. Start at 1220	Fan Confirmation - Fan OFF. Category II: Test start: 1348. Door open 1 minute 10 seconds, Primary fully closed and stayed closed, fan off. Fan remained off for entire test. Changed front filter at 1448. END test: 1828 - Run time: 4 hours 40 minutes.

Appliance Description

Model(s): Super LE, Super Heritage, Super Classic , Alderlea T5

Additional Models Discussion: The tested model , Super LE is the base model for this line for stoves which is also offered as models Super Heritage, Super Classic and the Alderlea T5. The difference between the models is limited to style and color. All models use an identical design in all aspects that may affect emissions and are presumed to have the same emission performance as the tested unit provided for certification.

Appliance Type: Residential wood-fired room heater

Firebox Volume: 2.15 Cu.Ft.

Automatic Control:

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 on the right side of the stove which moves back (open) to front (closed). Secondary air is pulled through a fixed opening in to rear bottom of the appliance and channeled into the insulated stainless steel baffle. Dimensions on all these features can be found in Appendix D.

Baffles: Combustion air is routed into the insulated stainless steel baffle from the bottom of the unit

Refractory Insulation: Firebox is lined with 1” firebrick.

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

Catalytic Combustor: N/A

Fan: The Super LE is optionally equipped with a convection blower that attaches to the rear of the appliance.

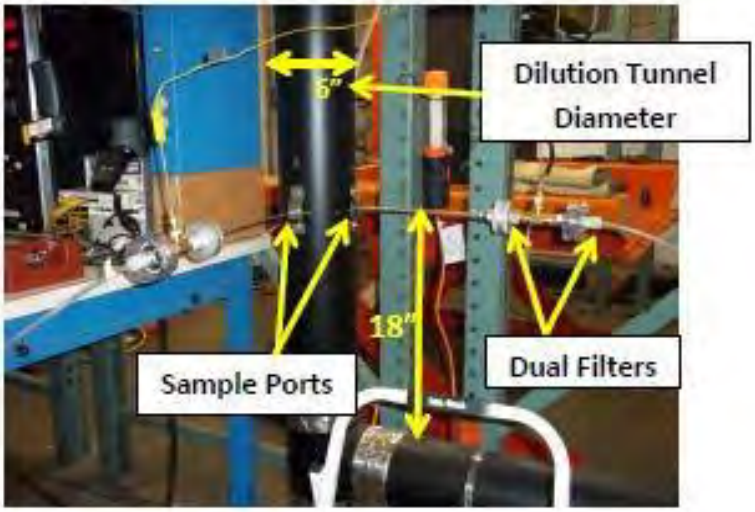
Test Fuel Properties:

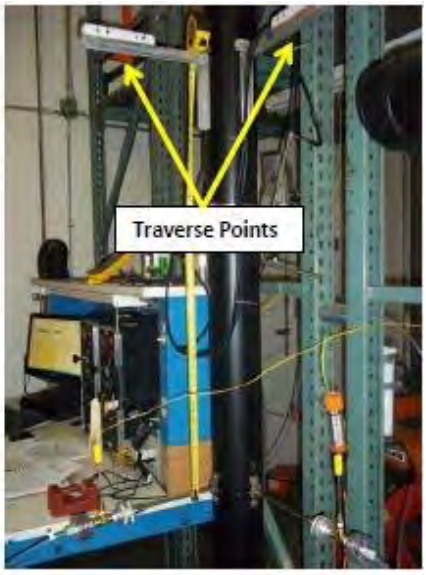
Fuel consisted of 2”x4”x15.5” and 4”x4”x15.5” Green, Douglas fir. Detailed fuel load specifications for each run can be found in the corresponding digital folders submitted with this report.

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:

EPA ASTM E2515-11 was used in collecting particulate samples. The dilution tunnel is 6 inches in diameter. All sampling conditions per ASTM E2515-11 were followed. No alternate procedures were used.

Analytical Methods Description:

All sample recovery and analysis procedures followed EPA ASTM E2515-11 procedures. At the end of each test run, filters and probes were removed from their housings, dessicated for 24 hours, and then weighed at 6 hour intervals to a constant weight per ASTM E2515-11 Section 11.0.

Calibration, Quality Control and Assurances:

Calibration procedures and results were conducted per EPA Method 28R, ASTM E2515-11 and ASTM E2780-10. Test method quality control procedures (leak checks, volume meter checks, stratification checks, proportionality results) followed the procedures outlined.

Appliance Sealing and Storage:

Following securing with metal strapping and the seal below, the appliance was placed into storage at client facilities located at: 2975 Allenby Road, Duncan, BC, Canada, V9L 6V8.

Sealing Label

Sealed Unit


ATTENTION:
THE SEAL IS NOT TO BE BROKEN WITHOUT PRIOR AUTHORIZATION
BY THE UNITED STATES ENVIRONMENTAL PROTECTION AGENCY.
THIS APPLIANCE HAS BEEN SEALED IN ACCORDANCE WITH
THE REQUIREMENTS OF 40 CFR PART 60 SUBPART AAA
DATE SEALED
MODEL #

Sampling and Analytical Procedures

All Sampling and analytical procedures were performed by Ben Nelke. All procedures used are directly from EPA Method 28R, ASTM 2515-11 and ASTM E2780-10. No alternative procedures were used for this test series.

Participants

The following personnel performed all testing:

- Ben Nelke

Analysis and Report Writing

The following people were involved with analysis and report writing:

- Ben Nelke, Doug Towne, Jeremy Clarke

Observers:

The following people were observers during testing:

- Ken Davis

Appliance Updates

No updates to the appliance were made.

Test Equipment Calibration Audit:

- Calibrations for the platform scale and bench scale were performed with Certified Class F weights
- Moisture meter calibration was performed with Delmhorst moisture meter calibrator
- Gas Analyzer calibration performed with certified EPA Protocol gases
- 47mm filters weighed to a constant weight with calibrated analytical balance

All equipment calibration data submitted in separate digital file along with this report.

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)

Accreditations:

CERTIFICATE OF ACCREDITATION

This certifies that:

Oirigo Laboratories, Inc.

Has satisfied the requirements for laboratory accreditation for the certification 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 Air Furnaces.

9q:l!x;r 21 20!5- Qxh;r 21, 2020
EFFECTIVE DATE

MEASUREMENT OLOGY GROUP
GROUPLEADm

Me1lJX!s 28R28 WHI-1.28 WHH-PJS.
All Medm> lisled Γ.Stmn;ro534.ΓOt'il.5476
METHODS
CERTIFICATE NUMBER

4

American Association for Laboratory Accreditation

Accredited Inspection Body

A2LA has accredited

DIRIGO LABORATORIES, INC.

Clackamas, OR

for technical competence as an

Inspection Body

This inspctiun bu<ly is accreditin accordance with the recognized International Standard TSO!lF.C 17020:2012 *Conformity Assessment – Requirements for the operation of various types of bodies performing inspection.* This accreditation demonstrates technical competence for a defined scope and the operotion of n quality mnnngement system.

Presented this 17''day of October 2014.

President & CEO
For the Accreditation Council
Certificate Number 3726.03
Valid to December 31,2016

For the hupections IQ which this a-:creditntion apprie.!, please refor to tlte ()rganiz11tion's Inspection Body Scope of Accreditation.

American Association for Laboratory Accreditation

Accredited Laboratory

A2LA has accredited

DIRIGO LABORATORIES, INC.

Clakamas, ***OR***

for technical competence in the (jeld of

Mechanical Testing

This lnborntory is accredited in accordance with the recognized Intcmational Standard ISOIIEC 17025:2005 *General requirements.for the competence of testing and calibracionlaboracories.* This accreditation demonstrates technical competence for a defined scope and the operntion of a laboratory quality management system *(refer to joint ISO-JLAC-IAF Comm1lnique dated 8 Jamlary 200Y).*

!'resented this 17h dayof 0ctober2014.

for the Accreditation Council
Certificate Number 3726.01
Valid to December31, 2016

For the tests or types of tests 10 wltich this accreditation applies, please rt!;/erco the laboratory's Mec/Jatlical Scope qf Accredltation.

American Association for Laboratory Accreditation

Accredited Product Certification Body

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DIRIGO LABORATORIES, INC.

Clackamas, OR

tor technical competence as a

Product Certification llod y

This proclucl certification body is accredited in accordance with the recognized International Stand m-d ISOllbC 17065:2012 *Conjonnity Assessment – Roquircmcnts jo1· Bodies Certifying Products, Processes a11d Services.* This accreditation demonstrates toclmical competence for a definod scupo mKl the operation ofquality management system.

Preseut ed this 17h day of ɔtuber 2014.

For the Accreditation Council
Cetlificate Nwuber 3726.02
Valid to December 31,2016

F()r tl1product r::,tificatioJ sclle11u:s tQ hich Jl,i,) eu:rerlitutior. applies, please refer to tlrt orgmrlzmtoJt ·s 17odttCt Cert;{JCnlfon Scope of Accredltatwn

DIRIGO LABORATORIES INC.

Client:	Pacific Energy
Model:	Super (Series E)
Tracking No.:	76
Project No.:	034-S-076-1
Test Dates:	2/28/17 - 3/11/17

Run Number	(kg/hr) Burn Rate	% Overall Efficiency
1C	0.94	70.8
2	1.13	71.6
3	1.50	72.7
4	2.95	68.8

Total Runs: 4

CSA B415.1-10 Weighted Average

DIRIGO LABORATORIES INC.

Weighted Average: 71.3 %

Client:	Pacific Energy
Model:	Super (Series E)
Tracking No.:	76
Project No.:	034-S-076-1
Test Dates:	2/28/17 - 3/11/17

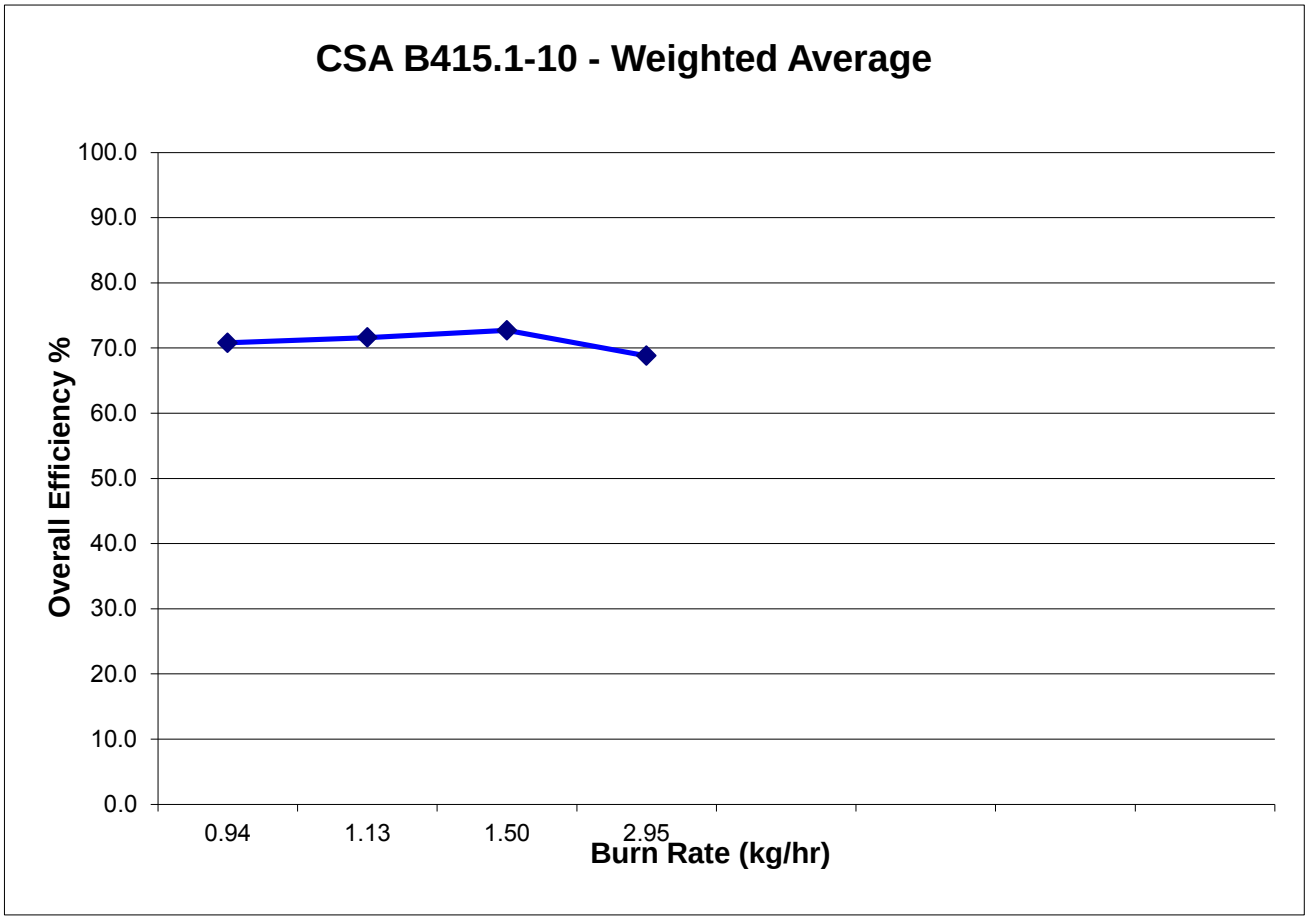
Burn Rate Category	2	Burn Rate Category	2
Burn Rate (kg/hr-dry)	0.94	Burn Rate (kg/hr-dry)	1.13
OA Efficiency %	70.8	OA Efficiency %	71.6
Emissions Rate Cap (g/hr)	15	Emissions Rate Cap (g/hr)	15
Weighting Factor	28.77%	Weighting Factor	25.73%
Run Number	1C	Run Number	2

Burn Rate Category	3	Burn Rate Category	4
Burn Rate (kg/hr-dry)	1.50	Burn Rate (kg/hr-dry)	2.95
OA Efficiency %	72.7	OA Efficiency %	68.8
Emissions Rate Cap (g/hr)	15	Emissions Rate Cap (g/hr)	18
Weighting Factor	30.45%	Weighting Factor	15.05%
Run Number	3	Run Number	4

CSA B415.1-10 - Weighted Average

DIRIGO LABORATORIES INC.

Client: Pacific Energy
Model: Super (Series E)
Tracking No.: 76
Project No.: 034-S-076-1
Test Dates: 2/28/17 - 3/11/17



DIRIGO LABORATORIES INC.

Test No.	Burn Rate	Pi	Ei	Ki	KiEi
1C	0.94	0.322	70.8	0.478	33.84
2	1.13	0.478	71.6	0.428	30.62
3	1.50	0.750	72.7	0.506	36.79
4	2.95	0.984	68.8	0.250	17.20
0	5.00	1.000	0.0	0.000	0.00
0	5.00	1.000	0.0	0.000	0.00
0	5.00	1.000	0.0	0.000	0.00
0	5.00	1.000	0.0	0.000	0.00
		1.000		1.662	118.44

Nomenclature:
Pi = Probability for burn rate during test run
Ei = Emissions Rate for test run
Ki = Test run weighting factor

Burn Rate (kg/hr-dry)	Cum. Probability (P)
0.00	0.0000
0.01	0.0004
0.02	0.0008
0.03	0.0012
0.04	0.0016
0.05	0.0020
0.06	0.0030
0.07	0.0040
0.08	0.0050
0.09	0.0060
0.10	0.0070
0.11	0.0080
0.12	0.0090
0.13	0.0100
0.14	0.0110
0.15	0.0120
0.16	0.0128
0.17	0.0136
0.18	0.0144
0.19	0.0152
0.20	0.0160
0.21	0.0170
0.22	0.0180
0.23	0.0190
0.24	0.0200
0.25	0.0210
0.26	0.0224
0.27	0.0238
0.28	0.0252
0.29	0.0266
0.30	0.0280
0.31	0.0290
0.32	0.0300

VERSION: 2.4 4/15/2010

Manufacturer: Pacific Energy
Model: Super (Series E)
Date: 3/16/2017
Run: 5
Control #: 034-S-076-1
Test Duration: 280
Burn Category 2

Appliance Type: Non-Cat

Temp. Units F
Weight Units lb

Wood Moisture (% DRY):	19.7	
Wood Moisture (% wet):	16.46	
Load Weight (lb wet):	14.00	
Burn Rate (dry kg/h):	1.14	
Total Particulate Emissions:	15.3	g

Fuel Data

	D. Fir
HHV	19,810
%C	48.73
%H	6.87
%O	43.90
%Ash	0.50

Averages		**293.3**	**71.0**	**11.06**	**8.76**
		Temp. (F)			
Elapsed Time (min)	**Fuel Weight Remaining (lb)**	**Flue Gas**	**Room Temp**	**Flue Gas Compositi O2**	**CO2**
0	14.0	229.0	70.0	16.04	3.40
10	13.1	306.0	70.0	15.24	4.89
20	12.5	315.0	70.0	12.20	8.26
30	11.6	331.0	70.0	11.60	8.97
40	10.6	424.0	70.0	5.28	15.52
50	9.0	480.0	71.0	4.85	15.86
60	7.7	490.0	71.0	4.45	16.13
70	6.2	490.0	71.0	4.38	16.24
80	4.7	486.0	71.0	4.25	15.95
90	3.6	447.0	72.0	6.02	14.33
100	3.1	379.0	72.0	9.83	10.75
110	2.6	339.0	72.0	10.10	10.26
120	2.4	321.0	72.0	10.14	9.94
130	2.1	284.0	72.0	11.74	7.99
140	1.9	260.0	72.0	11.95	7.62
150	1.7	246.0	72.0	12.33	7.04
160	1.6	235.0	71.0	12.30	6.90
170	1.4	227.0	71.0	12.52	6.45
180	1.3	218.0	71.0	12.99	6.00
190	1.2	213.0	71.0	12.95	6.18
200	1.0	208.0	71.0	12.75	6.53
210	0.9	205.0	71.0	12.82	6.54
220	0.8	203.0	71.0	12.80	6.58
230	0.6	202.0	71.0	12.73	6.59
240	0.5	199.0	71.0	13.55	6.08
250	0.4	196.0	71.0	13.59	5.89
260	0.3	194.0	70.0	13.47	6.03
270	0.2	191.0	71.0	13.72	5.74
280	0.0	189.0	71.0	14.06	5.32

(Cat, Non-Cat, Pellet)

(F or C)
(kg or lb)

kJ/kg

Dougla
Oak

1.53

on (%)

CO
1.42
0.84
0.73
0.83
0.92
0.93
1.51
1.90
1.96
0.75
0.26
0.59
0.66
1.26
1.58
1.83
2.07
2.46
2.37
2.27
2.06
2.02
1.99
2.11
1.72
1.71
1.73
1.87
1.97

Manufacturer:	Pacific Energy
Model:	Super (Series E)
Date:	3/16/2017
Run:	5
Control #:	034-S-076-1
Test Duration:	280 min

	HHV	LHV
Eff	71.4%	77.2%
Comb Eff	91.3%	91.3%
HT Eff	78.3%	84.6%
Output	16,088	kJ/h
Burn Rate	1.14	kg/h
Grams CO	640	g
Input	22,527	kJ/h
MC wet	16.46	

Overall Heating Efficiency:
Combustion Efficiency:
Heat Transfer Efficiency:

Heat Output: 15,261
Heat Input: 21,369

Ultimate CO2
CO2-ult 19.64
F_0
1.062

Burn Duration: 4.666666667
Burn Rate: 2.5
Stack Temp: 295.6

Averages	1.53	8.76	112.7%	20.26	10.74	145.2	21.7	86.4%	79.3%

INPUT DATA				Oxygen Calculation			Input Data		Combust	Heat
Elapsed Time	**Weight Remaining (kg)**	**% CO [e]**	**% CO2 [d]**	**Excess Air EA**	**Total O2**	**Calc. % O2 [g]**	**Flue Gas (ºC)**	**Room Temp (ºC)**	**Eff %**	**Transfer %**
0	6.35	1.42	3.40	307.5%	20.62	16.51	109.4	21.1	76.8%	73.0%
10	5.94	0.84	4.89	242.8%	20.56	15.25	152.2	21.1	88.5%	72.3%
20	5.67	0.73	8.26	118.5%	20.35	11.72	157.2	21.1	93.5%	78.4%
30	5.26	0.83	8.97	100.4%	20.29	10.91	166.1	21.1	93.2%	78.4%
40	4.81	0.92	15.52	19.5%	19.85	3.87	217.8	21.1	95.3%	80.0%
50	4.08	0.93	15.86	17.0%	19.83	3.51	248.9	21.7	95.4%	78.6%
60	3.49	1.51	16.13	11.4%	19.78	2.89	254.4	21.7	92.9%	78.3%
70	2.81	1.90	16.24	8.3%	19.74	2.55	254.4	21.7	91.3%	78.3%
80	2.13	1.96	15.95	9.7%	19.76	2.83	252.2	21.7	90.9%	78.2%
90	1.63	0.75	14.33	30.3%	19.94	5.24	230.6	22.2	95.9%	78.8%
100	1.41	0.26	10.75	78.4%	20.21	9.33	192.8	22.2	98.2%	78.5%
110	1.18	0.59	10.26	81.0%	20.22	9.67	170.6	22.2	95.7%	79.5%
120	1.09	0.66	9.94	85.3%	20.24	9.97	160.6	22.2	95.0%	79.9%
130	0.95	1.26	7.99	112.4%	20.33	11.71	140.0	22.2	89.0%	79.3%
140	0.86	1.58	7.62	113.5%	20.33	11.92	126.7	22.2	86.1%	79.9%

150	0.77	1.83	7.04	121.5%	20.35	12.40	118.9	22.2	83.3%	79.8%
160	0.73	2.07	6.90	119.0%	20.35	12.41	112.8	21.7	81.4%	80.0%
170	0.64	2.46	6.45	120.5%	20.35	12.67	108.3	21.7	77.8%	79.7%
180	0.59	2.37	6.00	134.7%	20.39	13.20	103.3	21.7	77.3%	79.6%
190	0.54	2.27	6.18	132.5%	20.38	13.07	100.6	21.7	78.4%	80.2%
200	0.45	2.06	6.53	128.7%	20.37	12.81	97.8	21.7	80.7%	81.0%
210	0.41	2.02	6.54	129.5%	20.37	12.82	96.1	21.7	81.0%	81.2%
220	0.36	1.99	6.58	129.2%	20.37	12.80	95.0	21.7	81.3%	81.4%
230	0.27	2.11	6.59	125.8%	20.37	12.72	94.4	21.7	80.5%	81.4%
240	0.23	1.72	6.08	151.8%	20.42	13.48	92.8	21.7	82.3%	81.2%
250	0.18	1.71	5.89	158.5%	20.44	13.69	91.1	21.7	81.9%	81.1%
260	0.14	1.73	6.03	153.1%	20.43	13.53	90.0	21.1	82.1%	81.3%
270	0.09	1.87	5.74	158.1%	20.44	13.76	88.3	21.7	80.3%	81.1%
280	0.00	1.97	5.32	169.5%	20.46	14.15	87.2	21.7	78.4%	80.6%
0										

	Air Fuel Ratio (A/F)		
71.4%	Dry Molecular Weight (Md)	29.83	
91.3%	Dry Moles Exhaust Gas (Nr):	366.18	%HC
78.3%	Air Fuel Ratio (A/F)	10.41	1.32

Combustion Efficiency:	91.3%
Total Input (kJ):	105,125
Total Output (kJ):	75,075
Efficiency:	71.4%
Total CO (g):	640.03

Btu/h	16,088	kJ/h
Btu/h	22,527	kJ/h
h		
lb/h	1.1	kg/h
Deg. F	146.5	Deg. C

68.5%	12.4	1.83	71.18	0.05	71.18	105876	4.06	6.87	2.74	19810.00	16.46
Net Eff %	**Air Fuel Ratio**	**Wet Wt Now Wt**	**% Wet Consumed x**	**Dry Wt. Now Wtdn**	**% Dry Comsumed y**	**Fuel Properties**					**Mw Moisture Fuel Burnt**
						Total Input	**Carbon /12= [a]**	**Hydrogen /1= [b]**	**Oxygen /16= [c]**	**Calorific Value**	
56.1%	23.4	6.35	0.00	5.31	0.00	0	4.06	6.87	2.74	19810.00	16.46
64.0%	20.2	5.94	6.43	4.97	6.43	9011	4.06	6.87	2.74	19810.00	16.46
73.3%	13.0	5.67	10.71	4.74	10.71	5632	4.06	6.87	2.74	19810.00	16.46
73.1%	11.9	5.26	17.14	4.40	17.14	7133	4.06	6.87	2.74	19810.00	16.46
76.3%	7.2	4.81	24.29	4.02	24.29	9762	4.06	6.87	2.74	19810.00	16.46
75.0%	7.0	4.08	35.71	3.41	35.71	10888	4.06	6.87	2.74	19810.00	16.46
72.7%	6.6	3.49	45.00	2.92	45.00	10513	4.06	6.87	2.74	19810.00	16.46
71.5%	6.4	2.81	55.71	2.35	55.71	11263	4.06	6.87	2.74	19810.00	16.46
71.1%	6.5	2.13	66.43	1.78	66.43	9762	4.06	6.87	2.74	19810.00	16.46
75.5%	7.8	1.63	74.29	1.36	74.29	6007	4.06	6.87	2.74	19810.00	16.46
77.2%	10.8	1.41	77.86	1.18	77.86	3754	4.06	6.87	2.74	19810.00	16.46
76.1%	10.8	1.18	81.43	0.99	81.43	2628	4.06	6.87	2.74	19810.00	16.46
75.9%	11.1	1.09	82.86	0.91	82.86	1877	4.06	6.87	2.74	19810.00	16.46
70.6%	12.5	0.95	85.00	0.80	85.00	1877	4.06	6.87	2.74	19810.00	16.46
68.8%	12.5	0.86	86.43	0.72	86.43	1502	4.06	6.87	2.74	19810.00	16.46

66.5%	12.9	0.77	87.86	0.64	87.86	1126	4.06	6.87	2.74	19810.00	16.46
65.1%	12.7	0.73	88.57	0.61	88.57	1126	4.06	6.87	2.74	19810.00	16.46
62.0%	12.6	0.64	90.00	0.53	90.00	1126	4.06	6.87	2.74	19810.00	16.46
61.5%	13.4	0.59	90.71	0.49	90.71	751	4.06	6.87	2.74	19810.00	16.46
62.9%	13.3	0.54	91.43	0.45	91.43	1126	4.06	6.87	2.74	19810.00	16.46
65.3%	13.2	0.45	92.86	0.38	92.86	1126	4.06	6.87	2.74	19810.00	16.46
65.8%	13.3	0.41	93.57	0.34	93.57	751	4.06	6.87	2.74	19810.00	16.46
66.1%	13.2	0.36	94.29	0.30	94.29	1126	4.06	6.87	2.74	19810.00	16.46
65.5%	13.0	0.27	95.71	0.23	95.71	1126	4.06	6.87	2.74	19810.00	16.46
66.8%	14.6	0.23	96.43	0.19	96.43	751	4.06	6.87	2.74	19810.00	16.46
66.5%	15.0	0.18	97.14	0.15	97.14	751	4.06	6.87	2.74	19810.00	16.46
66.8%	14.7	0.14	97.86	0.11	97.86	751	4.06	6.87	2.74	19810.00	16.46
65.1%	14.9	0.09	98.57	0.08	98.57	1877	4.06	6.87	2.74	19810.00	16.46
63.2%	15.5	0.00	100.00	0.00	100.00	751	4.06	6.87	2.74	19810.00	16.46
				0.00							

				Moisture Content MCwb:	16.46
		Moisture of Wood (wet basis):	16.46	Dry kg :	5.31
99,706	(Btu)	Initial Dry Weight Wtdo (kg):	5.31	CA:	48.73
71,205	(Btu)	Moisture Content Dry	19.70	HY:	6.87
				OX:	43.90

Load Weight (kg):	6.35					
Fuel Heating:	HHV	LHV		HHV	LHV	
Value in kJ/kg - CV:	19810.00	18328.69	Btu/lb	8522.48	7885.21	

78.98	20.95	2.58	8.46	0.21	0.26	33.19	51.11	6.73	0.90	340.19	32.73
Mass Balance (moles/100 mole dry flue gas)					**kg Wood per 100 mole dfp**	**Moles per kg of Dry Wood**					
[h]	**[u]**	**[w]**	**[j]**	**[k]**	**Nk**	**CO2**	**O2**	**CO**	**HC**	**N2**	**H2O**
78.67	20.87	1.23	3.87	0.18	0.12	27.75	134.77	11.59	1.47	642.07	31.58
79.02	20.96	1.44	4.73	0.10	0.14	34.24	106.81	5.88	0.69	553.36	33.15
79.29	21.03	2.24	7.50	0.09	0.22	37.14	52.70	3.28	0.39	356.48	33.74
79.29	21.03	2.44	8.17	0.10	0.24	36.97	44.95	3.42	0.43	326.77	33.67
79.69	21.14	4.08	13.76	0.13	0.41	38.23	9.54	2.27	0.31	196.29	33.89
79.70	21.14	4.17	14.05	0.13	0.41	38.26	8.46	2.24	0.31	192.25	33.90
79.47	21.08	4.40	14.67	0.22	0.44	36.87	6.61	3.45	0.49	181.64	33.54
79.31	21.04	4.53	15.03	0.27	0.45	36.00	5.66	4.21	0.60	175.79	33.31
79.26	21.02	4.48	14.83	0.28	0.45	35.78	6.34	4.40	0.63	177.83	33.26
79.68	21.14	3.74	12.64	0.10	0.37	38.52	14.09	2.02	0.27	214.21	33.98
79.66	21.13	2.72	9.29	0.02	0.27	39.77	34.52	0.96	0.08	294.66	34.35
79.48	21.08	2.69	9.10	0.07	0.27	38.34	36.13	2.20	0.26	297.04	34.00
79.43	21.07	2.63	8.87	0.08	0.26	37.98	38.10	2.52	0.31	303.53	33.91
79.04	20.97	2.32	7.63	0.16	0.23	34.64	50.76	5.46	0.71	342.63	33.09
78.88	20.92	2.32	7.54	0.21	0.23	33.04	51.70	6.85	0.92	342.06	32.69

78.73	20.88	2.25	7.22	0.25	0.22	31.52	55.51	8.19	1.10	352.45	32.31
78.62	20.85	2.28	7.26	0.28	0.23	30.44	54.76	9.13	1.24	346.80	32.04
78.42	20.80	2.28	7.15	0.34	0.23	28.46	55.92	10.86	1.49	346.06	31.54
78.43	20.80	2.14	6.71	0.32	0.21	28.17	61.97	11.13	1.52	368.15	31.48
78.48	20.82	2.16	6.79	0.31	0.21	28.79	60.88	10.58	1.44	365.65	31.64
78.60	20.85	2.18	6.94	0.28	0.22	30.05	58.96	9.48	1.29	361.65	31.95
78.62	20.85	2.18	6.92	0.27	0.22	30.21	59.25	9.33	1.27	363.20	31.99
78.63	20.86	2.18	6.94	0.27	0.22	30.38	59.09	9.19	1.24	363.04	32.03
78.58	20.84	2.21	7.03	0.29	0.22	29.93	57.77	9.58	1.30	356.85	31.91
78.72	20.88	1.98	6.33	0.23	0.20	30.91	68.55	8.74	1.16	400.12	32.19
78.71	20.88	1.93	6.17	0.23	0.19	30.71	71.40	8.92	1.18	410.39	32.15
78.71	20.88	1.97	6.30	0.23	0.20	30.80	69.12	8.84	1.18	402.01	32.17
78.63	20.86	1.94	6.15	0.25	0.19	29.80	71.46	9.71	1.30	408.24	31.92
78.56	20.84	1.86	5.86	0.26	0.19	28.74	76.46	10.64	1.43	424.40	31.67

10.94	418.34	4973.52	3718.99	3610.56	3571.77	4840.21	4318.74	294.84	5010.29	4353.12	55769.38
	Stack	**Heat Content Change - Ambient to Stack Temperature**						**Room**			**Energ**
Moisture	**Temp**	**Flue Gas Constituent**						**Temp**			
Present	**K**	**CO2**	**O2**	**CO**	**N2**	**CH4**	**H2O**	**K**	**CO2**	**O2**	**CO**
10.94	382.59	3476.31	2634.79	2566.72	2537.31	3305.69	3072.94	294.26	96.47	355.08	3309.22
10.94	425.37	5241.13	3936.00	3825.43	3783.46	5063.61	4577.08	294.26	179.48	420.39	1687.20
10.94	430.37	5450.87	4089.17	3973.22	3929.85	5275.77	4753.57	294.26	202.43	215.50	941.84
10.94	439.26	5825.53	4362.01	4236.30	4190.49	5656.40	5067.68	294.26	215.34	196.08	982.46
10.94	490.93	8048.63	5962.02	5774.24	5715.15	7956.40	6902.37	294.26	307.71	56.90	654.43
10.94	522.04	9403.46	6920.70	6691.51	6625.40	9394.04	7995.28	294.82	359.74	58.53	649.83
10.94	527.59	9652.12	7095.73	6858.74	6791.40	9659.93	8194.45	294.82	355.86	46.88	1000.40
10.94	527.59	9652.12	7095.73	6858.74	6791.40	9659.93	8194.45	294.82	347.44	40.14	1220.68
10.94	525.37	9552.55	7025.68	6791.83	6724.98	9553.37	8114.76	294.82	341.83	44.57	1274.28
10.94	503.71	8568.05	6328.72	6124.88	6063.15	8509.41	7320.08	295.37	330.08	89.14	582.95
10.94	465.93	6920.95	5152.12	4996.19	4943.73	6785.96	5974.34	295.37	275.22	177.87	276.98
10.94	443.71	5971.40	4466.00	4335.99	4289.38	5809.50	5186.53	295.37	228.97	161.37	633.55
10.94	433.71	5548.78	4158.69	4039.81	3995.92	5379.12	4832.93	295.37	210.76	158.44	723.92
10.94	413.15	4689.15	3529.84	3432.73	3394.64	4512.02	4107.89	295.37	162.41	179.17	1564.45
10.94	399.82	4138.11	3123.97	3040.22	3006.02	3962.23	3638.87	295.37	136.74	161.52	1959.85

10.94	392.04	3819.05	2887.95	2811.72	2779.84	3646.12	3365.75	295.37	120.36	160.30	2341.37
10.94	385.93	3590.76	2719.24	2648.43	2618.20	3419.57	3170.59	294.82	109.30	148.90	2608.31
10.94	381.48	3410.02	2584.86	2518.16	2489.29	3241.97	3014.83	294.82	97.06	144.55	3099.51
10.94	376.48	3207.36	2433.90	2371.73	2344.41	3043.50	2839.73	294.82	90.34	150.84	3174.75
10.94	373.71	3095.09	2350.13	2290.45	2263.99	2933.85	2742.52	294.82	89.12	143.07	3017.15
10.94	370.93	2983.05	2266.43	2209.21	2183.61	2824.62	2645.35	294.82	89.63	133.62	2703.37
10.94	369.26	2915.92	2216.24	2160.48	2135.41	2759.30	2587.07	294.82	88.10	131.31	2661.18
10.94	368.15	2871.22	2182.79	2128.01	2103.29	2715.83	2548.22	294.82	87.23	128.99	2619.67
10.94	367.59	2848.88	2166.07	2111.77	2087.23	2694.12	2528.80	294.82	85.26	125.13	2731.86
10.94	365.93	2781.92	2115.94	2063.08	2039.06	2629.11	2470.55	294.82	85.98	145.04	2492.23
10.94	364.26	2715.04	2065.82	2014.40	1990.91	2564.25	2412.32	294.82	83.38	147.50	2541.18
10.94	363.15	2691.66	2048.78	1997.97	1974.63	2540.52	2392.69	294.26	82.90	141.61	2518.26
10.94	361.48	2603.76	1982.36	1933.31	1910.70	2456.49	2315.30	294.82	77.60	141.65	2766.43
10.94	360.37	2559.30	1948.99	1900.88	1878.63	2413.51	2276.50	294.82	73.56	149.03	3032.09

SUMS				AVERAGE	SUMS					
31463.71	23288.81	45871.72	15326.11	6244.25	30050	9188	20861.42	75826	9188	640.03
y Losses (kJ/kg of Dry Fuel)				**Total**						
Flue Gas Constituent				**Loss**	**Total**	**Chemical**	**Sensible and**	**Total**	**Chem**	**Grams Pr**
N2	**CH4**	**H2O Comb**	**H2O Fuel MC**	**Rate**	**Loss**	**Loss 1**	**Latent Loss**	**Output**	**Loss 2**	**CO**
1629.14	1315.71	1485.46	514.85	8705.93	0	0	0.00	0	0	0.00
2093.61	613.80	1609.37	531.31	7135.16	3245	1035	2210.67	5765	1035	74.92
1400.91	352.47	1643.67	533.25	5290.06	1504	364	1140.23	4128	364	26.13
1369.31	381.86	1651.07	536.68	5332.80	1920	485	1435.12	5213	485	34.49
1121.84	282.90	1724.16	556.76	4704.71	2318	454	1864.11	7443	454	31.27
1273.75	281.91	1761.37	568.72	4953.86	2723	502	2220.50	8165	502	34.52
1233.62	443.14	1749.44	570.90	5400.24	2866	751	2114.78	7647	751	51.28
1193.84	544.20	1737.72	570.90	5654.92	3215	984	2231.52	8048	984	67.05
1195.89	567.52	1732.36	570.03	5726.48	2822	890	1931.91	6940	890	60.67
1298.81	243.77	1742.81	561.33	4848.90	1470	246	1224.12	4537	246	17.12
1456.74	75.93	1715.72	546.61	4525.07	858	66	791.74	2897	66	5.10
1274.12	235.89	1671.09	537.98	4742.99	629	114	515.36	1999	114	8.19
1212.87	274.34	1654.87	534.11	4769.32	452	93	358.48	1425	93	6.69
1163.12	639.26	1591.04	526.18	5825.63	552	207	345.30	1325	207	14.49
1028.24	818.65	1556.37	521.05	6182.43	469	209	259.90	1033	209	14.54

979.75	987.53	1529.52	518.06	6636.88	377	188	189.62	749	188	13.04
908.00	1110.69	1510.19	515.92	6911.31	393	210	183.12	733	210	14.54
861.44	1333.39	1481.76	514.22	7531.93	428	250	178.03	698	250	17.28
863.10	1359.45	1473.47	512.30	7624.25	289	171	118.30	462	171	11.81
827.83	1289.35	1477.73	511.24	7355.49	418	243	174.98	708	243	16.84
789.71	1149.14	1489.28	510.17	6864.91	390	218	172.67	736	218	15.09
775.59	1129.58	1489.45	509.53	6784.75	257	143	114.38	494	143	9.90
763.58	1110.95	1490.14	509.11	6709.67	381	211	170.68	745	211	14.63
744.82	1164.11	1483.98	508.90	6844.05	389	220	168.97	737	220	15.25
815.86	1039.35	1495.09	508.26	6581.80	249	133	116.42	501	133	9.28
817.05	1057.72	1491.30	507.62	6645.75	252	136	116.29	499	136	9.46
793.82	1050.57	1491.41	507.41	6585.98	250	134	115.15	501	134	9.38
780.03	1160.70	1477.48	506.56	6910.46	655	370	284.79	1222	370	25.76
797.29	1274.92	1464.40	506.14	7297.43	277	162	114.25	474	162	11.30

48.88

oduced HC
0.00
4.99
1.79
2.46
2.48
2.76
4.18
5.50
4.97
1.32
0.26
0.56
0.46
1.08
1.11

1.01
1.13
1.36
0.92
1.31
1.17
0.77
1.13
1.19
0.71
0.72
0.71
1.97
0.87

Dirigo Laboratories, Inc.

Manufacturer:	**Pacific Energy**
Model:	**Super (Series E)**
Date:	**3/16/2017**
Run:	**5**
Control #:	**034-S-076-1**
Test Duration:	**280**
Output Category:	**2**

	HHV Basis	LHV Basis
Overall Efficiency	71.4%	77.2%
Combustion Efficiency	91.3%	91.3%
Heat Transfer Efficiency	78.3%	84.6%

HHV Output Rate (kJ/h)	16,088	15,261	**(Btu/h)**
Burn Rate (kg/h)	1.14	2.51	**(lb/h)**
Input (kJ/h)	22,527	21,369	**(Btu/h)**

Test Load Weight (dry kg)	5.3	11.7	**dry lb**
MC wet (%)	16.46		
MC dry (%)	19.70		
Particulate (g)	15.30		
CO (g)	640		
Test Duration (h)	4.666666667		

Emissions	Particulate	CO
g/MJ Output	0.20	8.53
g/kg Dry Fuel	2.88	120.61
g/h	3.28	137.15
lb/MM Btu Output	0.47	19.81

Air/Fuel Ratio (A/F)	10.41

Test Results in Accordance with CSA B415.1-10

VERSION: 2.4 **4/15/2010**

lanufacturer: Pacific Energy
Model: Super (Series E)
Date: 3/16/2017
Run: 4
Control #: 034-S-076-1
est Duration: 110
urn Category 4

Appliance Type: Non-Cat (Cat, Non-Cat, Pe
Temp. Units F (F or C)
Weight Units lb (kg or lb)

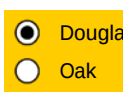
Wood Moisture (% DRY): 20.7
Wood Moisture (% wet): 17.15
Load Weight (lb wet): 14.40
Burn Rate (dry kg/h): 2.95
Total Particulate Emissions: 2.55 g

Fuel Data

	D. Fir	
HHV	19,810	kJ/kg
%C	48.73	
%H	6.87	
%O	43.90	
%Ash	0.50	

Averages		**609.8**	**73.3**	**10.09**	**10.44**	**0.27**
		Temp. (F)				
Elapsed Time (min)	**Fuel Weight Remaining (lb)**	**Flue Gas**	**Room Temp**	**Flue Gas Composition (%) O2**	**CO2**	**CO**
0	14.4	390.0	72.0	16.39	3.76	0.65
10	12.2	768.0	73.0	4.20	16.73	0.22
20	9.4	813.0	73.0	4.36	16.61	0.04
30	6.7	816.0	73.0	4.51	16.18	0.05
40	4.6	765.0	74.0	5.76	14.89	0.07
50	3.0	721.0	74.0	7.80	12.74	0.04
60	2.0	636.0	74.0	10.64	9.92	0.04
70	1.3	565.0	74.0	12.10	8.42	0.11
80	0.9	513.0	74.0	12.87	7.56	0.31
90	0.6	467.0	73.0	13.77	6.63	0.47
100	0.2	444.0	73.0	14.05	6.30	0.58
110	0.0	419.0	73.0	14.68	5.57	0.67

ellet)



Manufacturer:	Pacific Energy
Model:	Super (Series E)
Date:	3/16/2017
Run:	4
Control #:	034-S-076-1
Test Duration:	110 min

	HHV	LHV
Eff	68.8%	74.4%
Comb Eff	99.2%	99.2%
HT Eff	69.4%	75.0%
Output	40,245	kJ/h
Burn Rate	2.95	kg/h
Grams CO	71	g
Input	58,491	kJ/h
MC wet	17.15	

Overall Heating Efficiency:
Combustion Efficiency:
Heat Transfer Efficiency:

Heat Output: 38,177
Heat Input: 55,485

Ultimate CO2
CO2-ult 19.64
F_0
1.062

Burn Duration: 1.833333333
Burn Rate: 6.5
Stack Temp: 629.7

Averages	0.27	10.44	119.9%	20.23	9.65	321.0	23.0	97.0%	67.8%

INPUT DATA				Oxygen Calculation			Input Data		Combust	Heat
Elapsed Time	**Weight Remaining (kg)**	**% CO [e]**	**% CO2 [d]**	**Excess Air EA**	**Total O2**	**Calc. % O2 [g]**	**Flue Gas (ºC)**	**Room Temp (ºC)**	**Eff %**	**Transfer %**
0	6.53	0.65	3.76	345.4%	20.65	16.56	198.9	22.2	88.7%	60.0%
10	5.54	0.22	16.73	15.9%	19.82	2.98	408.9	22.8	98.9%	71.3%
20	4.26	0.04	16.61	18.0%	19.84	3.21	433.9	22.8	99.9%	70.0%
30	3.04	0.05	16.18	21.0%	19.87	3.66	435.6	22.8	99.8%	69.5%
40	2.09	0.07	14.89	31.3%	19.95	5.03	407.2	23.3	99.7%	69.7%
50	1.36	0.04	12.74	53.7%	20.10	7.34	382.8	23.3	99.9%	68.5%
60	0.91	0.04	9.92	97.2%	20.28	10.34	335.6	23.3	100.0%	67.2%
70	0.59	0.11	8.42	130.3%	20.38	11.90	296.1	23.3	99.3%	67.2%
80	0.41	0.31	7.56	149.6%	20.42	12.71	267.2	23.3	97.1%	67.6%
90	0.27	0.47	6.63	176.7%	20.47	13.61	241.7	22.8	95.0%	67.5%
100	0.09	0.58	6.30	185.5%	20.49	13.90	228.9	22.8	93.5%	67.8%
110	0.00	0.67	5.57	214.8%	20.53	14.62	215.0	22.8	91.7%	66.9%
0										

	Air Fuel Ratio (A/F)	
68.8%	Dry Molecular Weight (Md)	30.06
99.2%	Dry Moles Exhaust Gas (Nr):	353.19
69.4%	Air Fuel Ratio (A/F)	10.11

%HC 1.32

Combustion Efficiency: 99.2%
Total Input (kJ): 107,233
Total Output (kJ): 73,783
Efficiency: 68.8%
Total CO (g): 70.74

Btu/h 40,245 kJ/h
Btu/h 58,491 kJ/h

h

lb/h 3.0 kg/h

Deg. F 332.1 Deg. C

65.8%	13.2	2.09	68.00	0.02	68.00	107978	4.06	6.87	2.74	19810.00	17.15
Net Eff %	**Air Fuel Ratio**	**Wet Wt Now Wt**	**% Wet Consumed x**	**Dry Wt. Now Wtdn**	**% Dry Comsumed y**	**Fuel Properties**					**Mw Moisture Fuel Burnt**
						Total Input	**Carbon /12= [a]**	**Hydrogen /1= [b]**	**Oxygen /16= [c]**	**Calorific Value**	
53.3%	26.3	6.53	0.00	5.41	0.00	0	4.06	6.87	2.74	19810.00	17.15
70.5%	7.0	5.54	15.28	4.59	15.28	26808	4.06	6.87	2.74	19810.00	17.15
69.9%	7.2	4.26	34.72	3.53	34.72	20479	4.06	6.87	2.74	19810.00	17.15
69.3%	7.3	3.04	53.47	2.52	53.47	17872	4.06	6.87	2.74	19810.00	17.15
69.5%	8.0	2.09	68.06	1.73	68.06	13776	4.06	6.87	2.74	19810.00	17.15
68.5%	9.3	1.36	79.17	1.13	79.17	9681	4.06	6.87	2.74	19810.00	17.15
67.2%	11.9	0.91	86.11	0.75	86.11	6330	4.06	6.87	2.74	19810.00	17.15
66.7%	13.9	0.59	90.97	0.49	90.97	4096	4.06	6.87	2.74	19810.00	17.15
65.7%	15.0	0.41	93.75	0.34	93.75	2606	4.06	6.87	2.74	19810.00	17.15
64.1%	16.5	0.27	95.83	0.23	95.83	2606	4.06	6.87	2.74	19810.00	17.15
63.4%	17.0	0.09	98.61	0.08	98.61	2979	4.06	6.87	2.74	19810.00	17.15
61.4%	18.7	0.00	100.00	0.00	100.00	745	4.06	6.87	2.74	19810.00	17.15
				0.00							

				Moisture Content MCwb:	17.15
		Moisture of Wood (wet basis):	17.15	Dry kg :	5.41
101,705	(Btu)	Initial Dry Weight Wtdo (kg):	5.41	CA:	48.73
69,979	(Btu)	Moisture Content Dry	20.70	HY:	6.87
				OX:	43.90

Load Weight (kg):	6.53					
Fuel Heating:	HHV	LHV		HHV	LHV	
Value in kJ/kg - CV:	19810.00	18328.69	Btu/lb	8522.48	7885.21	

79.63	21.12	2.64	9.03	0.02	0.26	39.01	52.61	1.64	0.15	361.04	34.21
Mass Balance (moles/100 mole dry flue gas)					**kg Wood per 100 mole dfp**	**Moles per kg of Dry Wood**					
[h]	**[u]**	**[w]**	**[j]**	**[k]**	**Nk**	**CO2**	**O2**	**CO**	**HC**	**N2**	**H2O**
79.03	20.96	1.10	3.65	0.07	0.11	34.27	150.96	5.92	0.62	720.23	33.28
80.07	21.24	4.18	14.31	0.03	0.42	40.22	7.17	0.53	0.07	192.48	34.39
80.14	21.26	4.10	14.08	0.00	0.41	40.71	7.87	0.10	0.00	196.43	34.52
80.11	21.25	4.00	13.73	0.00	0.40	40.68	9.21	0.13	0.00	201.42	34.52
80.01	21.22	3.68	12.65	0.00	0.37	40.62	13.71	0.19	0.01	218.25	34.51
79.88	21.19	3.15	10.82	-0.01	0.31	40.70	23.44	0.13	-0.02	255.22	34.56
79.70	21.14	2.45	8.44	-0.01	0.24	40.69	42.43	0.16	-0.04	326.93	34.61
79.57	21.11	2.10	7.22	0.00	0.21	40.30	56.97	0.53	-0.01	380.84	34.55
79.42	21.07	1.94	6.63	0.02	0.19	39.08	65.68	1.60	0.13	410.59	34.27
79.29	21.03	1.76	5.95	0.05	0.18	37.86	77.70	2.68	0.27	452.83	33.99
79.22	21.01	1.71	5.75	0.06	0.17	37.04	81.69	3.41	0.37	465.75	33.79
79.14	20.99	1.55	5.19	0.07	0.15	36.00	94.52	4.33	0.48	511.51	33.56

11.50	594.12	12758.15	9208.68	8858.24	8780.34	13141.69	10569.64	296.11	6060.54	4493.18	5701.09
Moisture	**Stack Temp**	**Heat Content Change - Ambient to Stack Temperature Flue Gas Constituent**						**Room Temp**	**Energ**		
Present	**K**	**CO2**	**O2**	**CO**	**N2**	**CH4**	**H2O**	**K**	**CO2**	**O2**	**CO**
11.50	472.04	7184.58	5341.58	5178.23	5124.21	7059.34	6191.48	295.37	246.20	806.36	1706.79
11.50	682.04	16880.98	12040.04	11544.84	11451.17	17704.76	13763.40	295.93	678.92	86.28	155.77
11.50	707.04	18123.02	12865.87	12321.13	12224.47	19138.89	14683.84	295.93	737.84	101.25	28.95
11.50	708.71	18206.47	12921.12	12373.00	12276.16	19235.75	14745.33	295.93	740.70	119.02	37.13
11.50	680.37	16777.64	11968.83	11477.20	11383.94	17590.92	13682.97	296.48	681.44	164.13	56.23
11.50	655.93	15581.90	11167.17	10721.78	10631.82	16224.79	12786.65	296.48	634.24	261.74	37.54
11.50	608.71	13321.04	9633.73	9271.92	9189.35	13680.42	11064.78	296.48	542.07	408.71	47.96
11.50	569.26	11482.12	8368.24	8070.43	7995.06	11650.84	9636.25	296.48	462.74	476.70	153.24
11.50	540.37	10163.92	7450.28	7195.99	7126.49	10219.67	8595.63	296.48	397.23	489.34	465.05
11.50	514.82	9039.19	6660.87	6442.36	6378.27	9012.06	7698.24	295.93	342.24	517.56	776.86
11.50	502.04	8473.33	6260.18	6058.91	5997.77	8412.23	7241.34	295.93	313.83	511.40	985.60
11.50	488.15	7863.64	5826.32	5643.15	5585.33	7770.62	6745.77	295.93	283.11	550.69	1249.98

SUMS				AVERAGE	SUMS					
33480.56	1668.87	22404.33	7526.39	6777.91	33450	889	32560.95	74527	889	70.74
y Losses (kJ/kg of Dry Fuel)				**Total**						
Flue Gas Constituent				**Loss**	**Total**	**Chemical**	**Sensible and**	**Total**	**Chem**	**Grams Pr**
N2	**CH4**	**H2O Comb**	**H2O Fuel MC**	**Rate**	**Loss**	**Loss 1**	**Latent Loss**	**Output**	**Loss 2**	**CO**
3690.59	556.86	1669.41	576.85	9253.06	0	0	0.00	0	0	0.00
2204.14	59.52	1985.50	663.93	5834.06	7895	282	7613.53	18913	282	20.04
2401.25	1.48	2024.66	674.51	5969.94	6171	30	6141.22	14307	30	2.84
2472.68	3.19	2026.56	675.22	6074.50	5480	35	5445.36	12392	35	3.18
2484.57	5.24	1989.63	663.00	6044.23	4203	41	4162.18	9573	41	3.72
2713.51	-17.29	1961.52	652.70	6243.95	3051	9	3041.92	6629	9	1.75
3004.24	-40.07	1904.79	632.89	6500.59	2077	2	2074.85	4253	2	1.47
3044.83	-13.44	1852.19	616.47	6592.73	1363	28	1334.98	2733	28	3.05
2926.07	115.19	1801.22	604.50	6798.59	894	75	819.82	1712	75	5.90
2888.24	239.39	1756.18	594.18	7114.65	936	131	804.94	1670	131	9.89
2793.47	328.52	1730.47	588.92	7252.21	1090	194	896.44	1888	194	14.36
2856.98	430.29	1702.20	583.22	7656.48	288	62	225.71	457	62	4.56

3.13

oduced HC
0.00
1.42
0.03
0.05
0.06
-0.15
-0.23
-0.05
0.27
0.56
0.88
0.29

Dirigo Laboratories, Inc.

Manufacturer:	**Pacific Energy**
Model:	**Super (Series E)**
Date:	**3/16/2017**
Run:	**4**
Control #:	**034-S-076-1**
Test Duration:	**110**
Output Category:	**4**

	HHV Basis	LHV Basis	
Overall Efficiency	68.8%	74.4%	
Combustion Efficiency	99.2%	99.2%	
Heat Transfer Efficiency	69.4%	75.0%	
HHV Output Rate (kJ/h)	40,245	38,177	**(Btu/h)**
Burn Rate (kg/h)	2.95	6.51	**(lb/h)**
Input (kJ/h)	58,491	55,485	**(Btu/h)**
Test Load Weight (dry kg)	5.4	11.9	**dry lb**
MC wet (%)	17.15		
MC dry (%)	20.70		
Particulate (g)	2.55		
CO (g)	71		
Test Duration (h)	1.833333333		

Emissions	**Particulate**	**CO**
g/MJ Output	0.03	0.96
g/kg Dry Fuel	0.47	13.07
g/h	1.39	38.59
lb/MM Btu Output	0.08	2.23

Air/Fuel Ratio (A/F)	10.11

Test Results in Accordance with CSA B415.1-10

VERSION: 2.4 **4/15/2010**

lanufacturer: Pacific Energy
Model: Super (Series E)
Date: 3/16/2017
Run: 3
Control #: 034-S-076-1
est Duration: 210
urn Category 3

Appliance Type: Non-Cat (Cat, Non-Cat, Pe
Temp. Units F (F or C)
Weight Units lb (kg or lb)

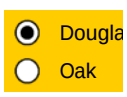
Wood Moisture (% DRY): 20.8
Wood Moisture (% wet): 17.22
Load Weight (lb wet): 14.00
Burn Rate (dry kg/h): 1.50
Total Particulate Emissions: 6.66 g

Fuel Data

	D. Fir	
HHV	19,810	kJ/kg
%C	48.73	
%H	6.87	
%O	43.90	
%Ash	0.50	

Averages	**323.0**	**69.7**	**10.09**	**9.95**	**1.14**	
	Temp. (F)					
Elapsed Time (min)	**Fuel Weight Remaining (lb)**	**Flue Gas**	**Room Temp**	**Flue Gas Composition (%) O2**	**CO2**	**CO**
0	14.0	264.0	69.0	17.27	3.21	0.60
10	12.3	497.0	69.0	6.70	14.04	0.31
20	10.3	538.0	70.0	3.09	17.16	1.88
30	8.3	538.0	70.0	2.74	17.37	2.55
40	6.5	515.0	70.0	4.25	16.19	1.26
50	5.1	496.0	70.0	4.77	15.51	1.65
60	3.9	454.0	70.0	6.89	13.55	0.77
70	3.0	402.0	70.0	8.25	12.14	0.55
80	2.4	377.0	70.0	8.45	11.44	0.40
90	2.0	326.0	71.0	10.23	9.73	0.63
100	1.7	282.0	70.0	11.60	8.40	0.74
110	1.6	261.0	70.0	11.66	8.43	0.81
120	1.3	248.0	70.0	11.69	8.40	0.92
130	1.3	239.0	70.0	11.65	8.45	0.94
140	1.0	232.0	69.0	12.06	7.82	1.11
150	0.8	225.0	70.0	12.24	7.57	1.23
160	0.7	218.0	70.0	12.24	7.57	1.31
170	0.5	210.0	70.0	12.93	6.82	1.36
180	0.4	203.0	69.0	13.15	6.43	1.52
190	0.2	197.0	69.0	13.41	6.17	1.59
200	0.1	194.0	69.0	13.26	6.38	1.57
210	0.0	191.0	69.0	13.51	6.19	1.48

ellet)



Manufacturer:	Pacific Energy
Model:	Super (Series E)
Date:	3/16/2017
Run:	3
Control #:	034-S-076-1
Test Duration:	210 min

	HHV	LHV
Eff	72.7%	78.6%
Comb Eff	93.4%	93.4%
HT Eff	77.9%	84.2%
Output	21,651	kJ/h
Burn Rate	1.50	kg/h
Grams CO	477	g
Input	29,762	kJ/h
MC wet	17.22	

Overall Heating Efficiency:
Combustion Efficiency:
Heat Transfer Efficiency:

Heat Output: 20,539
Heat Input: 28,233

Ultimate CO2
CO2-ult 19.64
F_0
1.062

Burn Duration: 3.5
Burn Rate: 3.3
Stack Temp: 325.9

Averages	1.14	9.95	103.8%	20.21	9.68	161.7	21.0	90.9%	79.3%

INPUT DATA				Oxygen Calculation			Input Data		Combust	Heat
Elapsed Time	**Weight Remaining (kg)**	**% CO [e]**	**% CO2 [d]**	**Excess Air EA**	**Total O2**	**Calc. % O2 [g]**	**Flue Gas (ºC)**	**Room Temp (ºC)**	**Eff %**	**Transfer %**
0	6.35	0.60	3.21	415.6%	20.69	17.18	128.9	20.6	88.1%	68.5%
10	5.58	0.31	14.04	36.9%	19.99	5.80	258.3	20.6	98.3%	76.9%
20	4.67	1.88	17.16	3.2%	19.68	1.58	281.1	21.1	91.7%	77.3%
30	3.77	2.55	17.37	-1.4%	19.62	0.98	281.1	21.1	89.3%	77.3%
40	2.95	1.26	16.19	12.6%	19.79	2.97	268.3	21.1	94.0%	77.6%
50	2.31	1.65	15.51	14.5%	19.81	3.47	257.8	21.1	92.0%	77.6%
60	1.77	0.77	13.55	37.2%	19.99	6.06	234.4	21.1	95.6%	77.8%
70	1.36	0.55	12.14	54.8%	20.10	7.69	205.6	21.1	96.5%	78.5%
80	1.09	0.40	11.44	65.9%	20.16	8.52	191.7	21.1	97.3%	78.9%
90	0.91	0.63	9.73	89.6%	20.26	10.21	163.3	21.7	95.2%	79.3%
100	0.77	0.74	8.40	114.9%	20.34	11.57	138.9	21.1	93.6%	79.8%
110	0.73	0.81	8.43	112.6%	20.33	11.49	127.2	21.1	93.0%	80.8%
120	0.59	0.92	8.40	110.8%	20.32	11.46	120.0	21.1	92.1%	81.3%
130	0.59	0.94	8.45	109.2%	20.32	11.40	115.0	21.1	91.9%	81.7%
140	0.45	1.11	7.82	120.0%	20.35	11.98	111.1	20.6	90.0%	81.4%

150	0.36	1.23	7.57	123.2%	20.36	12.17	107.2	21.1	88.7%	81.4%
160	0.32	1.31	7.57	121.2%	20.35	12.13	103.3	21.1	88.1%	81.7%
170	0.23	1.36	6.82	140.1%	20.40	12.90	98.9	21.1	86.6%	81.4%
180	0.18	1.52	6.43	147.1%	20.42	13.23	95.0	20.6	84.6%	81.2%
190	0.09	1.59	6.17	153.1%	20.43	13.46	91.7	20.6	83.5%	81.2%
200	0.05	1.57	6.38	147.1%	20.42	13.25	90.0	20.6	84.1%	81.6%
210	0.00	1.48	6.19	156.1%	20.43	13.50	88.3	20.6	84.5%	81.6%

	Air Fuel Ratio (A/F)		
72.7%	Dry Molecular Weight (Md)	29.98	
93.4%	Dry Moles Exhaust Gas (Nr):	342.25	%HC
77.9%	Air Fuel Ratio (A/F)	9.75	1.32

Combustion Efficiency:	93.4%
Total Input (kJ):	104,168
Total Output (kJ):	75,780
Efficiency:	72.7%
Total CO (g):	477.28

Btu/h	21,651	kJ/h
Btu/h	29,762	kJ/h

h

lb/h	1.5	kg/h

Deg. F	163.3	Deg. C

72.0%	12.0	1.60	74.87	0.03	74.87	104540	4.06	6.87	2.74	19810.00	17.22
Net Eff %	**Air Fuel Ratio**	**Wet Wt Now Wt**	**% Wet Consumed x**	**Dry Wt. Now Wtdn**	**% Dry Comsumed y**	**Fuel Properties**					**Mw Moisture Fuel Burnt**
						Total Input	**Carbon /12= [a]**	**Hydrogen /1= [b]**	**Oxygen /16= [c]**	**Calorific Value**	
60.4%	30.4	6.35	0.00	5.26	0.00	0	4.06	6.87	2.74	19810.00	17.22
75.6%	8.3	5.58	12.14	4.62	12.14	20090	4.06	6.87	2.74	19810.00	17.22
70.9%	6.1	4.67	26.43	3.87	26.43	14881	4.06	6.87	2.74	19810.00	17.22
69.0%	5.8	3.77	40.71	3.12	40.71	14137	4.06	6.87	2.74	19810.00	17.22
72.9%	6.7	2.95	53.57	2.44	53.57	11905	4.06	6.87	2.74	19810.00	17.22
71.4%	6.8	2.31	63.57	1.92	63.57	9673	4.06	6.87	2.74	19810.00	17.22
74.4%	8.2	1.77	72.14	1.46	72.14	7813	4.06	6.87	2.74	19810.00	17.22
75.8%	9.3	1.36	78.57	1.13	78.57	5580	4.06	6.87	2.74	19810.00	17.22
76.8%	10.0	1.09	82.86	0.90	82.86	3720	4.06	6.87	2.74	19810.00	17.22
75.5%	11.3	0.91	85.71	0.75	85.71	2604	4.06	6.87	2.74	19810.00	17.22
74.7%	12.8	0.77	87.86	0.64	87.86	1488	4.06	6.87	2.74	19810.00	17.22
75.1%	12.6	0.73	88.57	0.60	88.57	1488	4.06	6.87	2.74	19810.00	17.22
74.8%	12.5	0.59	90.71	0.49	90.71	1116	4.06	6.87	2.74	19810.00	17.22
75.1%	12.4	0.59	90.71	0.49	90.71	1116	4.06	6.87	2.74	19810.00	17.22
73.2%	13.0	0.45	92.86	0.38	92.86	1860	4.06	6.87	2.74	19810.00	17.22

72.3%	13.1	0.36	94.29	0.30	94.29	1116	4.06	6.87	2.74	19810.00	17.22
72.0%	13.0	0.32	95.00	0.26	95.00	1116	4.06	6.87	2.74	19810.00	17.22
70.5%	14.1	0.23	96.43	0.19	96.43	1116	4.06	6.87	2.74	19810.00	17.22
68.7%	14.4	0.18	97.14	0.15	97.14	1116	4.06	6.87	2.74	19810.00	17.22
67.8%	14.7	0.09	98.57	0.08	98.57	1116	4.06	6.87	2.74	19810.00	17.22
68.6%	14.4	0.05	99.29	0.04	99.29	1116	4.06	6.87	2.74	19810.00	17.22
69.0%	14.9	0.00	100.00	0.00	100.00	372	4.06	6.87	2.74	19810.00	17.22

				Moisture Content MCwb:	17.22
		Moisture of Wood (wet basis):	17.22	Dry kg :	5.26
98,798	(Btu)	Initial Dry Weight Wtdo (kg):	5.26	CA:	48.73
71,874	(Btu)	Moisture Content Dry	20.80	HY:	6.87
				OX:	43.90

Load Weight (kg):	6.35					
Fuel Heating:	HHV	LHV		HHV	LHV	
Value in kJ/kg - CV:	19810.00	18328.69	Btu/lb	8522.48	7885.21	

79.22	21.01	2.77	9.21	0.15	0.28	35.67	46.70	4.55	0.59	329.99	33.35
Mass Balance (moles/100 mole dry flue gas)					**kg Wood per 100 mole dfp**	**Moles per kg of Dry Wood**					
[h]	**[u]**	**[w]**	**[j]**	**[k]**	**Nk**	**CO2**	**O2**	**CO**	**HC**	**N2**	**H2O**
79.01	20.96	0.95	3.15	0.06	0.09	33.85	181.17	6.33	0.63	833.28	33.26
79.85	21.18	3.54	12.10	0.04	0.35	39.83	16.45	0.88	0.10	226.54	34.32
79.38	21.05	4.76	15.79	0.27	0.47	36.27	3.35	3.97	0.57	167.75	33.38
79.10	20.98	5.00	16.42	0.37	0.50	34.94	1.97	5.13	0.74	159.11	33.03
79.58	21.11	4.34	14.55	0.18	0.43	37.48	6.87	2.92	0.41	184.24	33.69
79.37	21.05	4.28	14.24	0.23	0.43	36.39	8.15	3.87	0.55	186.22	33.42
79.62	21.12	3.55	11.99	0.10	0.35	38.34	17.15	2.18	0.29	225.31	33.94
79.62	21.12	3.14	10.66	0.07	0.31	38.84	24.59	1.76	0.22	254.71	34.09
79.64	21.13	2.93	9.96	0.04	0.29	39.29	29.25	1.37	0.15	273.49	34.22
79.43	21.07	2.57	8.68	0.08	0.26	38.05	39.93	2.46	0.29	310.64	33.93
79.29	21.03	2.27	7.63	0.09	0.23	37.15	51.15	3.27	0.39	350.64	33.73
79.27	21.03	2.30	7.70	0.10	0.23	36.84	50.23	3.54	0.44	346.38	33.65
79.22	21.01	2.32	7.75	0.12	0.23	36.33	49.59	3.98	0.50	342.63	33.52
79.21	21.01	2.34	7.81	0.12	0.23	36.27	48.93	4.03	0.51	339.98	33.50
79.09	20.98	2.23	7.39	0.14	0.22	35.18	53.87	4.99	0.64	355.80	33.24

79.03	20.96	2.21	7.26	0.16	0.22	34.48	55.45	5.60	0.73	359.97	33.07
78.99	20.95	2.23	7.31	0.17	0.22	34.13	54.69	5.91	0.77	356.17	32.98
78.92	20.93	2.06	6.71	0.18	0.20	33.30	62.99	6.64	0.87	385.39	32.79
78.82	20.91	2.01	6.49	0.20	0.20	32.20	66.22	7.61	1.00	394.71	32.52
78.78	20.90	1.96	6.32	0.21	0.20	31.59	68.94	8.14	1.08	403.39	32.37
78.80	20.90	2.01	6.49	0.21	0.20	31.92	66.29	7.85	1.04	394.24	32.45
78.83	20.91	1.94	6.26	0.19	0.19	32.12	70.08	7.68	1.01	409.09	32.51

11.56	434.84	5714.63	4252.42	4123.31	4080.10	5606.85	4930.43	294.11	4585.52	3190.55	28686.14
Moisture	**Stack Temp**	**Heat Content Change - Ambient to Stack Temperature Flue Gas Constituent**						**Room Temp**	**Energ**		
Present	**K**	**CO2**	**O2**	**CO**	**N2**	**CH4**	**H2O**	**K**	**CO2**	**O2**	**CO**
11.56	402.04	4293.07	3240.56	3153.59	3118.14	4111.45	3774.54	293.71	145.34	587.09	1810.45
11.56	531.48	9869.02	7251.12	7007.91	6939.33	9885.92	8372.34	293.71	393.09	119.26	255.05
11.56	554.26	10879.33	7956.09	7679.84	7606.67	10979.70	9172.09	294.26	394.54	26.61	1154.88
11.56	554.26	10879.33	7956.09	7679.84	7606.67	10979.70	9172.09	294.26	380.11	15.68	1490.91
11.56	541.48	10298.86	7550.87	7293.57	7223.04	10351.65	8712.33	294.26	386.01	51.88	846.77
11.56	530.93	9822.91	7217.23	6975.17	6906.90	9839.72	8333.22	294.26	357.45	58.79	1122.54
11.56	507.59	8782.27	6483.27	6273.54	6210.51	8730.23	7497.45	294.26	336.74	111.17	630.29
11.56	478.71	7515.75	5581.35	5409.07	5352.98	7398.82	6466.98	294.26	291.88	137.25	507.43
11.56	464.82	6915.45	5150.41	4995.13	4942.55	6775.35	5973.26	294.26	271.68	150.66	395.59
11.56	436.48	5687.05	4260.32	4138.03	4093.18	5517.55	4950.29	294.82	216.41	170.13	707.46
11.56	412.04	4685.36	3528.66	3432.00	3393.83	4504.69	4107.14	294.26	174.04	180.48	937.28
11.56	400.37	4203.29	3173.56	3088.57	3053.81	4023.81	3696.77	294.26	154.84	159.41	1012.60
11.56	393.15	3906.85	2954.34	2876.36	2843.75	3729.94	3443.13	294.26	141.95	146.50	1137.56
11.56	388.15	3702.50	2802.85	2729.61	2698.51	3528.20	3267.70	294.26	134.28	137.14	1152.77
11.56	384.26	3565.22	2701.53	2631.57	2601.45	3391.67	3150.54	293.71	125.42	145.53	1426.20

11.56	380.37	3386.08	2567.65	2501.61	2472.88	3217.17	2995.09	294.26	116.76	142.39	1599.56
11.56	376.48	3228.52	2450.25	2387.74	2360.21	3062.93	2858.92	294.26	110.20	134.00	1685.66
11.56	372.04	3048.99	2316.25	2257.71	2231.56	2887.69	2703.40	294.26	101.54	145.91	1894.44
11.56	368.15	2913.53	2215.49	2160.02	2134.90	2754.66	2586.59	293.71	93.81	146.72	2170.40
11.56	364.82	2779.63	2115.22	2062.64	2038.57	2624.68	2470.10	293.71	87.82	145.82	2320.89
11.56	363.15	2712.81	2065.13	2013.97	1990.43	2559.93	2411.88	293.71	86.59	136.90	2238.66
11.56	361.48	2646.06	2015.06	1965.32	1942.31	2495.33	2353.67	293.71	85.00	141.22	2188.72

SUMS				AVERAGE	SUMS					
25559.93	11583.54	35890.84	12431.42	5542.18	28388	6901	21486.32	76152	6901	477.28
y Losses (kJ/kg of Dry Fuel)				**Total**						
Flue Gas Constituent				**Loss**	**Total**	**Chemical**	**Sensible and**	**Total**	**Chem**	**Grams Pr**
N2	**CH4**	**H2O Comb**	**H2O Fuel MC**	**Rate**	**Loss**	**Loss 1**	**Latent Loss**	**Output**	**Loss 2**	**CO**
2598.29	564.21	1587.99	551.71	7845.07	0	0	0.00	0	0	0.00
1572.03	91.57	1796.31	604.84	4832.15	4900	344	4556.10	15189	344	24.97
1276.05	517.05	1773.59	614.08	5756.81	4324	1228	3096.18	10557	1228	83.57
1210.26	670.90	1755.44	614.08	6137.38	4380	1509	2871.05	9757	1509	102.49
1330.77	372.95	1775.06	608.77	5372.21	3228	718	2510.82	8676	718	49.08
1286.17	496.08	1747.95	604.39	5673.38	2770	775	1995.67	6903	775	52.93
1399.28	260.71	1746.90	594.73	5079.82	2003	345	1658.36	5809	345	24.06
1363.48	194.69	1719.30	582.82	4796.86	1351	195	1156.61	4229	195	13.88
1351.76	137.38	1708.84	577.12	4593.02	863	99	763.95	2858	99	7.22
1271.52	264.14	1659.97	565.29	4854.93	638	126	512.05	1966	126	9.07
1190.02	353.13	1621.76	555.55	5012.26	377	96	280.56	1112	96	6.88
1057.76	389.10	1604.06	550.81	4928.59	370	104	265.89	1118	104	7.44
974.36	447.19	1589.35	547.88	4984.79	281	89	192.31	835	89	6.28
917.43	455.24	1582.61	545.85	4925.34	277	90	187.62	839	90	6.36
925.61	572.94	1566.26	544.50	5306.46	498	186	311.99	1362	186	13.13

890.17	649.92	1552.99	542.70	5494.49	310	126	183.74	807	126	8.84
840.63	690.48	1544.22	541.13	5546.32	312	133	179.53	804	133	9.32
860.03	774.04	1530.35	539.33	5845.65	329	149	179.99	787	149	10.48
842.67	895.55	1513.83	537.98	6200.97	349	172	177.71	767	172	12.01
822.35	960.56	1503.27	536.63	6377.34	359	184	175.53	757	184	12.84
784.71	926.93	1504.87	535.96	6214.62	350	177	172.82	766	177	12.39
794.58	898.79	1505.90	535.29	6149.50	115	58	57.83	257	58	4.04

37.34

oduced HC
0.00
1.65
6.90
8.50
3.98
4.31
1.83
0.98
0.46
0.62
0.47
0.52
0.45
0.46
0.96

0.66
0.70
0.78
0.90
0.97
0.94
0.30

Dirigo Laboratories, Inc.

Manufacturer:	**Pacific Energy**
Model:	**Super (Series E)**
Date:	**3/16/2017**
Run:	**3**
Control #:	**034-S-076-1**
Test Duration:	**210**
Output Category:	**3**

	HHV Basis	LHV Basis
Overall Efficiency	72.7%	78.6%
Combustion Efficiency	93.4%	93.4%
Heat Transfer Efficiency	77.9%	84.2%

HHV Output Rate (kJ/h)	21,651	20,539	**(Btu/h)**
Burn Rate (kg/h)	1.50	3.31	**(lb/h)**
Input (kJ/h)	29,762	28,233	**(Btu/h)**

Test Load Weight (dry kg)	5.3	11.6	**dry lb**
MC wet (%)	17.22		
MC dry (%)	20.80		
Particulate (g)	6.66		
CO (g)	477		
Test Duration (h)	3.5		

Emissions	Particulate	CO
g/MJ Output	0.09	6.30
g/kg Dry Fuel	1.27	90.77
g/h	1.90	136.37
lb/MM Btu Output	0.20	14.64

Air/Fuel Ratio (A/F)	9.75

Test Results in Accordance with CSA B415.1-10

VERSION: 2.4 4/15/2010

lanufacturer: Pacific Energy
Model: Super (Series E)
Date: 3/16/2017
Run: 2
Control #: 034-S-076-1
est Duration: 280
urn Category 2

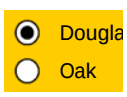
Appliance Type: Non-Cat (Cat, Non-Cat, Pe
Temp. Units F (F or C)
Weight Units lb (kg or lb)

Wood Moisture (% DRY): 20.4
Wood Moisture (% wet): 16.94
Load Weight (lb wet): 14.00
Burn Rate (dry kg/h): 1.13
Total Particulate Emissions: 5.67 g

Fuel Data	D. Fir	
HHV	19,810	kJ/kg
%C	48.73	
%H	6.87	
%O	43.90	
%Ash	0.50	

Averages	254.3	70.9	10.57	9.04	1.85	
	Temp. (F)					
Elapsed Time (min)	Fuel Weight Remaining (lb)	Flue Gas	Room Temp	Flue Gas Composition (%) O2	CO2	CO
0	14.0	228.0	71.0	16.56	3.80	1.02
10	12.4	446.0	71.0	8.57	12.00	0.76
20	10.7	490.0	71.0	3.58	16.51	2.06
30	8.8	481.0	71.0	3.66	16.37	2.57
40	7.2	471.0	72.0	4.10	16.06	2.00
50	5.8	458.0	71.0	4.63	15.59	2.14
60	4.5	422.0	72.0	5.91	14.57	0.71
70	3.7	369.0	72.0	7.92	12.43	0.56
80	3.1	336.0	72.0	8.29	11.84	0.72
90	2.6	307.0	72.0	9.32	10.93	0.72
100	2.3	277.0	71.0	10.68	9.12	1.40
110	2.1	239.0	71.0	11.13	8.53	1.36
120	1.9	220.0	71.0	11.23	8.20	1.86
130	1.8	207.0	71.0	11.42	7.78	2.28
140	1.5	198.0	71.0	11.73	7.13	2.75
150	1.5	189.0	71.0	12.06	6.81	2.75
160	1.3	181.0	71.0	12.39	6.90	2.07
170	1.2	174.0	71.0	12.50	6.78	1.95
180	1.1	169.0	71.0	12.43	6.85	2.05
190	1.0	163.0	70.0	12.53	6.57	2.33
200	0.9	159.0	71.0	12.52	6.61	2.31
210	0.7	156.0	70.0	12.61	6.49	2.31
220	0.7	154.0	70.0	12.70	6.44	2.24
230	0.5	152.0	70.0	12.86	6.44	2.05
240	0.4	151.0	71.0	12.83	6.49	2.04
250	0.3	148.0	71.0	13.11	6.16	2.16
260	0.2	146.0	70.0	13.13	6.06	2.22
270	0.1	144.0	70.0	13.33	5.85	2.40
280	0.0	141.0	70.0	12.89	6.88	1.83

ellet)



Manufacturer:	Pacific Energy
Model:	Super (Series E)
Date:	3/16/2017
Run:	2
Control #:	034-S-076-1
Test Duration:	280 min

	HHV	LHV
Eff	71.6%	77.4%
Comb Eff	90.5%	90.5%
HT Eff	79.1%	85.5%
Output	16,034	kJ/h
Burn Rate	1.13	kg/h
Grams CO	682	g
Input	22,396	kJ/h
MC wet	16.94	

Overall Heating Efficiency:
Combustion Efficiency:
Heat Transfer Efficiency:

Heat Output: 15,210
Heat Input: 21,245

Ultimate CO2
CO2-ult 19.64
F_0
1.062

Burn Duration: 4.666666667
Burn Rate: 2.5
Stack Temp: 255.3

Averages	1.85	9.04	97.6%	20.22	10.26	123.5	21.6	84.8%	81.4%

INPUT DATA				Oxygen Calculation			Input Data		Combust	Heat
Elapsed Time	**Weight Remaining (kg)**	**% CO [e]**	**% CO2 [d]**	**Excess Air EA**	**Total O2**	**Calc. % O2 [g]**	**Flue Gas (ºC)**	**Room Temp (ºC)**	**Eff %**	**Transfer %**
0	6.35	1.02	3.80	307.5%	20.62	16.31	108.9	21.7	83.4%	74.7%
10	5.63	0.76	12.00	53.9%	20.10	7.72	230.0	21.7	95.2%	76.9%
20	4.85	2.06	16.51	5.8%	19.71	2.17	254.4	21.7	90.7%	78.3%
30	3.99	2.57	16.37	3.7%	19.69	2.03	249.4	21.7	88.7%	78.3%
40	3.27	2.00	16.06	8.8%	19.75	2.69	243.9	22.2	90.8%	78.6%
50	2.63	2.14	15.59	10.8%	19.77	3.11	236.7	21.7	90.0%	78.6%
60	2.04	0.71	14.57	28.6%	19.93	5.01	216.7	22.2	96.2%	79.5%
70	1.68	0.56	12.43	51.2%	20.08	7.37	187.2	22.2	96.5%	80.0%
80	1.41	0.72	11.84	56.4%	20.11	7.91	168.9	22.2	95.3%	80.6%
90	1.18	0.72	10.93	68.6%	20.17	8.88	152.8	22.2	95.0%	81.1%
100	1.04	1.40	9.12	86.7%	20.25	10.43	136.1	21.7	89.2%	80.5%
110	0.95	1.36	8.53	98.6%	20.29	11.08	115.0	21.7	88.8%	81.7%
120	0.86	1.86	8.20	95.3%	20.28	11.15	104.4	21.7	85.0%	82.0%
130	0.82	2.28	7.78	95.3%	20.28	11.36	97.2	21.7	81.6%	82.0%
140	0.68	2.75	7.13	98.8%	20.29	11.78	92.2	21.7	77.6%	81.6%

150	0.68	2.75	6.81	105.5%	20.31	12.12	87.2	21.7	76.8%	81.8%
160	0.59	2.07	6.90	119.0%	20.35	12.41	82.8	21.7	81.4%	82.6%
170	0.54	1.95	6.78	125.0%	20.36	12.61	78.9	21.7	82.0%	83.0%
180	0.50	2.05	6.85	120.7%	20.35	12.48	76.1	21.7	81.4%	83.2%
190	0.45	2.33	6.57	120.7%	20.35	12.62	72.8	21.1	78.9%	83.1%
200	0.41	2.31	6.61	120.2%	20.35	12.59	70.6	21.7	79.1%	83.4%
210	0.32	2.31	6.49	123.2%	20.36	12.71	68.9	21.1	78.9%	83.4%
220	0.32	2.24	6.44	126.3%	20.37	12.81	67.8	21.1	79.2%	83.5%
230	0.23	2.05	6.44	131.4%	20.38	12.91	66.7	21.1	80.6%	83.7%
240	0.18	2.04	6.49	130.3%	20.38	12.87	66.1	21.7	80.7%	83.9%
250	0.14	2.16	6.16	136.1%	20.39	13.15	64.4	21.7	79.1%	83.7%
260	0.09	2.22	6.06	137.2%	20.39	13.22	63.3	21.1	78.5%	83.6%
270	0.05	2.40	5.85	138.1%	20.40	13.35	62.2	21.1	76.7%	83.4%
280	0.00	1.83	6.88	125.5%	20.36	12.57	60.6	21.1	83.0%	84.8%

	Air Fuel Ratio (A/F)		
71.6%	Dry Molecular Weight (Md)	29.86	
90.5%	Dry Moles Exhaust Gas (Nr):	348.08	%HC
79.1%	Air Fuel Ratio (A/F)	9.88	1.32

Combustion Efficiency:	90.5%
Total Input (kJ):	104,514
Total Output (kJ):	74,826
Efficiency:	71.6%
Total CO (g):	681.62

Btu/h	16,034	kJ/h
Btu/h	22,396	kJ/h
h		
lb/h	1.1	kg/h
Deg. F	124.0	Deg. C

69.0%	11.5	1.44	77.27	0.04	77.27	104887	4.06	6.87	2.74	19810.00	16.94
Net Eff %	**Air Fuel Ratio**	**Wet Wt Now Wt**	**% Wet Consumed x**	**Dry Wt. Now Wtdn**	**% Dry Comsumed y**	**Fuel Properties**					**Mw Moisture Fuel Burnt**
						Total Input	**Carbon /12= [a]**	**Hydrogen /1= [b]**	**Oxygen /16= [c]**	**Calorific Value**	
62.4%	23.8	6.35	0.00	5.28	0.00	0	4.06	6.87	2.74	19810.00	16.94
73.2%	9.2	5.63	11.43	4.67	11.43	18290	4.06	6.87	2.74	19810.00	16.94
71.0%	6.3	4.85	23.57	4.03	23.57	13438	4.06	6.87	2.74	19810.00	16.94
69.5%	6.1	3.99	37.14	3.32	37.14	13064	4.06	6.87	2.74	19810.00	16.94
71.3%	6.4	3.27	48.57	2.71	48.57	11198	4.06	6.87	2.74	19810.00	16.94
70.7%	6.5	2.63	58.57	2.19	58.57	10078	4.06	6.87	2.74	19810.00	16.94
76.5%	7.7	2.04	67.86	1.70	67.86	7839	4.06	6.87	2.74	19810.00	16.94
77.2%	9.1	1.68	73.57	1.39	73.57	5226	4.06	6.87	2.74	19810.00	16.94
76.9%	9.4	1.41	77.86	1.17	77.86	4106	4.06	6.87	2.74	19810.00	16.94
77.0%	10.1	1.18	81.43	0.98	81.43	2986	4.06	6.87	2.74	19810.00	16.94
71.8%	11.0	1.04	83.57	0.87	83.57	1866	4.06	6.87	2.74	19810.00	16.94
72.6%	11.7	0.95	85.00	0.79	85.00	1493	4.06	6.87	2.74	19810.00	16.94
69.7%	11.4	0.86	86.43	0.72	86.43	1120	4.06	6.87	2.74	19810.00	16.94
67.0%	11.3	0.82	87.14	0.68	87.14	1493	4.06	6.87	2.74	19810.00	16.94
63.3%	11.4	0.68	89.29	0.57	89.29	1120	4.06	6.87	2.74	19810.00	16.94

62.8%	11.7	0.68	89.29	0.57	89.29	747	4.06	6.87	2.74	19810.00	16.94
67.3%	12.7	0.59	90.71	0.49	90.71	1120	4.06	6.87	2.74	19810.00	16.94
68.0%	13.0	0.54	91.43	0.45	91.43	747	4.06	6.87	2.74	19810.00	16.94
67.8%	12.8	0.50	92.14	0.41	92.14	747	4.06	6.87	2.74	19810.00	16.94
65.6%	12.7	0.45	92.86	0.38	92.86	747	4.06	6.87	2.74	19810.00	16.94
66.0%	12.7	0.41	93.57	0.34	93.57	1120	4.06	6.87	2.74	19810.00	16.94
65.8%	12.8	0.32	95.00	0.26	95.00	747	4.06	6.87	2.74	19810.00	16.94
66.2%	13.0	0.32	95.00	0.26	95.00	747	4.06	6.87	2.74	19810.00	16.94
67.4%	13.3	0.23	96.43	0.19	96.43	1120	4.06	6.87	2.74	19810.00	16.94
67.7%	13.3	0.18	97.14	0.15	97.14	747	4.06	6.87	2.74	19810.00	16.94
66.2%	13.6	0.14	97.86	0.11	97.86	747	4.06	6.87	2.74	19810.00	16.94
65.6%	13.6	0.09	98.57	0.08	98.57	747	4.06	6.87	2.74	19810.00	16.94
64.0%	13.6	0.05	99.29	0.04	99.29	1120	4.06	6.87	2.74	19810.00	16.94
70.4%	13.1	0.00	100.00	0.00	100.00	373	4.06	6.87	2.74	19810.00	16.94

				Moisture Content MCwb:	16.94
		Moisture of Wood (wet basis):	16.94	Dry kg :	5.28
99,126	(Btu)	Initial Dry Weight Wtdo (kg):	5.28	CA:	48.73
70,969	(Btu)	Moisture Content Dry	20.40	HY:	6.87
				OX:	43.90

Load Weight (kg):	6.35				
Fuel Heating:	HHV	LHV		HHV	LHV
Value in kJ/kg - CV:	19810.00	18328.69	Btu/lb	8522.48	7885.21

78.85	20.92	2.74	8.92	0.25	0.27	32.37	44.95	7.43	1.01	314.80	32.50
Mass Balance (moles/100 mole dry flue gas)					**kg Wood per 100 mole dfp**	**Moles per kg of Dry Wood**					
[h]	**[u]**	**[w]**	**[j]**	**[k]**	**Nk**	**CO2**	**O2**	**CO**	**HC**	**N2**	**H2O**
78.87	20.92	1.22	3.94	0.12	0.12	31.38	134.69	8.42	1.01	651.26	32.50
79.52	21.09	3.17	10.68	0.10	0.32	38.09	24.50	2.41	0.31	252.40	33.90
79.26	21.02	4.65	15.37	0.30	0.46	35.71	4.70	4.46	0.64	171.45	33.24
79.03	20.96	4.76	15.59	0.37	0.47	34.60	4.30	5.43	0.78	167.01	32.95
79.25	21.02	4.52	14.95	0.29	0.45	35.72	5.98	4.45	0.64	176.29	33.24
79.16	21.00	4.44	14.64	0.31	0.44	35.28	7.04	4.84	0.69	179.12	33.13
79.71	21.14	3.79	12.81	0.10	0.38	38.67	13.29	1.88	0.25	211.59	34.02
79.64	21.12	3.22	10.91	0.07	0.32	38.84	23.04	1.75	0.22	248.87	34.09
79.53	21.10	3.12	10.52	0.09	0.31	38.19	25.52	2.32	0.30	256.54	33.93
79.47	21.08	2.89	9.75	0.09	0.29	37.99	30.87	2.50	0.32	276.25	33.89
79.05	20.97	2.64	8.68	0.19	0.26	34.76	39.74	5.34	0.71	301.33	33.09
79.03	20.96	2.48	8.16	0.18	0.25	34.57	44.89	5.51	0.73	320.30	33.06
78.79	20.90	2.54	8.22	0.25	0.25	32.45	44.11	7.36	1.00	311.81	32.52
78.58	20.84	2.55	8.15	0.31	0.25	30.61	44.67	8.97	1.24	309.16	32.05
78.34	20.78	2.53	7.92	0.38	0.25	28.36	46.86	10.94	1.52	311.55	31.48

78.32	20.77	2.45	7.65	0.38	0.24	27.96	49.77	11.29	1.57	321.51	31.39
78.62	20.85	2.28	7.26	0.28	0.23	30.44	54.76	9.13	1.24	346.80	32.04
78.66	20.87	2.21	7.08	0.26	0.22	30.77	57.21	8.85	1.20	356.95	32.13
78.62	20.85	2.26	7.21	0.28	0.22	30.46	55.48	9.12	1.24	349.59	32.04
78.48	20.82	2.27	7.16	0.32	0.23	29.08	55.85	10.31	1.41	347.43	31.70
78.49	20.82	2.27	7.18	0.32	0.23	29.21	55.61	10.21	1.40	346.83	31.73
78.49	20.82	2.24	7.08	0.32	0.22	29.05	56.92	10.34	1.42	351.37	31.69
78.51	20.83	2.21	6.99	0.31	0.22	29.25	58.17	10.17	1.39	356.59	31.74
78.60	20.85	2.16	6.86	0.28	0.21	29.98	60.11	9.54	1.29	365.84	31.93
78.60	20.85	2.17	6.90	0.28	0.22	30.08	59.63	9.45	1.28	364.27	31.96
78.53	20.83	2.12	6.70	0.29	0.21	29.19	62.31	10.23	1.39	372.08	31.74
78.50	20.82	2.11	6.66	0.30	0.21	28.82	62.88	10.56	1.44	373.28	31.65
78.40	20.80	2.11	6.60	0.33	0.21	27.83	63.49	11.42	1.56	373.02	31.40
78.72	20.88	2.21	7.08	0.25	0.22	31.35	57.28	8.34	1.12	358.71	32.28

11.33	396.67	4096.55	3066.19	2977.53	2945.39	3980.25	3561.78	294.78	4085.06	2822.79	61492.13
Moisture Present	Stack Temp K	Heat Content Change - Ambient to Stack Temperature Flue Gas Constituent						Room Temp K	Energ		
		CO2	O2	CO	N2	CH4	H2O		CO2	O2	CO
11.33	382.04	3432.58	2601.65	2534.43	2505.39	3264.11	3034.29	294.82	107.71	350.43	2404.66
11.33	503.15	8564.69	6327.68	6124.23	6062.44	8502.93	7319.42	294.82	326.21	155.00	697.42
11.33	527.59	9652.12	7095.73	6858.74	6791.40	9659.93	8194.45	294.82	344.72	33.37	1291.63
11.33	522.59	9428.28	6938.19	6708.23	6641.99	9420.55	8015.19	294.82	326.18	29.83	1573.49
11.33	517.04	9159.26	6747.06	6525.15	6460.36	9136.77	7796.99	295.37	327.21	40.34	1288.04
11.33	509.82	8859.54	6536.61	6324.22	6260.88	8815.16	7557.72	294.82	312.53	45.99	1400.93
11.33	489.82	7957.69	5894.65	5708.99	5650.57	7866.50	6824.38	295.37	307.76	78.33	544.09
11.33	460.37	6682.22	4980.17	4830.88	4779.85	6539.25	5777.12	295.37	259.57	114.74	503.70
11.33	442.04	5900.76	4414.72	4286.59	4240.42	5737.38	5127.56	295.37	225.36	112.65	667.21
11.33	425.93	5222.07	3920.30	3809.83	3768.10	5048.24	4558.31	295.37	198.41	121.02	717.82
11.33	409.26	4549.07	3427.65	3334.16	3296.99	4370.08	3990.18	294.82	158.14	136.21	1527.93
11.33	388.15	3681.35	2786.50	2713.60	2682.70	3508.78	3248.51	294.82	127.26	125.09	1574.72
11.33	377.59	3252.34	2467.43	2404.26	2376.59	3087.49	2878.63	294.82	105.54	108.83	2100.69
11.33	370.37	2960.66	2249.69	2192.96	2167.54	2802.83	2625.92	294.82	90.62	100.50	2558.03
11.33	365.37	2759.62	2099.23	2046.85	2023.01	2607.47	2451.14	294.82	78.25	98.37	3117.47

11.33	360.37	2559.30	1948.99	1900.88	1878.63	2413.51	2276.50	294.82	71.55	97.00	3216.34
11.33	355.93	2381.85	1815.63	1771.25	1750.42	2242.28	2121.39	294.82	72.50	99.42	2600.30
11.33	352.04	2227.05	1699.09	1657.91	1638.34	2093.36	1985.76	294.82	68.52	97.21	2518.77
11.33	349.26	2116.75	1615.93	1577.01	1558.34	1987.50	1888.93	294.82	64.47	89.65	2593.89
11.33	345.93	2005.84	1532.58	1495.98	1478.21	1880.47	1791.98	294.26	58.34	85.60	2934.36
11.33	343.71	1896.82	1449.82	1415.33	1398.49	1777.09	1695.41	294.82	55.40	80.63	2902.95
11.33	342.04	1852.17	1416.39	1382.86	1366.37	1733.73	1656.57	294.26	53.81	80.62	2940.90
11.33	340.93	1808.34	1383.22	1350.56	1334.44	1691.96	1617.90	294.26	52.89	80.46	2892.82
11.33	339.82	1764.55	1350.05	1318.26	1302.51	1650.26	1579.23	294.26	52.89	81.16	2712.92
11.33	339.26	1721.52	1317.13	1286.11	1270.74	1610.01	1540.72	294.82	51.78	78.54	2687.54
11.33	337.59	1655.93	1267.41	1237.68	1222.87	1547.64	1482.74	294.82	48.33	78.97	2908.89
11.33	336.48	1633.40	1250.64	1221.41	1206.77	1525.57	1463.28	294.26	47.07	78.64	3000.45
11.33	335.37	1589.75	1217.52	1189.14	1174.87	1484.14	1424.64	294.26	44.25	77.30	3244.85
11.33	333.71	1524.35	1167.87	1140.75	1127.03	1422.13	1366.70	294.26	47.79	66.89	2369.33

SUMS				AVERAGE	SUMS					
23086.55	26191.00	44846.00	15621.91	6142.95	29688	9895	19792.66	75199	9895	681.62
y Losses (kJ/kg of Dry Fuel)				**Total**						
Flue Gas Constituent				**Loss**	**Total**	**Chemical**	**Sensible and**	**Total**	**Chem**	**Grams Pr**
N2	**CH4**	**H2O Comb**	**H2O Fuel MC**	**Rate**	**Loss**	**Loss 1**	**Latent Loss**	**Output**	**Loss 2**	**CO**
1631.66	903.30	1527.63	532.71	7458.10	0	0	0.00	0	0	0.00
1530.18	280.58	1738.58	581.27	5309.25	4902	887	4015.00	13388	887	62.36
1164.36	577.68	1733.84	591.19	5736.79	3891	1243	2648.32	9546	1243	84.64
1109.29	706.00	1713.03	589.16	6046.98	3988	1474	2513.49	9076	1474	100.29
1138.92	574.55	1720.95	586.69	5676.68	3209	1033	2175.69	7989	1033	70.41
1121.43	624.36	1707.26	583.97	5796.48	2949	1012	1937.25	7129	1012	68.98
1195.61	227.50	1727.78	575.66	4656.75	1843	300	1542.35	5996	300	20.88
1189.57	195.51	1695.67	563.79	4522.55	1193	182	1011.17	4033	182	12.93
1087.83	266.52	1665.73	556.43	4581.74	950	191	758.52	3156	191	13.48
1040.93	282.14	1644.70	549.98	4555.00	687	149	537.56	2300	149	10.56
993.47	638.63	1587.20	543.54	5585.11	526	202	324.04	1340	202	14.08
859.26	653.45	1561.02	535.14	5435.94	410	167	243.09	1083	167	11.63
741.05	895.01	1523.42	530.94	6005.48	339	168	171.31	780	168	11.65
670.11	1103.36	1493.43	528.08	6544.13	493	274	219.01	1000	274	18.93
630.28	1355.99	1461.53	526.10	7268.00	411	251	159.46	709	251	17.31

604.00	1397.40	1451.71	524.12	7362.14	277	173	104.52	469	173	11.91
607.06	1109.23	1476.58	522.36	6487.44	367	209	158.10	753	209	14.45
584.80	1068.74	1476.39	520.82	6335.25	239	135	104.19	508	135	9.34
544.78	1105.76	1469.46	519.73	6387.73	241	139	101.93	506	139	9.62
513.57	1261.04	1450.41	518.63	6821.95	257	157	99.66	489	157	10.88
485.04	1247.27	1448.74	517.53	6737.57	381	234	147.21	739	234	16.16
480.11	1262.83	1445.91	517.09	6781.27	256	158	97.76	491	158	10.91
475.85	1239.15	1447.10	516.66	6704.92	253	155	97.57	494	155	10.73
476.51	1154.20	1454.54	516.22	6448.43	365	218	146.75	755	218	15.10
462.89	1143.38	1454.41	515.78	6394.32	241	144	97.14	506	144	9.98
455.00	1240.88	1442.61	515.12	6689.81	252	156	96.28	494	156	10.80
450.47	1281.98	1437.80	514.90	6811.31	257	161	95.87	490	161	11.14
438.25	1392.98	1425.27	514.47	7137.37	403	261	142.19	716	261	18.07
404.27	1001.58	1463.25	513.81	5866.93	111	63	47.24	263	63	4.40

54.04

oduced HC
0.00
4.61
6.97
8.28
5.78
5.65
1.60
0.92
0.99
0.76
1.08
0.88
0.91
1.49
1.37

0.94
1.12
0.72
0.75
0.85
1.26
0.85
0.84
1.17
0.77
0.84
0.87
1.41
0.34

Dirigo Laboratories, Inc.

Manufacturer:	**Pacific Energy**
Model:	**Super (Series E)**
Date:	**3/16/2017**
Run:	**2**
Control #:	**034-S-076-1**
Test Duration:	**280**
Output Category:	**2**

	HHV Basis	LHV Basis
Overall Efficiency	71.6%	77.4%
Combustion Efficiency	90.5%	90.5%
Heat Transfer Efficiency	79.1%	85.5%

HHV Output Rate (kJ/h)	16,034	15,210	**(Btu/h)**
Burn Rate (kg/h)	1.13	2.49	**(lb/h)**
Input (kJ/h)	22,396	21,245	**(Btu/h)**

Test Load Weight (dry kg)	5.3	11.6	**dry lb**
MC wet (%)	16.94		
MC dry (%)	20.40		
Particulate (g)	5.67		
CO (g)	682		
Test Duration (h)	4.666666667		

Emissions	**Particulate**	**CO**
g/MJ Output	0.08	9.11
g/kg Dry Fuel	1.07	129.20
g/h	1.22	146.06
lb/MM Btu Output	0.18	21.17

Air/Fuel Ratio (A/F)	9.88

Test Results in Accordance with CSA B415.1-10

VERSION: 2.4 **4/15/2010**

Manufacturer: Pacific Energy
Model: Super (Series E)
Date: 3/16/2017
Run: 1C
Control #: 034-S-076-1
Test Duration: 340
Burn Category 2

Appliance Type: Non-Cat (Cat, Non-Cat, Pe

Temp. Units F (F or C)
Weight Units lb (kg or lb)

Wood Moisture (% DRY): 20
Wood Moisture (% wet): 16.67
Load Weight (lb wet): 14.10
Burn Rate (dry kg/h): 0.94
Total Particulate Emissions: 13.72 g

Fuel Data

	D. Fir	
HHV	19,810	kJ/kg
%C	48.73	
%H	6.87	
%O	43.90	
%Ash	0.50	

Averages	**208.7**	**72.2**	**10.25**	**9.14**	**2.20**	
	Temp. (F)					
Elapsed Time (min)	**Fuel Weight Remaining (lb)**	**Flue Gas**	**Room Temp**	**Flue Gas Composition (%) O2**	**CO2**	**CO**
0	14.1	199.0	72.0	14.40	5.21	1.75
10	12.9	324.0	71.0	13.19	6.96	1.24
20	11.8	357.0	72.0	8.51	12.09	1.03
30	10.2	416.0	72.0	4.23	15.79	3.37
40	8.6	418.0	72.0	4.30	15.78	2.24
50	7.1	409.0	73.0	4.80	15.36	2.35
60	5.8	397.0	73.0	4.80	15.33	2.67
70	4.6	372.0	73.0	5.59	14.42	2.43
80	3.8	351.0	73.0	6.11	14.29	0.74
90	3.2	304.0	73.0	8.59	11.68	0.64
100	2.8	284.0	73.0	8.13	12.20	0.43
110	2.5	251.0	72.0	9.85	9.93	1.21
120	2.3	209.0	72.0	11.38	7.90	1.89
130	2.1	188.0	72.0	11.47	7.43	2.44
140	2.0	174.0	72.0	11.51	7.32	2.46
150	1.9	164.0	73.0	11.42	7.46	2.42
160	1.8	156.0	73.0	11.49	7.20	2.67
170	1.7	150.0	73.0	11.55	7.02	2.84
180	1.6	144.0	72.0	11.70	6.59	3.31
190	1.5	140.0	72.0	11.83	6.46	3.26
200	1.3	136.0	72.0	11.74	6.53	3.34
210	1.3	134.0	72.0	11.81	6.61	3.35
220	1.2	131.0	72.0	11.86	6.54	3.36
230	1.1	129.0	72.0	10.82	8.86	1.87
240	0.9	128.0	72.0	11.00	8.61	1.55
250	0.8	127.0	72.0	11.04	8.47	1.59
260	0.7	127.0	72.0	10.97	8.56	1.82
270	0.6	127.0	72.0	11.77	7.55	2.16
280	0.5	127.0	72.0	11.62	7.44	2.46
290	0.4	125.0	72.0	11.76	7.34	2.43
300	0.3	123.0	72.0	11.93	7.05	2.67
310	0.3	121.0	72.0	12.06	7.50	2.22
320	0.2	121.0	72.0	11.75	7.72	2.11
330	0.1	120.0	72.0	11.78	7.43	2.52
340	0.0	120.0	72.0	12.04	7.35	2.19

ellet)

- (•) Dougla
- ( ) Oak

Manufacturer:	Pacific Energy
Model:	Super (Series E)
Date:	3/16/2017
Run:	1C
Control #:	034-S-076-1
Test Duration:	340 min

	HHV	LHV
Eff	70.8%	76.5%
Comb Eff	88.0%	88.0%
HT Eff	80.4%	86.9%
Output	13,196	kJ/h
Burn Rate	0.94	kg/h
Grams CO	869	g
Input	18,637	kJ/h
MC wet	16.67	

Ultimate CO2

CO2-ult 19.64

F_0 1.063

Averages	2.20	9.14	83.0%	20.19	9.95	98.1

INPUT DATA				**Oxygen Calculation**			**Input**
Elapsed Time	**Weight Remaining (kg)**	**% CO [e]**	**% CO2 [d]**	**Excess Air EA**	**Total O2**	**Calc. % O2 [g]**	**Flue Gas (ºC)**
0	6.40	1.75	5.21	182.2%	20.48	14.40	92.8
10	5.85	1.24	6.96	139.5%	20.40	12.82	162.2
20	5.35	1.03	12.09	49.7%	20.07	7.47	180.6
30	4.63	3.37	15.79	2.5%	19.67	2.20	213.3
40	3.90	2.24	15.78	9.0%	19.75	2.85	214.4
50	3.22	2.35	15.36	10.9%	19.77	3.24	209.4
60	2.63	2.67	15.33	9.1%	19.75	3.09	202.8
70	2.09	2.43	14.42	16.6%	19.83	4.19	188.9
80	1.72	0.74	14.29	30.7%	19.95	5.29	177.2
90	1.45	0.64	11.68	59.4%	20.13	8.13	151.1
100	1.27	0.43	12.20	55.5%	20.11	7.69	140.0
110	1.13	1.21	9.93	76.3%	20.20	9.67	121.7
120	1.04	1.89	7.90	100.6%	20.29	11.45	98.3
130	0.95	2.44	7.43	99.0%	20.29	11.64	86.7
140	0.91	2.46	7.32	100.8%	20.29	11.74	78.9
150	0.86	2.42	7.46	98.8%	20.29	11.62	73.3
160	0.82	2.67	7.20	99.0%	20.29	11.75	68.9
170	0.77	2.84	7.02	99.2%	20.29	11.85	65.6
180	0.73	3.31	6.59	98.4%	20.29	12.04	62.2
190	0.68	3.26	6.46	102.1%	20.30	12.21	60.0
200	0.59	3.34	6.53	99.0%	20.29	12.09	57.8
210	0.59	3.35	6.61	97.2%	20.28	12.00	56.7
220	0.54	3.36	6.54	98.4%	20.29	12.07	55.0
230	0.50	1.87	8.86	83.1%	20.23	10.44	53.9
240	0.41	1.55	8.61	93.3%	20.27	10.88	53.3
250	0.36	1.59	8.47	95.3%	20.28	11.01	52.8
260	0.32	1.82	8.56	89.2%	20.25	10.78	52.8

270	0.27	2.16	7.55	102.3%	20.30	11.67	52.8
280	0.23	2.46	7.44	98.4%	20.29	11.62	52.8
290	0.18	2.43	7.34	101.1%	20.29	11.74	51.7
300	0.14	2.67	7.05	102.1%	20.30	11.91	50.6
310	0.14	2.22	7.50	102.1%	20.30	11.69	49.4
320	0.09	2.11	7.72	99.8%	20.29	11.52	49.4
330	0.05	2.52	7.43	97.4%	20.28	11.59	48.9
340	0.00	2.19	7.35	105.9%	20.31	11.87	48.9

			Air Fuel Ratio (A/F)			
Overall Heating Efficiency:	70.8%		Dry Molecular Weight (Md)		29.86	
Combustion Efficiency:	88.0%		Dry Moles Exhaust Gas (Nr):		335.62	%HC
Heat Transfer Efficiency:	80.4%		Air Fuel Ratio (A/F)		9.51	1.32

Heat Output:	12,518	Btu/h	13,196	kJ/h
Heat Input:	17,679	Btu/h	18,637	kJ/h

2

Burn Duration:	5.666666667	h		
Burn Rate:	2.1	lb/h	0.9	kg/h
Stack Temp:	208.9	Deg. F	98.3	Deg. C

22.3	83.3%	83.3%	69.4%	10.6	1.45	77.30	0.04	77.30
Data Room Temp (ºC)	**Combust Eff %**	**Heat Transfer %**	**Net Eff %**	**Air Fuel Ratio**	**Wet Wt Now Wt**	**% Wet Consumed x**	**Dry Wt. Now Wtdn**	**% Dry Comsumed y**
22.2	79.9%	79.9%	63.9%	16.3	6.40	0.00	5.33	0.00
21.7	87.8%	75.8%	66.6%	14.1	5.85	8.51	4.88	8.51
22.2	93.6%	80.0%	74.9%	8.9	5.35	16.31	4.46	16.31
22.2	85.4%	79.6%	68.1%	6.0	4.63	27.66	3.86	27.66
22.2	89.7%	79.9%	71.6%	6.4	3.90	39.01	3.25	39.01
22.8	89.0%	79.9%	71.1%	6.5	3.22	49.65	2.68	49.65
22.8	87.7%	80.2%	70.3%	6.4	2.63	58.87	2.19	58.87
22.8	88.1%	80.5%	70.9%	6.8	2.09	67.38	1.74	67.38
22.8	95.9%	81.6%	78.3%	7.8	1.72	73.05	1.44	73.05
22.8	95.8%	81.7%	78.3%	9.6	1.45	77.30	1.21	77.30
22.8	97.3%	82.8%	80.5%	9.4	1.27	80.14	1.06	80.14
22.2	91.1%	82.3%	75.1%	10.4	1.13	82.27	0.95	82.27
22.2	84.3%	82.3%	69.5%	11.7	1.04	83.69	0.87	83.69
22.2	80.0%	82.7%	66.1%	11.5	0.95	85.11	0.79	85.11
22.2	79.7%	83.2%	66.3%	11.5	0.91	85.82	0.76	85.82
22.8	80.2%	83.9%	67.3%	11.4	0.86	86.52	0.72	86.52
22.8	78.2%	83.9%	65.6%	11.4	0.82	87.23	0.68	87.23
22.8	76.8%	84.0%	64.5%	11.4	0.77	87.94	0.64	87.94
22.2	73.2%	83.7%	61.2%	11.2	0.73	88.65	0.60	88.65
22.2	73.1%	83.8%	61.3%	11.4	0.68	89.36	0.57	89.36
22.2	72.9%	84.0%	61.2%	11.2	0.59	90.78	0.49	90.78
22.2	73.0%	84.1%	61.4%	11.1	0.59	90.78	0.49	90.78
22.2	72.8%	84.2%	61.3%	11.2	0.54	91.49	0.45	91.49
22.2	85.8%	86.4%	74.1%	10.7	0.50	92.20	0.42	92.20
22.2	87.6%	86.5%	75.8%	11.3	0.41	93.62	0.34	93.62
22.2	87.2%	86.5%	75.4%	11.4	0.36	94.33	0.30	94.33
22.2	85.7%	86.4%	74.0%	11.0	0.32	95.04	0.26	95.04

22.2	82.0%	85.8%	70.3%	11.7	0.27	95.74	0.23	95.74
22.2	79.9%	85.5%	68.3%	11.4	0.23	96.45	0.19	96.45
22.2	79.9%	85.6%	68.4%	11.6	0.18	97.16	0.15	97.16
22.2	77.8%	85.4%	66.5%	11.6	0.14	97.87	0.11	97.87
22.2	81.5%	86.0%	70.1%	11.7	0.14	97.87	0.11	97.87
22.2	82.6%	86.1%	71.2%	11.6	0.09	98.58	0.08	98.58
22.2	79.5%	85.8%	68.2%	11.3	0.05	99.29	0.04	99.29
22.2	81.4%	86.0%	70.0%	11.9	0.00	100.00	0.00	100.00

Combustion Efficiency:	88.0%		
Total Input (kJ):	105,611	100,167	(Btu)
Total Output (kJ):	74,778	70,924	(Btu)
Efficiency:	70.8%		
Total CO (g):	868.99		

Load Weight (kg):
Fuel Heating:
Value in kJ/kg - CV:

105986	4.06	6.87	2.74	19810.00	16.67	78.71	20.88	2.87
Fuel Properties					**Mw**	**Mass Balance**		
Total Input	**Carbon /12= [a]**	**Hydrogen /1= [b]**	**Oxygen /16= [c]**	**Calorific Value**	**Moisture Fuel Burnt**	**(moles/100 mole dry [h]**	**[u]**	**[w]**
0	4.06	6.87	2.74	19810.00	16.67	78.64	20.86	1.77
13108	4.06	6.87	2.74	19810.00	16.67	78.98	20.95	2.06
10112	4.06	6.87	2.74	19810.00	16.67	79.41	21.06	3.26
11984	4.06	6.87	2.74	19810.00	16.67	78.64	20.86	4.84
11610	4.06	6.87	2.74	19810.00	16.67	79.13	20.99	4.52
10486	4.06	6.87	2.74	19810.00	16.67	79.05	20.97	4.44
9363	4.06	6.87	2.74	19810.00	16.67	78.91	20.93	4.53
7490	4.06	6.87	2.74	19810.00	16.67	78.96	20.94	4.23
5243	4.06	6.87	2.74	19810.00	16.67	79.68	21.14	3.73
3745	4.06	6.87	2.74	19810.00	16.67	79.55	21.10	3.05
2622	4.06	6.87	2.74	19810.00	16.67	79.68	21.13	3.12
1873	4.06	6.87	2.74	19810.00	16.67	79.19	21.01	2.78
1498	4.06	6.87	2.74	19810.00	16.67	78.76	20.89	2.47
1124	4.06	6.87	2.74	19810.00	16.67	78.49	20.82	2.51
749	4.06	6.87	2.74	19810.00	16.67	78.48	20.82	2.49
749	4.06	6.87	2.74	19810.00	16.67	78.50	20.82	2.52
749	4.06	6.87	2.74	19810.00	16.67	78.38	20.79	2.52
749	4.06	6.87	2.74	19810.00	16.67	78.29	20.77	2.53
749	4.06	6.87	2.74	19810.00	16.67	78.06	20.71	2.55
1124	4.06	6.87	2.74	19810.00	16.67	78.07	20.71	2.51
749	4.06	6.87	2.74	19810.00	16.67	78.04	20.70	2.55
375	4.06	6.87	2.74	19810.00	16.67	78.04	20.70	2.57
749	4.06	6.87	2.74	19810.00	16.67	78.03	20.70	2.55
1124	4.06	6.87	2.74	19810.00	16.67	78.83	20.91	2.71
1124	4.06	6.87	2.74	19810.00	16.67	78.96	20.94	2.55
749	4.06	6.87	2.74	19810.00	16.67	78.93	20.94	2.53
749	4.06	6.87	2.74	19810.00	16.67	78.84	20.91	2.62

749	4.06	6.87	2.74	19810.00	16.67	78.62	20.85	2.46
749	4.06	6.87	2.74	19810.00	16.67	78.48	20.82	2.52
749	4.06	6.87	2.74	19810.00	16.67	78.49	20.82	2.49
375	4.06	6.87	2.74	19810.00	16.67	78.37	20.79	2.48
375	4.06	6.87	2.74	19810.00	16.67	78.59	20.85	2.47
749	4.06	6.87	2.74	19810.00	16.67	78.65	20.86	2.49
1124	4.06	6.87	2.74	19810.00	16.67	78.46	20.81	2.54
375	4.06	6.87	2.74	19810.00	16.67	78.59	20.85	2.42

Moisture Content MCwb: 16.67

Moisture of Wood (wet basis): 16.67
Initial Dry Weight Wtdo (kg): 5.33
Moisture Content Dry 20.00

Dry kg : 5.33
CA: 48.73
HY: 6.87
OX: 43.90

6.40

HHV	LHV		HHV	LHV
19810.00	18328.69	Btu/lb	8522.48	7885.21

9.24	0.30	0.29	31.55	39.08	8.14	1.12	290.48	32.28
flue gas)		kg Wood per 100 mole dfp	Moles per kg of Dry Wood					
[j]	[k]	Nk	CO2	O2	CO	HC	N2	H2O
5.62	0.23	0.18	29.57	81.69	9.93	1.32	446.29	31.89
6.75	0.16	0.20	33.98	62.58	6.05	0.78	385.57	32.96
10.94	0.14	0.32	37.22	22.99	3.17	0.43	244.45	33.67
15.64	0.49	0.48	32.80	4.57	7.00	1.01	163.35	32.50
14.87	0.32	0.45	35.11	6.34	4.98	0.72	176.07	33.09
14.59	0.34	0.44	34.74	7.32	5.31	0.76	178.77	33.00
14.78	0.38	0.45	34.03	6.85	5.93	0.85	175.19	32.82
13.85	0.35	0.42	34.22	9.95	5.77	0.82	187.38	32.87
12.60	0.10	0.37	38.55	14.26	2.00	0.27	214.95	33.99
10.33	0.08	0.30	38.44	26.75	2.11	0.26	261.83	33.99
10.63	0.05	0.31	39.27	24.75	1.38	0.16	256.45	34.20
9.24	0.16	0.28	35.86	34.92	4.37	0.58	285.99	33.36
7.98	0.26	0.25	32.09	46.51	7.68	1.04	319.94	32.43
7.96	0.34	0.25	29.71	46.54	9.76	1.35	313.85	31.83
7.88	0.34	0.25	29.52	47.36	9.92	1.37	316.49	31.78
7.97	0.33	0.25	29.81	46.42	9.67	1.33	313.67	31.85
7.92	0.37	0.25	28.70	46.84	10.64	1.48	312.37	31.57
7.88	0.39	0.25	27.94	47.16	11.30	1.57	311.58	31.38
7.84	0.46	0.25	25.95	47.42	13.04	1.82	307.41	30.87
7.70	0.46	0.25	25.91	48.96	13.08	1.83	313.13	30.87
7.81	0.47	0.25	25.78	47.72	13.19	1.85	308.11	30.83
7.88	0.47	0.26	25.87	46.95	13.11	1.84	305.41	30.85
7.83	0.47	0.25	25.74	47.49	13.22	1.85	307.10	30.82
8.78	0.26	0.27	32.92	38.77	6.95	0.95	292.87	32.62
8.35	0.21	0.25	33.89	42.84	6.10	0.82	310.79	32.88
8.26	0.21	0.25	33.65	43.74	6.32	0.85	313.54	32.82
8.49	0.25	0.26	32.87	41.41	6.99	0.95	302.74	32.62

7.87	0.30	0.25	30.79	47.59	8.81	1.21	320.68	32.11
7.98	0.34	0.25	29.65	46.30	9.80	1.35	312.81	31.81
7.88	0.34	0.25	29.64	47.41	9.81	1.35	317.00	31.81
7.79	0.37	0.25	28.52	48.19	10.80	1.50	316.98	31.53
7.87	0.30	0.25	30.53	47.58	9.04	1.24	319.96	32.04
7.98	0.29	0.25	31.14	46.45	8.51	1.17	317.23	32.19
8.01	0.35	0.25	29.44	45.94	9.99	1.38	310.92	31.76
7.72	0.30	0.24	30.48	49.21	9.08	1.24	325.98	32.03

11.11	371.29	3020.58	2272.48	2209.64	2185.19	2909.36	2644.14	295.50
Moisture Present	**Stack Temp K**	**Heat Content Change - Ambient to Stack Temperature Flue Gas Constituent**						**Room Temp K**
		CO2	**O2**	**CO**	**N2**	**CH4**	**H2O**	
11.11	365.93	2760.76	2099.58	2047.07	2023.25	2609.67	2451.36	295.37
11.11	435.37	5640.18	4226.20	4105.14	4060.59	5469.90	4911.02	294.82
11.11	453.71	6396.92	4774.20	4632.74	4583.46	6245.49	5540.70	295.37
11.11	486.48	7812.03	5790.73	5609.34	5551.73	7713.81	6705.57	295.37
11.11	487.59	7860.55	5825.36	5642.55	5584.67	7764.64	6745.17	295.37
11.11	482.59	7621.33	5653.27	5477.15	5420.69	7517.00	6547.85	295.93
11.11	475.93	7331.74	5445.96	5278.18	5223.38	7214.93	6310.58	295.93
11.11	462.04	6732.57	5015.37	4864.45	4813.19	6593.63	5817.08	295.93
11.11	450.37	6233.59	4655.01	4517.75	4469.55	6080.08	5403.39	295.93
11.11	424.26	5131.12	3852.93	3744.58	3703.52	4958.32	4480.31	295.93
11.11	413.15	4667.98	3513.48	3416.73	3378.83	4492.56	4088.70	295.93
11.11	394.82	3932.80	2972.18	2893.29	2860.58	3758.63	3463.26	295.37
11.11	371.48	2984.27	2266.81	2209.44	2183.88	2826.99	2645.59	295.37
11.11	359.82	2515.93	1915.96	1868.67	1846.79	2372.61	2237.92	295.37
11.11	352.04	2205.89	1682.74	1641.90	1622.54	2073.92	1966.57	295.37
11.11	346.48	1964.33	1500.13	1464.13	1446.77	1843.18	1753.77	295.93
11.11	342.04	1788.67	1367.33	1334.84	1318.95	1675.40	1599.00	295.93
11.11	338.71	1657.30	1267.84	1237.94	1223.16	1550.30	1483.01	295.93
11.11	335.37	1547.43	1184.81	1157.12	1143.25	1445.27	1386.26	295.37
11.11	333.15	1460.25	1118.61	1092.60	1079.48	1362.63	1309.01	295.37
11.11	330.93	1373.20	1052.46	1028.11	1015.73	1280.26	1231.79	295.37
11.11	329.82	1329.74	1019.40	995.88	983.87	1239.18	1193.18	295.37
11.11	328.15	1264.60	969.82	947.54	936.10	1177.69	1135.29	295.37
11.11	327.04	1221.22	936.79	915.32	904.26	1136.79	1096.71	295.37
11.11	326.48	1199.55	920.28	899.21	888.34	1116.36	1077.42	295.37
11.11	325.93	1177.88	903.77	883.11	872.42	1095.95	1058.13	295.37
11.11	325.93	1177.88	903.77	883.11	872.42	1095.95	1058.13	295.37

11.11	325.93	1177.88	903.77	883.11	872.42	1095.95	1058.13	295.37
11.11	325.93	1177.88	903.77	883.11	872.42	1095.95	1058.13	295.37
11.11	324.82	1134.58	870.76	850.90	840.60	1055.18	1019.56	295.37
11.11	323.71	1091.30	837.76	818.70	808.78	1014.48	981.00	295.37
11.11	322.59	1048.07	804.77	786.51	776.97	973.85	942.44	295.37
11.11	322.59	1048.07	804.77	786.51	776.97	973.85	942.44	295.37
11.11	322.04	1026.47	788.28	770.42	761.07	953.56	923.16	295.37
11.11	322.04	1026.47	788.28	770.42	761.07	953.56	923.16	295.37

SUMS							AVERAGE
3543.53	2290.70	81094.74	19643.27	35085.90	52699.81	18127.48	6071.01
Energy Losses (kJ/kg of Dry Fuel)							**Total**
Flue Gas Constituent							**Loss**
CO2	**O2**	**CO**	**N2**	**CH4**	**H2O Comb**	**H2O Fuel MC**	**Rate**
81.62	171.52	2830.44	902.95	1175.03	1480.36	515.79	7157.71
191.64	264.47	1737.93	1565.65	700.13	1611.04	543.12	6613.96
238.07	109.76	911.96	1120.43	381.14	1667.10	550.11	4978.58
256.23	26.46	2020.27	906.89	909.59	1646.75	563.06	6329.24
276.00	36.94	1438.62	983.30	643.21	1678.13	563.50	5619.69
264.73	41.37	1533.02	969.08	684.82	1666.90	561.30	5721.21
249.51	37.32	1708.67	915.06	765.45	1650.01	558.67	5884.68
230.40	49.90	1660.01	901.89	739.47	1636.64	553.18	5771.49
240.29	66.40	573.93	960.72	240.22	1678.00	548.59	4308.15
197.25	103.05	603.99	969.70	236.33	1647.01	538.33	4295.66
183.30	86.97	396.39	866.51	144.86	1643.51	533.98	3855.51
141.04	103.79	1249.28	818.11	519.19	1582.39	527.03	4940.82
95.77	105.42	2189.61	698.70	932.54	1511.90	517.94	6051.89
74.75	89.16	2779.20	579.61	1202.50	1470.67	513.41	6709.31
65.12	79.70	2823.89	513.52	1222.34	1459.95	510.40	6674.92
58.55	69.64	2750.59	453.81	1190.68	1456.40	508.03	6487.70
51.33	64.05	3025.59	412.00	1316.16	1438.63	506.32	6814.07
46.30	59.79	3212.55	381.11	1401.49	1426.25	505.03	7032.52
40.16	56.19	3704.05	351.45	1626.17	1400.34	503.95	7682.31
37.83	54.77	3714.50	338.02	1628.97	1397.65	503.09	7674.84
35.40	50.23	3745.22	312.96	1645.04	1393.62	502.23	7684.71
34.40	47.86	3723.01	300.48	1636.11	1393.33	501.81	7637.00
32.55	46.05	3754.61	287.48	1649.97	1390.13	501.16	7661.95
40.20	36.32	1972.33	264.83	846.98	1470.14	500.73	5131.53
40.65	39.43	1732.07	276.08	731.22	1481.21	500.52	4801.18
39.63	39.53	1792.98	273.54	757.85	1477.88	500.31	4881.71
38.72	37.43	1984.01	264.11	848.60	1468.71	500.31	5141.88

36.27	43.01	2500.98	279.77	1076.33	1445.70	500.31	5882.37
34.93	41.84	2783.30	272.90	1207.40	1432.46	500.31	6273.13
33.63	41.29	2785.66	266.47	1206.96	1431.27	499.88	6265.15
31.12	40.37	3065.07	256.37	1333.84	1417.24	499.45	6643.45
32.00	38.29	2564.78	248.60	1105.79	1439.00	499.02	5927.49
32.63	37.38	2414.99	246.48	1038.86	1445.75	499.02	5715.11
30.22	36.21	2833.79	236.63	1231.33	1425.73	498.81	6292.72
31.29	38.79	2577.46	248.09	1109.31	1438.03	498.81	5941.76

SUMS						
30833	12626	18207.22	75153	12626	868.99	69.08
Total Loss	**Chemical Loss 1**	**Sensible and Latent Loss**	**Total Output**	**Chem Loss 2**	**Grams Produced**	
					CO	**HC**
0	0	0.00	0	0	0.00	0.00
4376	1594	2782.37	8731	1594	112.15	8.28
2541	651	1890.05	7570	651	45.32	3.47
3829	1744	2084.97	8155	1744	118.58	9.81
3293	1200	2093.13	8316	1200	81.79	6.72
3028	1156	1872.92	7458	1156	78.77	6.46
2781	1152	1629.62	6581	1152	78.44	6.45
2182	895	1287.62	5308	895	61.05	4.99
1140	213	927.58	4103	213	14.79	1.14
812	157	654.97	2933	157	11.15	0.80
510	71	439.32	2111	71	5.13	0.34
467	166	301.27	1406	166	11.57	0.88
458	235	223.05	1040	235	16.26	1.26
381	225	155.91	743	225	15.49	1.22
252	152	100.11	497	152	10.50	0.83
245	148	96.91	504	148	10.24	0.81
258	164	94.11	491	164	11.27	0.89
266	174	92.06	483	174	11.97	0.95
290	201	89.60	459	201	13.80	1.10
435	302	133.18	688	302	20.76	1.66
291	203	87.36	458	203	13.96	1.12
144	101	43.35	230	101	6.94	0.56
290	204	85.91	459	204	14.00	1.12
291	159	131.56	832	159	11.03	0.86
272	139	132.96	851	139	9.69	0.74
185	96	88.38	564	96	6.69	0.51
194	107	87.59	555	107	7.40	0.58

222	135	87.50	527	135	9.33	0.73
237	151	86.68	512	151	10.38	0.82
237	151	86.29	512	151	10.39	0.82
126	83	42.63	249	83	5.72	0.45
112	69	42.82	262	69	4.78	0.38
216	130	85.79	533	130	9.01	0.71
357	230	126.85	767	230	15.86	1.25
112	70	42.79	262	70	4.81	0.38

Dirigo Laboratories, Inc.

Manufacturer:	**Pacific Energy**
Model:	**Super (Series E)**
Date:	**3/16/2017**
Run:	**1C**
Control #:	**034-S-076-1**
Test Duration:	**340**
Output Category:	**2**

	HHV Basis	LHV Basis	
Overall Efficiency	70.8%	76.5%	
Combustion Efficiency	88.0%	88.0%	
Heat Transfer Efficiency	80.4%	86.9%	
HHV Output Rate (kJ/h)	13,196	12,518	**(Btu/h)**
Burn Rate (kg/h)	0.94	2.07	**(lb/h)**
Input (kJ/h)	18,637	17,679	**(Btu/h)**
Test Load Weight (dry kg)	5.3	11.8	**dry lb**
MC wet (%)	16.67		
MC dry (%)	20.00		
Particulate (g)	13.72		
CO (g)	869		
Test Duration (h)	5.666666667		

Emissions	**Particulate**	**CO**
g/MJ Output	0.18	11.62
g/kg Dry Fuel	2.57	163.00
g/h	2.42	153.35
lb/MM Btu Output	0.43	27.01

Air/Fuel Ratio (A/F)	9.51

Test Results in Accordance with CSA B415.1-10

Fuel Load Information

Project Number	Client	Date
034-S-076-1	Pacific Energy	3/7/2017

Firebox Volume (ft^3)	2.15	Assessment	No

Longest useable measurement parallel or perpendicular to front of unit.	20.75"

Test Fuel Charge Range	**13.5** - **16.5lbs**
Coal bed range (lbs)	**3.10** - **3.5lbs**

Vol ≤ 1.5 ft^3	**Vol > 1.5 ≤ 3.0 ft^3**	**Vol > 3.0 ft^3**
		
		
Fuel Piece Length	**15.50 Inches**	

Run # 1C

Test Run Fuel Moisture (db) — Hydronic Heater

Weight Without Cleats (Lbs)

Piece	S1	S2	S3	S4	S5	S6	AVG (%)		Fuel	
1	19.0	20.8	19.9					**19.9**		**3.77**
2	20.9	20.8	19.7					**20.5**		**3.37**
3	20.6	19.9	20.4					**20.3**		**2.01**
4	20.3	19.0	19.1					**19.5**		**1.76**
5	19.2	19.0	19.4					**19.2**		**1.41**
6										
7										
8										
9										
10										
11										
12										
13										
14										
15										
Spacer Average	20.5				Fuel Average			**20.0**	**Total:**	**14.1lbs**

Fuel Load Density: 6.56 lb/ft3

Signature

Date

Fuel Load Information

Project Number	Client	Date
034-S-076-1	Pacific Energy	3/8/2017

Firebox Volume (ft^3)	2.15	Assessment	No

Longest useable measurement parallel or perpendicular to front of unit.	20.75"

Test Fuel Charge Range	**13.5** - **16.5lbs**
Coal bed range (lbs)	**3.10** - **3.50**

Vol ≤ 1.5 ft^3	**Vol > 1.5 ≤ 3.0 ft^3**	**Vol > 3.0 ft^3**
		
		

Fuel Piece Length	**15.50 Inches**

Run # 2

Test Run Fuel Moisture (db)

Weight Without Cleats (Lbs)

Piece	S1	S2	S3	S4	Hydronic Heater S5	Hydronic Heater S6	AVG (%)		Fuel	
1	20.0	20.0	20.0					**20.0**		**3.24**
2	20.1	21.2	20.8					**20.7**		**3.84**
3	20.6	20.1	22.2					**21.0**		**1.52**
4	21.7	20.4	21.1					**21.1**		**1.83**
5	20.0	20.8	20.6					**20.5**		**1.79**
6										
7										
8										
9										
10										
11										
12										
13										
14										
15										
Spacer Average	19				Fuel Average			**20.4**		14.0

Fuel Load Density: 6.51 lb/ft3

Signature

Date

Fuel Load Information

Project Number	Client	Date
034-S-076-1	Pacific Energy	3/9/2017

Firebox Volume (ft^3)	2.15	Assessment	No

Longest useable measurement parallel or perpendicular to front of unit.	20.75"

Test Fuel Charge Range	**13.5** - **16.5lbs**
Coal bed range (lbs)	**2.80** - **3.50**

Vol ≤ 1.5 ft^3	**Vol > 1.5 ≤ 3.0 ft^3**	**Vol > 3.0 ft^3**
		
		
Fuel Piece Length	**15.50 Inches**	

Run # 3

Test Run Fuel Moisture (db)

Weight Without Cleats (Lbs)

Piece	S1	S2	S3	S4	Hydronic Heater S5	Hydronic Heater S6	AVG (%)		Fuel	
1	19.2	19.2	20.0					**19.5**		**3.48**
2	20.0	20.3	20.1					**20.1**		**3.48**
3	23.2	23.1	20.6					**22.3**		**1.54**
4	20.1	20.4	20.4					**20.3**		**1.81**
5	20.6	20.1	22.6					**21.1**		**1.87**
6										
7										
8										
9										
10										
11										
12										
13										
14										
15										
Spacer Average	21.5				Fuel Average			**20.8**	**Total:**	**14.0lbs**

Fuel Load Density: 6.51 lb/ft3

Signature

Date

Fuel Load Information

Project Number	Client	Date
034-S-076-1	Pacific Energy	3/10/2017

Firebox Volume (ft^3)	2.15	Assessment	No

Longest useable measurement parallel or perpendicular to front of unit.	20.75"

Test Fuel Charge Range	**13.5** - **16.5lbs**
Coal bed range (lbs)	**2.90** - **3.50**

Vol ≤ 1.5 ft^3	**Vol > 1.5 ≤ 3.0 ft^3**	**Vol > 3.0 ft^3**
		
		
Fuel Piece Length	**15.50 Inches**	

Run # 4

Test Run Fuel Moisture (db) — Hydronic Heater

Weight Without Cleats (Lbs)

Piece	S1	S2	S3	S4	S5	S6	AVG (%)		Fuel	
1	21.5	19.8	22.8					**21.4**		**3.46**
2	19.1	19.4	21.0					**19.8**		**3.97**
3	22.6	22.7	22.0					**22.4**		**1.76**
4	19.0	19.5	19.3					**19.3**		**1.68**
5	20.4	19.2	19.0					**19.5**		**1.72**
6										
7										
8										
9										
10										
11										
12										
13										
14										
15										
Spacer Average	22				Fuel Average			**20.7**	**Total:**	**14.4lbs**

Fuel Load Density: 6.70 lb/ft3

Signature _____ Date _____

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Fuel Load Information

Project Number	Client	Date
034-S-076-1	Pacific Energy	3/11/2017

Firebox Volume (ft^3)	2.15	Assessment	No

Longest useable measurement parallel or perpendicular to front of unit.	20.75"

Test Fuel Charge Range	**13.5** - **16.5lbs**
Coal bed range (lbs)	**2.90** - **3.50**

Vol ≤ 1.5 ft^3	**Vol > 1.5 ≤ 3.0 ft^3**	**Vol > 3.0 ft^3**
		
		
Fuel Piece Length	**15.50 Inches**	

Run # 5

Test Run Fuel Moisture (db)

Weight Without Cleats (Lbs)

Piece	S1	S2	S3	S4	Hydronic Heater S5	Hydronic Heater S6	AVG (%)		Fuel	
1	20.8	19.3	20.8					**20.3**		**3.46**
2	19.7	19.9	20.3					**20.0**		**3.48**
3	19.0	19.0	19.0					**19.0**		**1.70**
4	20.1	19.9	19.8					**19.9**		**1.87**
5	19.4	19.4	19.8					**19.5**		**1.85**
6										
7										
8										
9										
10										
11										
12										
13										
14										
15										
Spacer Average	19.5				Fuel Average			**19.7**	**Total:**	**14.0lbs**

Fuel Load Density: 6.51 lb/ft3

Signature

Date

DIRIGO LABORATORIES INC.

Client:	Pacific Energy
Model:	Super (Series E)
Tracking No.:	76
Project No.:	034-S-076-1
Test Dates:	2/28/17 - 3/11/17

Run Number	(kg/hr) Burn Rate	(g/hr) Emmisions Rate
1C	0.94	2.4
2	1.13	1.2
3	1.50	1.9
4	2.95	1.4

Total Runs: 4

EPA Method 28 - Weighted Average

DIRIGO LABORATORIES INC.

Weighted Average: 1.80 (g/hr)

Client:	Pacific Energy
Model:	Super (Series E)
Tracking No.:	76
Project No.:	034-S-076-1
Test Dates:	2/28/17 - 3/11/17

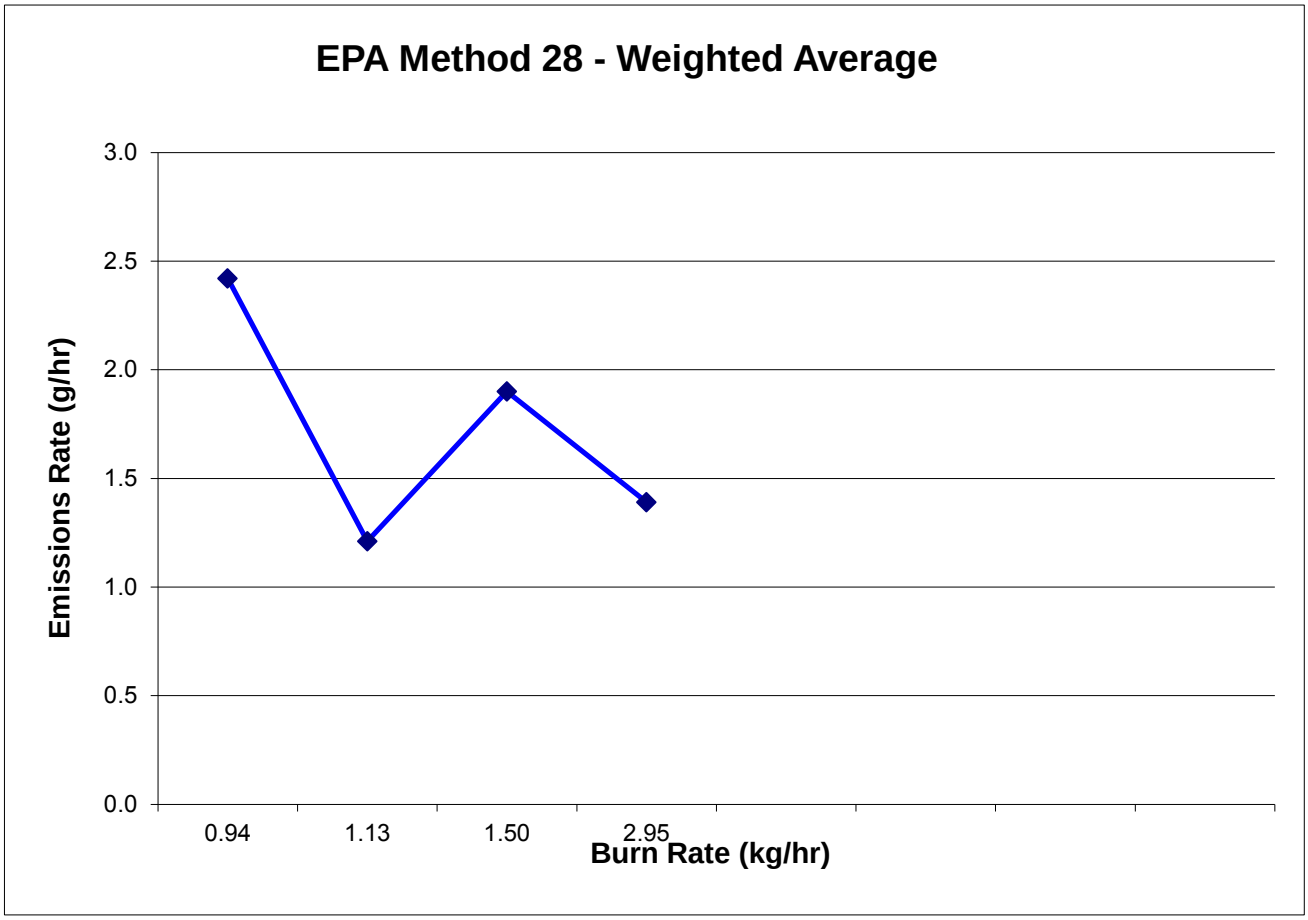
Burn Rate Category	2	Burn Rate Category	2
Burn Rate (kg/hr-dry)	0.94	Burn Rate (kg/hr-dry)	1.13
Emissions Rate (g/hr)	2.4	Emissions Rate (g/hr)	1.2
Emissions Rate Cap (g/hr)	15	Emissions Rate Cap (g/hr)	15
Weighting Factor	28.77%	Weighting Factor	25.73%
Run Number	1C	Run Number	2

Burn Rate Category	3	Burn Rate Category	4
Burn Rate (kg/hr-dry)	1.50	Burn Rate (kg/hr-dry)	2.95
Emissions Rate (g/hr)	1.9	Emissions Rate (g/hr)	1.4
Emissions Rate Cap (g/hr)	15	Emissions Rate Cap (g/hr)	18
Weighting Factor	30.45%	Weighting Factor	15.05%
Run Number	3	Run Number	4

EPA Method 28 - Weighted Average

DIRIGO LABORATORIES INC.

Client: Pacific Energy
Model: Super (Series E)
Tracking No.: 76
Project No.: 034-S-076-1
Test Dates: 2/28/17 - 3/11/17



DIRIGO LABORATORIES INC.

Test No.	Burn Rate	Pi	Ei	Ki	KiEi
1C	0.94	0.322	2.4	0.478	1.16
2	1.13	0.478	1.2	0.428	0.52
3	1.50	0.750	1.9	0.506	0.96
4	2.95	0.984	1.4	0.250	0.35
0	5.00	1.000	0.0	0.000	0.00
0	5.00	1.000	0.0	0.000	0.00
0	5.00	1.000	0.0	0.000	0.00
0	5.00	1.000	0.0	0.000	0.00
		1.000		1.662	2.98

Nomenclature:
Pi = Probability for burn rate during test run
Ei = Emissions Rate for test run
Ki = Test run weighting factor

Burn Rate (kg/hr-dry)	Cum. Probability (P)
0.00	0.0000
0.01	0.0004
0.02	0.0008
0.03	0.0012
0.04	0.0016
0.05	0.0020
0.06	0.0030
0.07	0.0040
0.08	0.0050
0.09	0.0060
0.10	0.0070
0.11	0.0080
0.12	0.0090
0.13	0.0100
0.14	0.0110
0.15	0.0120
0.16	0.0128
0.17	0.0136
0.18	0.0144
0.19	0.0152
0.20	0.0160
0.21	0.0170
0.22	0.0180
0.23	0.0190
0.24	0.0200
0.25	0.0210
0.26	0.0224
0.27	0.0238
0.28	0.0252
0.29	0.0266
0.30	0.0280
0.31	0.0290
0.32	0.0300
0.33	0.0310

PREBURN

JOB # 034-S-076-1
TECHNICIAN BTN
DATE: 3_11_17
RUN #: EPA5
READING INTERVAL: 10
.
Run Time: 80

Model Designation PACIFIC_SUPERe

	Tunnel Traverse Information								
	Pt.1	Pt.2	Pt.3	Pt.4	Pt.5	Pt.6	Pt.7	Pt.8	
dP	0.032	0.044	0.042	0.038	0.039	0.042	0.044	0.036	0.040
Temperature	120	120	120	120	120	120	120	120	120.000

			1	2	3	4	5	
			TEMPERATURES					
ET	SCALE READING	FLUE DRAFT	LEFT SIDE	RIGHT SIDE	BACK	TOP	BOTTOM	STOVE AVG T
0	6.5	-0.083	635	568	577	958	445	636.6
10	4.7	-0.068	624	578	567	817	434	604
20	4.2	-0.05	612	562	547	695	423	567.8
30	3.9	-0.045	598	546	538	579	408	533.8
40	3.7	-0.039	569	523	517	507	397	502.6
50	3.5	-0.03	542	500	494	460	386	476.4
60	3.4	-0.031	515	478	471	426	379	453.8
70	3.2	-0.028	491	457	449	399	370	433.2
80	3.1	-0.024	458	430	425	371	363	409.4

Dilution Tunnel MW(dry):	29.00	lb/lb-mole
Dilution Tunnel MW(wet):	28.78	lb/lb-mole
Dilution Tunnel H2O:	2.00	%
Dilution Tunnel Static:	-0.400	In H20
Tunnel Area:	0.196	ft^2
Pitot Tube Cp:	0.99	

Tunnel Velocity:	13.52654	ft/sec.
Intial Tunnel Flow:	145.2675	scfm
Average Tunnel Flow:	149.6887	scfm

Run #	EPA5
Date:	3/11/17

Dilution Tunnel MW(dry):	29.00	lb/lb-mole
Dilution Tunnel MW(wet):	28.78	lb/lb-mole
Dilution Tunnel H2O:	2.00	%
Dilution Tunnel Static:	-0.400	In H20
Tunnel Area:	0.196	ft^2
Pitot Tube Cp:	0.99	

Dilution Tunnel Traverse Data									
	Pt.1	Pt.2	Pt.3	Pt.4	Pt.5	Pt.6	Pt.7	Pt.8	
dP	0.032	0.044	0.042	0.038	0.039	0.042	0.044	0.036	0.040
Temperature	120	120	120	120	120	120	120	120	120.000

Tunnel Velocity:	13.527	ft/sec.
Intial Tunnel Flow:	145.27	scfm
Average Tunnel Flow	149.69	scfm

JOB #	034-S-076-1															
TECHNICIA	BTN						ROOM TEMP (F)		71.0				BEG	MID	END	AVG
DATE:	3_11_17							BAROMETRIC					30.11	30.11	30.11	30.11
RUN #:	EPA5															
READING INTERVAL:	10															
SAMPLE BOX :	A	METER Y FACTOR:		1.01					PROBE MATERIAL:				SS			
FRONT FILTER #:	3100&3105				REAR FILTER #	REAR FILTER #:		3101								
FINAL LEAK RATE (CFM):	<0.01	@	19	IN-HG		FINAL LEAK RATE (CFM)		<0.01	@	19	IN-HG					
Run Time:		280		AMBIENT FILTER #:		3104	VOLUME	1476.277	LITERS	FUEL MOISTURE DB				19.7	%	
				FINAL LEAK RATE (CFM):		<0.01	@	18	IN-HG							
TEST START TIME:		13:48							1	2	3	4	5	6		
									TEMPERATURES							
	GAS METER	SAMPLE	TUNNEL	ORIFICE	FILTER	TUNNEL VEL	Proportional	Scale	Weight	TUNNEL	FLUE	FILTER	FB REAR	FB	METER	AMBIENT
ET	VOLUME	RATE(FT3/MIN)	DELTA P	DELTA H	VAC	FT/SEC	Rate (%)	Weight	Chg	TEMP	TEMP	TEMP	TEMP	INT	TEMP	TEMP
0	0.000	0.000	0.04	0	-0.03		NA	14	0	93	229	70	404	4156.33	73	70
10	1.370	0.137	0.04	2	-1.11	13.502	101	13.1	0.9	95	306	75	366	4157.02	74	70
20	2.758	0.139	0.04	2.04	-0.94	13.489	102	12.5	0.6	94	315	76	325	4157.52	77	70
30	4.155	0.140	0.04	2.01	-0.65	13.489	102	11.6	0.9	94	331	76	296	4157.97	81	70
40	5.555	0.140	0.04	2.02	-0.92	13.562	102	10.6	1	100	424	77	280	4158.41	84	70
50	6.956	0.140	0.04	2.01	-1.14	13.635	102	9	1.6	106	480	78	288	4158.75	87	71
60	8.364	0.141	0.04	2.01	-1.13	13.659	102	7.7	1.3	108	490	79	306	4159.12	89	71
70	9.771	0.141	0.04	2.02	-1.56	13.695	102	6.2	1.5	111	490	80	331	4159.55	91	71
80	11.188	0.142	0.04	2.02	-0.73	13.695	102	4.7	1.5	111	486	80	356	4159.89	93	71
90	12.600	0.141	0.04	2.02	-1.2	13.647	101	3.6	1.1	107	447	80	384	4160.2	94	72
100	14.020	0.142	0.04	2.03	-1.06	13.586	101	3.1	0.5	102	379	79	409	4160.51	95	72
110	15.437	0.142	0.04	2.02	-1.46	13.538	101	2.6	0.5	98	339	79	421	4160.8	96	72
120	16.860	0.142	0.04	2.02	-0.97	13.514	101	2.4	0.2	96	321	78	425	4161.07	97	72
130	18.281	0.142	0.04	2.02	-1.53	13.477	100	2.1	0.3	93	284	77	421	4161.3	98	72
140	19.706	0.143	0.04	2.02	-1.49	13.453	100	1.9	0.2	91	260	77	414	4161.54	98	72
150	21.125	0.142	0.04	2.03	-1.1	13.441	100	1.7	0.2	90	246	77	404	4161.8	98	72
160	22.549	0.142	0.04	2.05	-1.32	13.428	100	1.6	0.1	89	235	76	393	4161.94	99	71
170	23.971	0.142	0.04	2.01	-0.88	13.404	99	1.4	0.2	87	227	76	383	4162.06	99	71
180	25.394	0.142	0.04	2.03	-1.57	13.404	99	1.3	0.1	87	218	76	373	4162.2	99	71
190	26.820	0.143	0.04	2.04	-1.47	13.392	100	1.2	0.1	86	213	75	364	4162.21	99	71
200	28.241	0.142	0.04	2.03	-1.45	13.379	99	1	0.2	85	208	75	356	4162.22	99	71
210	29.670	0.143	0.04	2.03	-1.31	13.379	100	0.9	0.1	85	205	75	351	4162.26	99	71
220	31.094	0.142	0.04	2.01	-0.88	13.367	99	0.8	0.1	84	203	75	349	4162.26	99	71
230	32.514	0.142	0.04	2.02	-0.73	13.367	99	0.6	0.2	84	202	74	348	4162.23	99	71
240	33.930	0.142	0.04	2.01	-1.2	13.367	99	0.5	0.1	84	199	74	349	4162.15	99	71
250	35.350	0.142	0.04	2.02	-1	13.367	99	0.4	0.1	84	196	74	344	4162.15	99	71
260	36.767	0.142	0.04	1.99	-0.65	13.355	99	0.3	0.1	83	194	74	338	4162.05	99	70
270	38.187	0.142	0.04	2.02	-1.3	13.355	99	0.2	0.1	83	191	74	334	4162	99	71

TEST START TIME:		13:48								1	2	3	4	5	6	
										TEMPERATURES						
	GAS METER	SAMPLE	TUNNEL	ORIFICE	FILTER	TUNNEL VEL	Proportional	Scale	Weight	TUNNEL	FLUE	FILTER	FB REAR	FB	METER	AMBIENT
ET	VOLUME	RATE(FT3/MIN)	DELTA P	DELTA H	VAC	FT/SEC	Rate (%)	Weight	Chg	TEMP	TEMP	TEMP	TEMP	INT	TEMP	TEMP
280	39.605	0.142	0.04	2	-1.36	13.343	99	0	0.2	82	189	74	329	4162.08	99	71

TEST START TIME:		13:48								1	2	3	4	5	6	
										TEMPERATURES						
	GAS METER	SAMPLE	TUNNEL	ORIFICE	FILTER	TUNNEL VEL	Proportional	Scale	Weight	TUNNEL	FLUE	FILTER	FB REAR	FB	METER	AMBIENT
ET	VOLUME	RATE(FT3/MIN)	DELTA P	DELTA H	VAC	FT/SEC	Rate (%)	Weight	Chg	TEMP	TEMP	TEMP	TEMP	INT	TEMP	TEMP
	39.605		0.040	2.02		13.475	100.3			93	293				94	71

JOB #	034-S-076-1										
TECHNICIAN	BTN										
DATE:	3_11_17										
RUN #:	EPA5										
READING INTERVAL:	10										
SAMPLE BOX :	*B*	METER Y FACTOR:		1.002			PROBE MATERIAL:			**SS**	
FRONT FILTER #:	3102					REAR FILTER #:	3103				
FINAL LEAK RATE (CFM):	<0.01	@	18	IN-HG		FINAL LEAK RATE (CFM):	<0.01	@	18	IN-HG	

Run Time: 280 **Firebox Delta T** **76.4**

							1	2	3	4	5	6	
							TEMPERATURES						
ET	GAS METER VOLUME	SAMPLE RATE(FT3/MIN)	PROPORTIONAL RATE	FLUE DRAFT	ORIFICE DELTA H	FILTER VAC	LEFT SIDE	RIGHT SIDE	FILTER	FB TOP	FB BOT	METER	STOVE AVG T
0	0	0	NA	0	0	-1	432	409	70	352	354	72	390
10	1.353	0.135	101	-0.04	1.98	-1.84	392	372	74	379	342	73	370
20	2.717	0.136	101	-0.04	1.99	-1.44	360	332	75	388	329	76	347
30	4.087	0.137	101	-0.04	1.96	-1.83	340	303	76	423	315	79	335
40	5.461	0.137	101	-0.06	2	-1.89	337	289	77	479	303	83	338
50	6.843	0.138	102	-0.06	1.99	-1.43	358	297	78	600	292	86	367
60	8.227	0.138	102	-0.07	1.99	-1.99	387	314	78	650	283	88	388
70	9.614	0.139	102	-0.07	1.99	-1.3	419	336	79	681	277	90	409
80	11.005	0.139	102	-0.06	1.98	-1.94	449	360	80	698	274	91	427
90	12.400	0.140	102	-0.06	1.99	-1.36	475	384	79	684	273	93	440
100	13.795	0.140	101	-0.05	1.98	-2.01	485	401	79	623	274	94	438
110	15.189	0.139	100	-0.05	1.97	-1.94	482	412	78	551	277	95	429
120	16.587	0.140	100	-0.04	1.98	-1.62	476	416	78	512	281	95	422
130	17.989	0.140	100	-0.04	1.97	-1.45	466	413	77	470	285	96	411
140	19.388	0.140	100	-0.03	1.99	-1.88	455	405	77	425	288	96	397
150	20.788	0.140	100	-0.03	1.99	-1.82	441	397	76	395	291	97	386
160	22.191	0.140	100	-0.03	1.98	-1.4	427	387	76	373	291	97	374
170	23.592	0.140	99	-0.03	1.99	-1.32	416	377	75	357	291	97	365
180	24.993	0.140	99	-0.03	1.98	-1.96	405	369	75	342	290	97	356
190	26.398	0.141	100	-0.03	1.98	-1.67	395	362	75	329	289	98	348
200	27.799	0.140	99	-0.03	1.98	-1.31	386	355	75	319	286	98	340

							1	2	3	4	5	6	
							TEMPERATURES						
ET	GAS METER VOLUME	SAMPLE RATE(FT3/MIN)	PROPORTIONAL RATE	FLUE DRAFT	ORIFICE DELTA H	FILTER VAC	LEFT SIDE	RIGHT SIDE	FILTER	FB TOP	FB BOT	METER	STOVE AVG T
210	29.204	0.141	99	-0.02	1.97	-1.73	381	349	75	312	284	98	335
220	30.609	0.141	99	-0.02	1.99	-1.7	378	345	74	307	282	98	332
230	32.010	0.140	99	-0.02	1.98	-1.69	376	343	74	303	280	98	330
240	33.417	0.141	99	-0.02	1.98	-1.7	373	342	74	301	279	98	329
250	34.821	0.140	99	-0.02	1.99	-1.28	365	340	74	295	279	98	325
260	36.225	0.140	99	-0.02	2	-1.62	358	337	74	291	278	98	320
270	37.630	0.141	99	-0.02	1.98	-2.08	353	335	74	287	277	98	317
280	39.034	0.140	99	-0.02	1.99	-1.7	347	334	74	282	277	98	314

							1	2	3	4	5	6	
							TEMPERATURES						
ET	GAS METER VOLUME	SAMPLE RATE(FT3/MIN)	PROPORTIONAL RATE	FLUE DRAFT	ORIFICE DELTA H	FILTER VAC	LEFT SIDE	RIGHT SIDE	FILTER	FB TOP	FB BOT	METER	STOVE AVG T
	39.034	0.139	100.252	-0.036	1.983571	-1.651724	404	359	76	428	290	92	76
	TOTAL	AVG	AVG	AVG	AVG	AVG	AVG	AVG	AVG	AVG	AVG	AVG	DT

Ambient Sample Results:

JOB NUMBER: 034-S-076-1
TECHNICIAN: BTN
DATE: 3_11_17
RUN NUMBER: EPA5

METER Y FACTOR: **0.997**

	Sample Volume (L)	Meter Temp °F	ΔH	ΔP
Start	0	78	0	0
End	1476.277	98	0	0

	SAMPLE INFORMATION	
Total Sample Volume - Vm	1476.277	Liters
Total Sample Volume - Vm	52.134	ft^3
Average Sample Rate	0.19	ft^3/min
Sample Time	280.00	Minutes
Average Meter Temperature	88	°F
Total Sample Volume (Standard Conditions) - Vmstd	50.399	dscf
Total Particulates	0.4	mg
Particulate Concentration (dry-standard)	0.000007937	grams/dscf
Particulate Emission Rate	0.000085714	grams/hour

JOB NUMBER 034-S-076-1

RUN # EPA5

DATE: 3_11_17

BURN RATE 1.14 KG/HR DRY

FILTER A PARTICULATE 14.4 mg

FILTER B PARTICULATE 14.1 mg

	SAMPLE A INFORMATION		SAMPLE B INFORMATION	
Total Sample Volume - Vm	39.61		39.03	
Average Gas Velocity in Dilution Tunnel - vs	13.53	feet/second	13.53	feet/second
Average Gas Flow Rate in Dilution Tunnel - Qsd	8981.32	dscf/hour	8981.32	dscf/hour
Total Sample Volume (Standard Conditions) - Vmstd	38.59	dscf	37.81	dscf
Average Tunnel Temperature	92.8	F	92.8	F
Average Delta p	0.040		0.040	
Average Gas Meter Temperature	94	F	92	F
Average Delta H	2.02	in-h20	1.98	in-h20
Total Time of Test	280	min	280	min
Total Particulates	14.4	mg	14.1	mg
Particulate Concentration (dry-standard)	0.00037	grams/dscf	0.00037	grams/dscf
Ambient Train (dry-standard)	0.000007937	grams/dscf	0.000007937	grams/dscf
Net (dry-standard)	0.000365230	grams/dscf	0.00036493	grams/dscf
Particulate Emission Rate	3.28	grams/hour	3.28	grams/hour
Total PM Emissions	15.31	grams	15.30	grams

Average Total PM Emissions	15.30	grams	
AVERAGE PARTICLATE EMISSIONS RATE	3.28	grams/hour	
% OF AVERAGE	100.0		100.0
Emissions Factor	2.885	g/Kg -Dry	2.883 g/Kg -Dry

PREBURN

JOB # 034-S-076-1
TECHNICIAN BTN
DATE: 3_10_17
RUN #: EPA4
READING INTERVAL: 10
.
Run Time: 60

Model Designation PACIFIC_SUPERe

	Tunnel Traverse Information								
	Pt.1	Pt.2	Pt.3	Pt.4	Pt.5	Pt.6	Pt.7	Pt.8	
dP	0.035	0.043	0.045	0.041	0.039	0.046	0.048	0.036	0.042
Temperature	160	160	160	160	160	160	160	160	160.000

			1	2	3	4	5	
			TEMPERATURES					
ET	SCALE READING	FLUE DRAFT	LEFT SIDE	RIGHT SIDE	BACK	TOP	BOTTOM	STOVE AVG T
0	14.5	-0.072	665	621	606	706	464	612.4
10	10.4	-0.092	592	519	353	743	477	536.8
20	6.9	-0.09	604	490	326	794	461	535
30	4.3	-0.083	618	505	315	776	440	530.8
40	3.7	-0.069	625	514	314	579	422	490.8
50	3.4	-0.061	562	496	289	427	411	437
60	3.1	-0.055	496	450	258	339	402	389

Dilution Tunnel MW(dry):	29.00	lb/lb-mole
Dilution Tunnel MW(wet):	28.78	lb/lb-mole
Dilution Tunnel H2O:	2.00	%
Dilution Tunnel Static:	-0.400	In H20
Tunnel Area:	0.196	ft^2
Pitot Tube Cp:	0.99	

Tunnel Velocity:	14.49717	ft/sec.
Intial Tunnel Flow:	144.1997	scfm
Average Tunnel Flow:	146.65	scfm

Run #	EPA4
Date:	3/10/17

Dilution Tunnel MW(dry):	29.00	lb/lb-mole
Dilution Tunnel MW(wet):	28.78	lb/lb-mole
Dilution Tunnel H2O:	2.00	%
Dilution Tunnel Static:	-0.400	In H20
Tunnel Area:	0.196	ft^2
Pitot Tube Cp:	0.99	

Dilution Tunnel Traverse Data									
	Pt.1	Pt.2	Pt.3	Pt.4	Pt.5	Pt.6	Pt.7	Pt.8	
dP	0.035	0.043	0.045	0.041	0.039	0.046	0.048	0.036	0.042
Temperature	160	160	160	160	160	160	160	160	160.000

Tunnel Velocity:	14.497	ft/sec.
Intial Tunnel Flow:	144.2	scfm
Average Tunnel Flow	146.65	scfm

JOB #	034-S-076-1															
TECHNICIA	BTN							ROOM TEMP (F)		73.3			BEG	MID	END	AVG
DATE:	3_10_17								BAROMETRIC				30.20	30.20	30.20	30.20
RUN #:	EPA4															
READING INTERVAL:		10														
SAMPLE BOX :		A	METER Y FACTOR:		1.01					PROBE MATERIAL:			SS			
FRONT FILTER #:		3094&3099				REAR FILTER #	REAR FILTER #:		3095							
FINAL LEAK RATE (CFM):		<0.01	@	19	IN-HG		FINAL LEAK RATE (CFM)		<0.01	@	19	IN-HG				
Run Time:		110		AMBIENT FILTER #:			3098	VOLUME	580.408	LITERS	FUEL MOISTURE DB			20.7	%	
				FINAL LEAK RATE (CFM):			<0.01	@	18	IN-HG						
TEST START TIME:		13:53								1	2	3	4	5	6	
										TEMPERATURES						
	GAS METER	SAMPLE	TUNNEL	ORIFICE	FILTER	TUNNEL VEL	Proportional	Scale	Weight	TUNNEL	FLUE	FILTER	FB REAR	FB	METER	AMBIENT
ET	VOLUME	RATE(FT3/MIN)	DELTA P	DELTA H	VAC	FT/SEC	Rate (%)	Weight	Chg	TEMP	TEMP	TEMP	TEMP	INT	TEMP	TEMP
0	0.000	0.000	0.042	0.02	-0.05		NA	14.4	0	120	390	75	242	4161.11	75	72
10	1.370	0.137	0.042	2.02	-0.87	14.660	102	12.2	2.2	165	768	87	208	4161.67	76	73
20	2.748	0.138	0.042	2.01	-0.75	14.823	103	9.4	2.8	179	813	89	194	4162.19	80	73
30	4.133	0.139	0.042	2.01	-1.49	14.835	103	6.7	2.7	180	816	89	199	4162.64	83	73
40	5.523	0.139	0.042	2.01	-1.33	14.730	102	4.6	2.1	171	765	88	213	4163.22	87	74
50	6.925	0.140	0.042	2.02	-1.56	14.648	102	3	1.6	164	721	87	232	4163.7	90	74
60	8.328	0.140	0.042	2.02	-1.82	14.483	100	2	1	150	636	88	241	4164.2	92	74
70	9.740	0.141	0.042	2.01	-1.53	14.352	100	1.3	0.7	139	565	89	243	4164.51	94	74
80	11.154	0.141	0.042	2.04	-0.93	14.255	99	0.9	0.4	131	513	88	243	4164.78	96	74
90	12.567	0.141	0.042	2.03	-0.99	14.171	98	0.6	0.3	124	467	86	242	4165.04	97	73
100	13.986	0.142	0.042	2.02	-1.04	14.122	98	0.2	0.4	120	444	85	241	4165.19	98	73
110	15.403	0.142	0.042	2.04	-1.39	14.073	97	0	0.2	116	419	84	240	4165.37	99	73

TEST START TIME:		13:53								1	2	3	4	5	6	
										TEMPERATURES						
ET	GAS METER VOLUME	SAMPLE RATE(FT3/MIN)	TUNNEL DELTA P	ORIFICE DELTA H	FILTER VAC	TUNNEL VEL FT/SEC	Proportional Rate (%)	Scale Weight	Weight Chg	TUNNEL TEMP	FLUE TEMP	FILTER TEMP	FB REAR TEMP	FB INT	METER TEMP	AMBIENT TEMP

TEST START TIME:		13:53								1	2	3	4	5	6	
										TEMPERATURES						
	GAS METER	SAMPLE	TUNNEL	ORIFICE	FILTER	TUNNEL VEL	Proportional	Scale	Weight	TUNNEL	FLUE	FILTER	FB REAR	FB	METER	AMBIENT
ET	VOLUME	RATE(FT3/MIN)	DELTA P	DELTA H	VAC	FT/SEC	Rate (%)	Weight	Chg	TEMP	TEMP	TEMP	TEMP	INT	TEMP	TEMP
	15.403		0.042	2.02		14.468	100.3			147	610				89	73

JOB #	034-S-076-1										
TECHNICIAN	BTN										
DATE:	3_10_17										
RUN #:	EPA4										
READING INTERVAL:	10										
SAMPLE BOX :	*B*	METER Y FACTOR:		1.002			PROBE MATERIAL:			**SS**	
FRONT FILTER #:	3096					REAR FILTER #:	3097				
FINAL LEAK RATE (CFM):	<0.01	@	18	IN-HG		FINAL LEAK RATE (CFM):	<0.01	@	18	IN-HG	

Run Time: 110 **Firebox Delta T** **8.6**

							1	2	3	4	5	6	
							TEMPERATURES						
ET	GAS METER VOLUME	SAMPLE RATE(FT3/MIN)	PROPORTIONAL RATE	FLUE DRAFT	ORIFICE DELTA H	FILTER VAC	LEFT SIDE	RIGHT SIDE	FILTER	FB TOP	FB BOT	METER	STOVE AVG T
0	0	0	NA	0	0	-1	463	422	75	302	395	74	365
10	1.351	0.135	102	-0.08	1.99	-1.38	415	376	86	464	380	75	369
20	2.710	0.136	103	-0.09	1.98	-2.03	432	379	88	667	362	79	407
30	4.074	0.136	103	-0.09	1.96	-1.66	478	405	88	730	347	82	432
40	5.446	0.137	102	-0.09	1.97	-2.03	523	435	86	695	338	85	441
50	6.824	0.138	101	-0.08	1.99	-1.61	552	465	86	653	336	88	448
60	8.205	0.138	100	-0.07	1.97	-1.66	543	482	88	547	341	91	431
70	9.598	0.139	100	-0.07	1.99	-1.78	531	476	88	461	348	93	412
80	10.994	0.140	99	-0.07	2	-1.68	521	457	87	393	359	94	395
90	12.397	0.140	98	-0.06	2	-1.65	506	437	85	345	368	96	380
100	13.797	0.140	98	-0.06	2	-2.23	494	418	84	313	374	97	368
110	15.199	0.140	98	-0.06	2.01	-2.32	473	402	83	291	375	97	356

							1	2	3	4	5	6	
							TEMPERATURES						
ET	GAS METER VOLUME	SAMPLE RATE(FT3/MIN)	PROPORTIONAL RATE	FLUE DRAFT	ORIFICE DELTA H	FILTER VAC	LEFT SIDE	RIGHT SIDE	FILTER	FB TOP	FB BOT	METER	STOVE AVG T

							1	2	3	4	5	6	
							TEMPERATURES						
ET	GAS METER VOLUME	SAMPLE RATE(FT3/MIN)	PROPORTIONAL RATE	FLUE DRAFT	ORIFICE DELTA H	FILTER VAC	LEFT SIDE	RIGHT SIDE	FILTER	FB TOP	FB BOT	METER	STOVE AVG T
	15.199	0.138	100.338	-0.068	1.987273	-1.7525	494	430	85	488	360	88	9
	TOTAL	AVG	AVG	AVG	AVG	AVG	AVG	AVG	AVG	AVG	AVG	AVG	**DT**

Ambient Sample Results:

JOB NUMBER: 034-S-076-1
TECHNICIAN: BTN
DATE: 3_10_17
RUN NUMBER: EPA4

METER Y FACTOR: **0.997**

	Sample Volume (L)	Meter Temp °F	ΔH	ΔP
Start	0	81	0	0
End	580.408	102.5	0	0

	SAMPLE INFORMATION	
Total Sample Volume - Vm	580.408	Liters
Total Sample Volume - Vm	20.497	ft^3
Average Sample Rate	0.19	ft^3/min
Sample Time	110.00	Minutes
Average Meter Temperature	91.75	°F
Total Sample Volume (Standard Conditions) - Vmstd	19.739	dscf
Total Particulates	0.1	mg
Particulate Concentration (dry-standard)	0.000005066	grams/dscf
Particulate Emission Rate	0.000054545	grams/hour

JOB NUMBER 034-S-076-1

RUN # EPA4

DATE: 3_10_17

BURN RATE 2.95 KG/HR DRY

FILTER A PARTICULATE 2.4 mg

FILTER B PARTICULATE 2.5 mg

	SAMPLE A INFORMATION		SAMPLE B INFORMATION	
Total Sample Volume - Vm	15.40		15.20	
Average Gas Velocity in Dilution Tunnel - vs	14.50	feet/second	14.50	feet/second
Average Gas Flow Rate in Dilution Tunnel - Qsd	8799.00	dscf/hour	8799.00	dscf/hour
Total Sample Volume (Standard Conditions) - Vmstd	15.18	dscf	14.89	dscf
Average Tunnel Temperature	146.6	F	146.6	F
Average Delta p	0.042		0.042	
Average Gas Meter Temperature	89	F	88	F
Average Delta H	2.02	in-h20	1.99	in-h20
Total Time of Test	110	min	110	min
Total Particulates	2.4	mg	2.5	mg
Particulate Concentration (dry-standard)	0.00016	grams/dscf	0.00017	grams/dscf
Ambient Train (dry-standard)	0.000005066	grams/dscf	0.000005066	grams/dscf
Net (dry-standard)	0.000153051	grams/dscf	0.00016279	grams/dscf
Particulate Emission Rate	1.35	grams/hour	1.43	grams/hour
Total PM Emissions	2.47	grams	2.63	grams
Average Total PM Emissions		2.55		grams
AVERAGE PARTICLATE EMISSIONS RATE		1.39		grams/hour
% OF AVERAGE	96.9		103.1	
Emissions Factor	0.456	g/Kg -Dry	0.485	g/Kg -Dry

PREBURN

JOB # 034-S-076-1
TECHNICIAN BTN
DATE: 3_9_17
RUN #: EPA3
READING INTERVAL: 10
.
Run Time: 60

Model Designation PACIFIC_SUPERe

	Tunnel Traverse Information								
	Pt.1	Pt.2	Pt.3	Pt.4	Pt.5	Pt.6	Pt.7	Pt.8	
dP	0.033	0.044	0.042	0.040	0.036	0.040	0.039	0.038	0.039
Temperature	120	120	120	120	120	120	120	120	120.000

			1	2	3	4	5	
			TEMPERATURES					
ET	SCALE READING	FLUE DRAFT	LEFT SIDE	RIGHT SIDE	BACK	TOP	BOTTOM	STOVE AVG T
0	7.4	-0.086	577	557	550	860	435	595.8
10	5.3	-0.074	540	518	328	657	427	494
20	3.9	-0.061	527	491	290	576	418	460.4
30	3.5	-0.041	521	473	280	432	405	422.2
40	3.4	-0.035	498	450	265	343	398	390.8
50	3.2	-0.036	471	425	251	296	393	367.2
60	3	-0.029	446	403	240	268	388	349

Dilution Tunnel MW(dry):	29.00	lb/lb-mole
Dilution Tunnel MW(wet):	28.78	lb/lb-mole
Dilution Tunnel H2O:	2.00	%
Dilution Tunnel Static:	-0.400	In H20
Tunnel Area:	0.196	ft^2
Pitot Tube Cp:	0.99	

Tunnel Velocity:	13.37722	ft/sec.
Intial Tunnel Flow:	144.1061	scfm
Average Tunnel Flow:	147.5757	scfm

Run #	EPA3
Date:	3/9/17

Dilution Tunnel MW(dry):	29.00	lb/lb-mole
Dilution Tunnel MW(wet):	28.78	lb/lb-mole
Dilution Tunnel H2O:	2.00	%
Dilution Tunnel Static:	-0.400	In H20
Tunnel Area:	0.196	ft^2
Pitot Tube Cp:	0.99	

Dilution Tunnel Traverse Data									
	Pt.1	Pt.2	Pt.3	Pt.4	Pt.5	Pt.6	Pt.7	Pt.8	
dP	0.033	0.044	0.042	0.040	0.036	0.040	0.039	0.038	0.039
Temperature	120	120	120	120	120	120	120	120	120.000

Tunnel Velocity:	13.377	ft/sec.
Intial Tunnel Flow:	144.11	scfm
Average Tunnel Flow	147.58	scfm

JOB #	034-S-076-1															
TECHNICIA	BTN						ROOM TEMP (F)		69.7				BEG	MID	END	AVG
DATE:	3_9_17							BAROMETRIC					30.08	30.08	30.08	30.08
RUN #:	EPA3															
READING INTERVAL:		10														
SAMPLE BOX :		A	METER Y FACTOR:		1.01				PROBE MATERIAL:				SS			
FRONT FILTER #:		3088&3093				REAR FILTER #	REAR FILTER #:		3089							
FINAL LEAK RATE (CFM):		<0.01	@	19	IN-HG		FINAL LEAK RATE (CFM)		<0.01	@	19	IN-HG				
Run Time:		210		AMBIENT FILTER #:			3092	VOLUME	1109.12	LITERS	FUEL MOISTURE DB			20.8	%	
				FINAL LEAK RATE (CFM):			<0.01	@	18	IN-HG						
TEST START TIME:		14:53								1	2	3	4	5	6	
										TEMPERATURES						

ET	GAS METER VOLUME	SAMPLE RATE(FT3/MIN)	TUNNEL DELTA P	ORIFICE DELTA H	FILTER VAC	TUNNEL VEL FT/SEC	Proportional Rate (%)	Scale Weight	Weight Chg	TUNNEL TEMP	FLUE TEMP	FILTER TEMP	FB REAR TEMP	FB INT	METER TEMP	AMBIENT TEMP
0	0.000	0.000	0.039	0.01	-0.07		NA	14	0	96	264	70	233	4157.8	73	69
10	1.654	0.165	0.039	1.99	-0.69	13.541	122	12.3	1.7	112	497	78	335	4158.11	74	69
20	3.039	0.139	0.039	2.01	-1.43	13.565	102	10.3	2	114	538	80	195	4158.38	77	70
30	4.432	0.139	0.039	2.01	-1.22	13.588	102	8.3	2	116	538	80	182	4158.67	80	70
40	5.827	0.140	0.039	2.02	-1.44	13.553	101	6.5	1.8	113	515	80	183	4158.99	84	70
50	7.236	0.141	0.039	2.02	-0.85	13.529	101	5.1	1.4	111	496	79	188	4159.26	87	70
60	8.650	0.141	0.039	2.03	-0.7	13.470	101	3.9	1.2	106	454	78	196	4159.51	89	70
70	10.065	0.142	0.039	2.03	-0.83	13.410	100	3	0.9	101	402	79	203	4159.74	91	70
80	11.485	0.142	0.039	2.02	-1.5	13.374	100	2.4	0.6	98	377	78	210	4159.89	93	70
90	12.909	0.142	0.039	2.03	-1.43	13.326	100	2	0.4	94	326	77	215	4160.09	94	71
100	14.333	0.142	0.039	2.04	-0.88	13.278	99	1.7	0.3	90	282	76	214	4160.39	95	70
110	15.762	0.143	0.039	2.04	-1.5	13.254	99	1.6	0.1	88	261	76	211	4160.58	96	70
120	17.182	0.142	0.039	2.01	-1.49	13.230	98	1.3	0.3	86	248	75	207	4160.78	97	70
130	18.604	0.142	0.039	2.01	-0.77	13.218	98	1.3	0	85	239	75	203	4160.84	97	70
140	20.021	0.142	0.039	2	-1.47	13.206	98	1	0.3	84	232	74	201	4160.91	98	69
150	21.444	0.142	0.039	1.99	-0.94	13.206	98	0.8	0.2	84	225	74	196	4161.04	98	70
160	22.862	0.142	0.039	2.01	-1.41	13.193	98	0.7	0.1	83	218	74	192	4161.03	98	70
170	24.286	0.142	0.039	2.02	-1.16	13.193	98	0.5	0.2	83	210	74	188	4161.06	98	70
180	25.709	0.142	0.039	2.01	-1.46	13.181	98	0.4	0.1	82	203	73	183	4161.04	99	69
190	27.130	0.142	0.039	2.01	-0.71	13.169	97	0.2	0.2	81	197	73	179	4161.09	99	69
200	28.555	0.143	0.039	2.02	-0.72	13.169	98	0.1	0.1	81	194	73	177	4161.09	99	69
210	29.974	0.142	0.039	2.02	-1.01	13.157	97	0	0.1	80	191	73	175	4160.97	99	69

TEST START TIME:	14:53									1	2	3	4	5	6	
										TEMPERATURES						
	GAS METER	SAMPLE	TUNNEL	ORIFICE	FILTER	TUNNEL VEL	Proportional	Scale	Weight	TUNNEL	FLUE	FILTER	FB REAR	FB	METER	AMBIENT
ET	VOLUME	RATE(FT3/MIN)	DELTA P	DELTA H	VAC	FT/SEC	Rate (%)	Weight	Chg	TEMP	TEMP	TEMP	TEMP	INT	TEMP	TEMP

TEST START TIME:		14:53								1	2	3	4	5	6	
										TEMPERATURES						
	GAS METER	SAMPLE	TUNNEL	ORIFICE	FILTER	TUNNEL VEL	Proportional	Scale	Weight	TUNNEL	FLUE	FILTER	FB REAR	FB	METER	AMBIENT
ET	VOLUME	RATE(FT3/MIN)	DELTA P	DELTA H	VAC	FT/SEC	Rate (%)	Weight	Chg	TEMP	TEMP	TEMP	TEMP	INT	TEMP	TEMP
	29.974		0.039	2.02		13.324	100.3			94	323				92	70

JOB #	034-S-076-1										
TECHNICIAN	BTN										
DATE:	3_9_17										
RUN #:	EPA3										
READING INTERVAL:	10										
SAMPLE BOX :	*B*	METER Y FACTOR:		1.002			PROBE MATERIAL:			**SS**	
FRONT FILTER #:	3090					REAR FILTER #:	3091				
FINAL LEAK RATE (CFM):	<0.01	@	18	IN-HG		FINAL LEAK RATE (CFM):	<0.01	@	18	IN-HG	

Run Time: 210 **Firebox Delta T** **90.8**

							1	2	3	4	5	6	
							TEMPERATURES						
ET	GAS METER VOLUME	SAMPLE RATE(FT3/MIN)	PROPORTIONAL RATE	FLUE DRAFT	ORIFICE DELTA H	FILTER VAC	LEFT SIDE	RIGHT SIDE	FILTER	FB TOP	FB BOT	METER	STOVE AVG T
0	0	0	NA	0	0	-1	427	390	71	253	385	72	338
10	1.359	0.136	103	-0.07	1.98	-1.96	428	399	78	467	378	73	401
20	2.728	0.137	103	-0.07	1.98	-1.48	381	342	80	526	366	76	362
30	4.097	0.137	102	-0.07	1.96	-1.53	383	338	80	563	349	80	363
40	5.470	0.137	102	-0.06	2	-1.29	396	345	80	562	333	83	364
50	6.852	0.138	102	-0.07	1.99	-1.69	412	354	79	551	321	86	365
60	8.239	0.139	101	-0.06	1.99	-1.62	423	364	79	516	313	88	362
70	9.630	0.139	101	-0.06	1.99	-1.54	426	374	78	452	308	90	353
80	11.026	0.140	101	-0.05	1.99	-1.88	429	397	78	407	306	91	350
90	12.423	0.140	100	-0.05	1.98	-1.6	424	403	77	354	307	93	341
100	13.820	0.140	100	-0.04	1.98	-1.4	413	395	76	306	311	94	328
110	15.223	0.140	100	-0.03	1.97	-1.58	398	381	75	272	315	95	315
120	16.624	0.140	99	-0.03	1.97	-1.76	385	367	75	251	318	95	306
130	18.026	0.140	99	-0.03	1.99	-1.9	375	354	74	239	320	96	298
140	19.431	0.141	99	-0.03	1.98	-1.77	366	343	74	231	321	96	292
150	20.833	0.140	99	-0.02	1.98	-2.04	359	331	74	225	321	96	286
160	22.237	0.140	99	-0.03	1.98	-1.46	351	319	74	218	319	97	280
170	23.643	0.141	99	-0.02	1.99	-1.56	340	308	73	210	316	97	272
180	25.048	0.141	99	-0.02	1.97	-1.84	329	297	73	201	312	97	264
190	26.451	0.140	99	-0.01	1.98	-1.57	319	289	73	194	308	97	258
200	27.860	0.141	99	-0.02	1.97	-1.58	310	281	73	188	301	97	251

							1	2	3	4	5	6	
							TEMPERATURES						
ET	GAS METER VOLUME	SAMPLE RATE(FT3/MIN)	PROPORTIONAL RATE	FLUE DRAFT	ORIFICE DELTA H	FILTER VAC	LEFT SIDE	RIGHT SIDE	FILTER	FB TOP	FB BOT	METER	STOVE AVG T
210	29.262	0.140	99	-0.02	1.98	-1.45	303	277	72	184	295	97	247

							1	2	3	4	5	6	
							TEMPERATURES						
ET	GAS METER VOLUME	SAMPLE RATE(FT3/MIN)	PROPORTIONAL RATE	FLUE DRAFT	ORIFICE DELTA H	FILTER VAC	LEFT SIDE	RIGHT SIDE	FILTER	FB TOP	FB BOT	METER	STOVE AVG T
	29.262	0.139	100.215	-0.039	1.980952	-1.613636	381	348	76	335	324	90	91
	TOTAL	AVG	AVG	AVG	AVG	AVG	AVG	AVG	AVG	AVG	AVG	AVG	DT

Ambient Sample Results:

JOB NUMBER: 034-S-076-1
TECHNICIAN: BTN
DATE: 3_9_17
RUN NUMBER: EPA3

METER Y FACTOR: **0.997**

	Sample Volume (L)	Meter Temp °F	ΔH	ΔP
Start	0	76	0	0
End	1109.12	97	0	0

	SAMPLE INFORMATION	
Total Sample Volume - Vm	1109.120	Liters
Total Sample Volume - Vm	39.168	ft^3
Average Sample Rate	0.19	ft^3/min
Sample Time	210.00	Minutes
Average Meter Temperature	86.5	°F
Total Sample Volume (Standard Conditions) - Vmstd	37.931	dscf
Total Particulates	0.2	mg
Particulate Concentration (dry-standard)	0.000005273	grams/dscf
Particulate Emission Rate	0.000057143	grams/hour

JOB NUMBER: 034-S-076-1

RUN #: EPA3

DATE: 3_9_17

BURN RATE: 1.50 KG/HR DRY

FILTER A PARTICULATE: 6.1 mg

FILTER B PARTICULATE: 6.6 mg

	SAMPLE A INFORMATION		SAMPLE B INFORMATION	
Total Sample Volume - Vm	29.97		29.26	
Average Gas Velocity in Dilution Tunnel - vs	13.38	feet/second	13.38	feet/second
Average Gas Flow Rate in Dilution Tunnel - Qsd	8854.54	dscf/hour	8854.54	dscf/hour
Total Sample Volume (Standard Conditions) - Vmstd	29.28	dscf	28.42	dscf
Average Tunnel Temperature	94.0	F	94.0	F
Average Delta p	0.039		0.039	
Average Gas Meter Temperature	92	F	90	F
Average Delta H	2.02	in-h20	1.98	in-h20
Total Time of Test	210	min	210	min
Total Particulates	6.1	mg	6.6	mg
Particulate Concentration (dry-standard)	0.00021	grams/dscf	0.00023	grams/dscf
Ambient Train (dry-standard)	0.000005273	grams/dscf	0.000005273	grams/dscf
Net (dry-standard)	0.000203078	grams/dscf	0.00022695	grams/dscf
Particulate Emission Rate	1.80	grams/hour	2.01	grams/hour
Total PM Emissions	6.29	grams	7.03	grams
Average Total PM Emissions		6.66		grams
AVERAGE PARTICLATE EMISSIONS RATE		1.90		grams/hour
% OF AVERAGE	94.4		105.6	
Emissions Factor	1.197	g/Kg -Dry	1.338	g/Kg -Dry

PREBURN

JOB # 034-S-076-1
TECHNICIAN BTN
DATE: 3_8_17
RUN #: EPA2
READING INTERVAL: 10
.
Run Time: 60

Model Designation PACIFIC_SUPERe

	Tunnel Traverse Information								
	Pt.1	Pt.2	Pt.3	Pt.4	Pt.5	Pt.6	Pt.7	Pt.8	
dP	0.036	0.042	0.044	0.039	0.042	0.042	0.040	0.036	0.040
Temperature	105	105	105	105	105	105	105	105	105.000

			1	2	3	4	5	
			TEMPERATURES					
ET	SCALE READING	FLUE DRAFT	LEFT SIDE	RIGHT SIDE	BACK	TOP	BOTTOM	STOVE AVG T
0	7	-0.081	646	547	552	930	463	627.6
10	5.3	-0.067	580	509	320	676	452	507.4
20	4.2	-0.058	542	483	282	558	440	461
30	3.8	-0.038	522	468	274	442	425	426.2
40	3.6	-0.033	485	446	256	346	410	388.6
50	3.5	-0.027	444	414	234	295	402	357.8
60	3.3	-0.024	410	384	217	259	391	332.2

Dilution Tunnel MW(dry):	29.00	lb/lb-mole
Dilution Tunnel MW(wet):	28.78	lb/lb-mole
Dilution Tunnel H2O:	2.00	%
Dilution Tunnel Static:	-0.400	In H20
Tunnel Area:	0.196	ft^2
Pitot Tube Cp:	0.99	

Tunnel Velocity:	13.47195	ft/sec.
Intial Tunnel Flow:	148.3082	scfm
Average Tunnel Flow:	150.2953	scfm

Run #	EPA2
Date:	3/8/17

Dilution Tunnel MW(dry):	29.00	lb/lb-mole
Dilution Tunnel MW(wet):	28.78	lb/lb-mole
Dilution Tunnel H2O:	2.00	%
Dilution Tunnel Static:	-0.400	In H20
Tunnel Area:	0.196	ft^2
Pitot Tube Cp:	0.99	

Dilution Tunnel Traverse Data									
	Pt.1	Pt.2	Pt.3	Pt.4	Pt.5	Pt.6	Pt.7	Pt.8	
dP	0.036	0.042	0.044	0.039	0.042	0.042	0.040	0.036	0.040
Temperature	105	105	105	105	105	105	105	105	105.000

Tunnel Velocity:	13.472	ft/sec.
Intial Tunnel Flow:	148.31	scfm
Average Tunnel Flow	150.3	scfm

JOB #	034-S-076-1															
TECHNICIA	BTN							ROOM TEMP (F)		71.0			BEG	MID	END	AVG
DATE:	3_8_17								BAROMETRIC				30.15	30.15	30.15	30.15
RUN #:	EPA2															
READING INTERVAL:		10														
SAMPLE BOX :		A	METER Y FACTOR:		1.01					PROBE MATERIAL:			SS			
FRONT FILTER #:		3082&3087				REAR FILTER #	REAR FILTER #:		3083							
FINAL LEAK RATE (CFM):		<0.01	@	19	IN-HG		FINAL LEAK RATE (CFM)		<0.01	@	19	IN-HG				
Run Time:		280		AMBIENT FILTER #:			3086	VOLUME	1479.872	LITERS	FUEL MOISTURE DB			20.4	%	
				FINAL LEAK RATE (CFM):			<0.01	@	18	IN-HG						
TEST START TIME:		13:54								1	2	3	4	5	6	
										TEMPERATURES						
	GAS METER	SAMPLE	TUNNEL	ORIFICE	FILTER	TUNNEL VEL	Proportional	Scale	Weight	TUNNEL	FLUE	FILTER	FB REAR	FB	METER	AMBIENT
ET	VOLUME	RATE(FT3/MIN)	DELTA P	DELTA H	VAC	FT/SEC	Rate (%)	Weight	Chg	TEMP	TEMP	TEMP	TEMP	INT	TEMP	TEMP
0	0.000	0.000	0.04	0.01	0		NA	14	0	92	228	72	208	4161.29	75	71
10	1.370	0.137	0.04	2	-1.51	13.650	102	12.4	1.6	108	446	78	303	4161.37	76	71
20	2.751	0.138	0.04	2.01	-0.77	13.662	103	10.7	1.7	109	490	79	212	4161.36	79	71
30	4.137	0.139	0.04	2.02	-1.25	13.662	102	8.8	1.9	109	481	80	182	4161.48	83	71
40	5.528	0.139	0.04	2.02	-1.28	13.662	102	7.2	1.6	109	471	80	179	4161.56	86	72
50	6.926	0.140	0.04	2.02	-1.2	13.626	102	5.8	1.4	106	458	80	182	4161.7	89	71
60	8.331	0.141	0.04	2.02	-1.21	13.590	102	4.5	1.3	103	422	80	188	4161.86	91	72
70	9.737	0.141	0.04	1.99	-1.16	13.541	101	3.7	0.8	99	369	80	193	4161.96	93	72
80	11.148	0.141	0.04	2.02	-1.24	13.505	101	3.1	0.6	96	336	79	198	4162.12	94	72
90	12.557	0.141	0.04	2.03	-0.78	13.468	100	2.6	0.5	93	307	78	203	4162.14	96	72
100	13.971	0.141	0.04	2.01	-0.85	13.432	100	2.3	0.3	90	277	77	205	4162.25	96	71
110	15.386	0.142	0.04	2	-1.45	13.407	100	2.1	0.2	88	239	76	202	4162.25	97	71
120	16.805	0.142	0.04	2.01	-0.68	13.383	100	1.9	0.2	86	220	76	197	4162.3	98	71
130	18.224	0.142	0.04	2.03	-0.99	13.371	100	1.8	0.1	85	207	75	191	4162.28	98	71
140	19.647	0.142	0.04	2.02	-1.46	13.358	100	1.5	0.3	84	198	75	186	4162.2	98	71
150	21.066	0.142	0.04	2.03	-1.45	13.346	99	1.5	0	83	189	75	181	4162.12	99	71
160	22.491	0.143	0.04	2.01	-1.37	13.334	100	1.3	0.2	82	181	74	177	4162.03	99	71
170	23.911	0.142	0.04	2.03	-1.12	13.321	99	1.2	0.1	81	174	74	171	4161.97	99	71
180	25.340	0.143	0.04	2.03	-1.48	13.321	100	1.1	0.1	81	169	74	166	4161.83	99	71
190	26.760	0.142	0.04	2.03	-0.86	13.321	99	1	0.1	81	163	74	162	4161.73	99	70
200	28.185	0.143	0.04	2.03	-1.46	13.321	100	0.9	0.1	81	159	74	160	4161.61	99	71
210	29.609	0.142	0.04	2.01	-0.62	13.309	99	0.7	0.2	80	156	74	158	4161.56	99	70
220	31.032	0.142	0.04	2.04	-1.15	13.309	99	0.7	0	80	154	73	156	4161.5	99	70
230	32.456	0.142	0.04	2.02	-0.65	13.309	99	0.5	0.2	80	152	73	153	4161.42	99	70
240	33.876	0.142	0.04	2.03	-1.54	13.309	99	0.4	0.1	80	151	73	152	4161.31	99	71
250	35.303	0.143	0.04	2.03	-1.31	13.309	100	0.3	0.1	80	148	73	150	4161.25	99	71
260	36.725	0.142	0.04	2.04	-0.8	13.309	99	0.2	0.1	80	146	73	149	4161.22	99	70
270	38.151	0.143	0.04	2.04	-1.46	13.297	99	0.1	0.1	79	144	73	148	4161.21	99	70

TEST START TIME:		13:54								1	2	3	4	5	6	
										TEMPERATURES						
ET	GAS METER VOLUME	SAMPLE RATE(FT3/MIN)	TUNNEL DELTA P	ORIFICE DELTA H	FILTER VAC	TUNNEL VEL FT/SEC	Proportional Rate (%)	Scale Weight	Weight Chg	TUNNEL TEMP	FLUE TEMP	FILTER TEMP	FB REAR TEMP	FB INT	METER TEMP	AMBIENT TEMP
280	39.576	0.143	0.04	2.04	-1.36	13.297	99	0	0.1	79	141	73	148	4161.08	99	70

TEST START TIME:		13:54								1	2	3	4	5	6	
										TEMPERATURES						
	GAS METER	SAMPLE	TUNNEL	ORIFICE	FILTER	TUNNEL VEL	Proportional	Scale	Weight	TUNNEL	FLUE	FILTER	FB REAR	FB	METER	AMBIENT
ET	VOLUME	RATE(FT3/MIN)	DELTA P	DELTA H	VAC	FT/SEC	Rate (%)	Weight	Chg	TEMP	TEMP	TEMP	TEMP	INT	TEMP	TEMP
	39.576		0.040	2.02		13.419	100.2			89	254				94	71

JOB #	034-S-076-1										
TECHNICIAN	BTN										
DATE:	3_8_17										
RUN #:	EPA2										
READING INTERVAL:	10										
SAMPLE BOX :	*B*	METER Y FACTOR:		1.002			PROBE MATERIAL:			**SS**	
FRONT FILTER #:	3084						REAR FILTER #:	3085			
FINAL LEAK RATE (CFM):	<0.01	@	18	IN-HG			FINAL LEAK RATE (CFM):	<0.01	@	18	IN-HG

Run Time: 280 **Firebox Delta T** **110.6**

							1	2	3	4	5	6	
							TEMPERATURES						
ET	GAS METER VOLUME	SAMPLE RATE(FT3/MIN)	PROPORTIONAL RATE	FLUE DRAFT	ORIFICE DELTA H	FILTER VAC	LEFT SIDE	RIGHT SIDE	FILTER	FB TOP	FB BOT	METER	STOVE AVG T
0	0	0	NA	0	0	-1	389	369	73	243	385	75	319
10	1.359	0.136	102	-0.06	1.99	-1.57	392	381	78	465	375	76	383
20	2.724	0.137	102	-0.07	1.99	-1.43	363	340	79	529	363	79	361
30	4.095	0.137	102	-0.07	2.02	-1.75	358	331	80	544	347	82	352
40	5.480	0.139	103	-0.07	1.99	-1.75	365	331	80	542	331	85	350
50	6.865	0.139	102	-0.06	1.99	-1.6	379	339	80	538	319	88	351
60	8.255	0.139	102	-0.06	1.99	-2.06	395	347	80	511	310	90	350
70	9.650	0.140	102	-0.05	1.98	-1.47	402	356	79	451	305	91	341
80	11.046	0.140	101	-0.05	1.99	-1.65	400	360	78	401	301	93	332
90	12.442	0.140	100	-0.04	1.99	-1.95	396	363	77	371	300	94	327
100	13.844	0.140	100	-0.04	2	-1.54	391	360	77	347	302	95	321
110	15.244	0.140	100	-0.03	1.98	-1.56	381	350	76	285	304	96	304
120	16.645	0.140	100	-0.03	1.99	-2.01	369	339	76	251	306	96	292
130	18.049	0.140	100	-0.02	2	-1.56	356	328	75	233	307	97	283
140	19.453	0.140	100	-0.02	1.99	-1.45	344	318	75	220	306	97	275
150	20.856	0.140	100	-0.02	2	-1.87	332	308	74	209	304	97	267
160	22.262	0.141	100	-0.02	2	-1.76	319	300	74	200	301	97	259
170	23.667	0.141	99	-0.02	1.99	-1.97	308	291	74	192	296	98	252
180	25.071	0.140	99	-0.01	2	-1.41	297	280	73	186	292	98	244
190	26.479	0.141	100	-0.01	1.99	-1.96	288	272	73	179	288	98	238
200	27.882	0.140	99	-0.01	2	-1.95	281	263	73	174	284	98	232

							1	2	3	4	5	6	
							TEMPERATURES						
ET	GAS METER VOLUME	SAMPLE RATE(FT3/MIN)	PROPORTIONAL RATE	FLUE DRAFT	ORIFICE DELTA H	FILTER VAC	LEFT SIDE	RIGHT SIDE	FILTER	FB TOP	FB BOT	METER	STOVE AVG T
210	29.289	0.141	99	-0.01	2	-1.61	276	257	73	169	281	98	228
220	30.694	0.141	99	-0.01	2	-2.03	272	253	73	166	278	98	225
230	32.098	0.140	99	-0.01	1.99	-1.75	269	248	73	163	276	98	222
240	33.505	0.141	99	-0.01	2	-1.59	268	245	73	162	272	98	220
250	34.909	0.140	99	-0.01	2	-1.47	266	244	73	160	270	98	218
260	36.315	0.141	99	-0.01	1.99	-1.44	263	241	73	157	267	98	215
270	37.721	0.141	99	-0.01	2.01	-1.58	258	236	73	154	266	98	212
280	39.125	0.140	99	0	1.99	-1.88	249	230	73	152	262	97	208

							1	2	3	4	5	6	
							TEMPERATURES						
ET	GAS METER VOLUME	SAMPLE RATE(FT3/MIN)	PROPORTIONAL RATE	FLUE DRAFT	ORIFICE DELTA H	FILTER VAC	LEFT SIDE	RIGHT SIDE	FILTER	FB TOP	FB BOT	METER	STOVE AVG T
	39.125	0.140	100.254	-0.029	1.994643	-1.676552	332	306	75	288	303	93	111
	TOTAL	AVG	AVG	AVG	AVG	AVG	AVG	AVG	AVG	AVG	AVG	AVG	**DT**

Ambient Sample Results:

JOB NUMBER: 034-S-076-1
TECHNICIAN: BTN
DATE: 3_8_17
RUN NUMBER: EPA2

METER Y FACTOR: **0.997**

	Sample Volume (L)	Meter Temp °F	ΔH	ΔP
Start	0	80	0	0
End	1479.872	97.5	0	0

	SAMPLE INFORMATION	
Total Sample Volume - Vm	1479.872	Liters
Total Sample Volume - Vm	52.261	ft^3
Average Sample Rate	0.19	ft^3/min
Sample Time	280.00	Minutes
Average Meter Temperature	88.75	°F
Total Sample Volume (Standard Conditions) - Vmstd	50.520	dscf
Total Particulates	0.4	mg
Particulate Concentration (dry-standard)	0.000007918	grams/dscf
Particulate Emission Rate	0.000085714	grams/hour

JOB NUMBER 034-S-076-1

RUN # EPA2

DATE: 3_8_17

BURN RATE 1.13 KG/HR DRY

FILTER A PARTICULATE 5.6 mg

FILTER B PARTICULATE 5.3 mg

	SAMPLE A INFORMATION		SAMPLE B INFORMATION	
Total Sample Volume - Vm	39.58		39.13	
Average Gas Velocity in Dilution Tunnel - vs	13.47	feet/second	13.47	feet/second
Average Gas Flow Rate in Dilution Tunnel - Qsd	9017.72	dscf/hour	9017.72	dscf/hour
Total Sample Volume (Standard Conditions) - Vmstd	38.56	dscf	37.89	dscf
Average Tunnel Temperature	89.1	F	89.1	F
Average Delta p	0.040		0.040	
Average Gas Meter Temperature	94	F	93	F
Average Delta H	2.02	in-h20	1.99	in-h20
Total Time of Test	280	min	280	min
Total Particulates	5.6	mg	5.3	mg
Particulate Concentration (dry-standard)	0.00015	grams/dscf	0.00014	grams/dscf
Ambient Train (dry-standard)	0.000007918	grams/dscf	0.000007918	grams/dscf
Net (dry-standard)	0.000137324	grams/dscf	0.00013197	grams/dscf
Particulate Emission Rate	1.24	grams/hour	1.19	grams/hour
Total PM Emissions	5.78	grams	5.55	grams
Average Total PM Emissions		5.67		grams
AVERAGE PARTICLATE EMISSIONS RATE		1.21		grams/hour
% OF AVERAGE	102.0		98.0	
Emissions Factor	1.096	g/Kg -Dry	1.053	g/Kg -Dry

PREBURN

JOB # 034-S-076-1
TECHNICIAN BTN
DATE: 3_7_17
RUN #: EPA1C
READING INTERVAL: 10
.
Run Time: 60

Model Designation PACIFIC_SUPERe

	Tunnel Traverse Information								
	Pt.1	Pt.2	Pt.3	Pt.4	Pt.5	Pt.6	Pt.7	Pt.8	
dP	0.036	0.042	0.044	0.038	0.040	0.042	0.038	0.036	0.040
Temperature	100	100	100	100	100	100	100	100	100.000

			1	2	3	4	5	
			TEMPERATURES					
ET	SCALE READING	FLUE DRAFT	LEFT SIDE	RIGHT SIDE	BACK	TOP	BOTTOM	STOVE AVG T
0	6.7	-0.082	599	581	571	875	448	614.8
10	4.9	-0.062	548	536	340	622	438	496.8
20	4	-0.048	502	487	282	530	427	445.6
30	3.6	-0.031	467	451	261	388	407	394.8
40	3.5	-0.022	432	414	242	301	391	356
50	3.5	-0.018	401	384	227	256	379	329.4
60	3.4	-0.011	376	358	215	227	368	308.8

Dilution Tunnel MW(dry):	29.00	lb/lb-mole
Dilution Tunnel MW(wet):	28.78	lb/lb-mole
Dilution Tunnel H2O:	2.00	%
Dilution Tunnel Static:	-0.400	In H20
Tunnel Area:	0.196	ft^2
Pitot Tube Cp:	0.99	

Tunnel Velocity:	13.4383	ft/sec.
Intial Tunnel Flow:	147.6786	scfm
Average Tunnel Flow:	150.6716	scfm

Run #	EPA1C
Date:	3/7/17

Dilution Tunnel MW(dry):	29.00	lb/lb-mole
Dilution Tunnel MW(wet):	28.78	lb/lb-mole
Dilution Tunnel H2O:	2.00	%
Dilution Tunnel Static:	-0.400	In H20
Tunnel Area:	0.196	ft^2
Pitot Tube Cp:	0.99	

Dilution Tunnel Traverse Data									
	Pt.1	Pt.2	Pt.3	Pt.4	Pt.5	Pt.6	Pt.7	Pt.8	
dP	0.036	0.042	0.044	0.038	0.040	0.042	0.038	0.036	0.040
Temperature	100	100	100	100	100	100	100	100	100.000

Tunnel Velocity:	13.438	ft/sec.
Intial Tunnel Flow:	147.68	scfm
Average Tunnel Flow	150.67	scfm

JOB #	034-S-076-1															
TECHNICIA	BTN							ROOM TEMP (F)	72.2				BEG	MID	END	AVG
DATE:	3_7_17								BAROMETRIC				30.10	30.10	30.10	30.10
RUN #:	EPA1C															
READING INTERVAL:	10															
SAMPLE BOX :	A	METER Y FACTOR:		1.01						PROBE MATERIAL:			SS			
FRONT FILTER #:	3076&3081				REAR FILTER #	REAR FILTER #:		3077								
FINAL LEAK RATE (CFM):	<0.01	@	19	IN-HG		FINAL LEAK RATE (CFM)		<0.01	@	19	IN-HG					
Run Time:		340		AMBIENT FILTER #:		3080	VOLUME	1794.925	LITERS	FUEL MOISTURE DB				20.0	%	
				FINAL LEAK RATE (CFM):		<0.01	@	18	IN-HG							
TEST START TIME:		14:18							1	2	3	4	5	6		
									TEMPERATURES							
	GAS METER	SAMPLE	TUNNEL	ORIFICE	FILTER	TUNNEL VEL	Proportional	Scale	Weight	TUNNEL	FLUE	FILTER	FB REAR	FB	METER	AMBIENT
ET	VOLUME	RATE(FT3/MIN)	DELTA P	DELTA H	VAC	FT/SEC	Rate (%)	Weight	Chg	TEMP	TEMP	TEMP	TEMP	INT	TEMP	TEMP
0	0.000	0.000	0.04	0.01	0		NA	14.1	0	90	199	71	211	4158.08	74	72
10	1.392	0.139	0.04	2.01	-1.56	13.516	103	12.9	1.2	96	324	76	304	4158.65	75	71
20	2.799	0.141	0.04	2.02	-0.96	13.516	104	11.8	1.1	96	357	77	203	4159.11	78	72
30	4.195	0.140	0.04	2.02	-1.52	13.577	103	10.2	1.6	101	416	78	167	4159.59	82	72
40	5.601	0.141	0.04	2.02	-1.58	13.577	103	8.6	1.6	101	418	79	164	4160.08	85	72
50	7.010	0.141	0.04	2.03	-0.77	13.577	102	7.1	1.5	101	409	79	167	4160.56	88	73
60	8.424	0.141	0.04	2.05	-0.71	13.565	102	5.8	1.3	100	397	79	173	4161	91	73
70	9.844	0.142	0.04	2.03	-1.48	13.540	102	4.6	1.2	98	372	79	182	4161.37	93	73
80	11.262	0.142	0.04	2.02	-0.8	13.516	102	3.8	0.8	96	351	79	190	4161.74	94	73
90	12.680	0.142	0.04	2.03	-0.77	13.467	101	3.2	0.6	92	304	78	196	4162.11	96	73
100	14.099	0.142	0.04	2.03	-0.8	13.455	101	2.8	0.4	91	284	78	200	4162.41	97	73
110	15.522	0.142	0.04	2.03	-1.59	13.418	101	2.5	0.3	88	251	77	201	4162.76	97	72
120	16.947	0.143	0.04	2.04	-1.52	13.394	100	2.3	0.2	86	209	77	197	4162.97	98	72
130	18.368	0.142	0.04	2.04	-0.91	13.369	100	2.1	0.2	84	188	76	190	4163.16	99	72
140	19.797	0.143	0.04	2.03	-1.29	13.357	100	2	0.1	83	174	76	183	4163.25	99	72
150	21.221	0.142	0.04	2.03	-0.63	13.357	100	1.9	0.1	83	164	75	178	4163.4	99	73
160	22.649	0.143	0.04	2.01	-0.73	13.345	100	1.8	0.1	82	156	75	173	4163.52	100	73
170	24.078	0.143	0.04	2.02	-0.74	13.332	100	1.7	0.1	81	150	75	168	4163.67	100	73
180	25.501	0.142	0.04	2.03	-1.36	13.332	99	1.6	0.1	81	144	75	164	4163.76	100	72
190	26.928	0.143	0.04	2.02	-0.69	13.320	100	1.5	0.1	80	140	75	160	4163.82	100	72
200	28.353	0.143	0.04	2.04	-1.27	13.320	100	1.3	0.2	80	136	75	157	4163.88	100	72
210	29.781	0.143	0.04	2.01	-0.61	13.320	100	1.3	0	80	134	74	155	4163.99	100	72
220	31.205	0.142	0.04	2	-0.76	13.308	99	1.2	0.1	79	131	74	152	4164	100	72
230	32.625	0.142	0.04	2.03	-1.49	13.308	99	1.1	0.1	79	129	74	151	4164.09	100	72
240	34.047	0.142	0.04	2.02	-0.72	13.308	99	0.9	0.2	79	128	74	151	4164.16	100	72
250	35.462	0.142	0.04	2.02	-1.37	13.308	99	0.8	0.1	79	127	74	152	4164.15	100	72
260	36.880	0.142	0.04	2.03	-0.68	13.308	99	0.7	0.1	79	127	74	151	4164.14	100	72
270	38.296	0.142	0.04	2.02	-1.53	13.308	99	0.6	0.1	79	127	74	148	4164.16	100	72

TEST START TIME:		14:18								1	2	3	4	5	6	
										TEMPERATURES						
	GAS METER	SAMPLE	TUNNEL	ORIFICE	FILTER	TUNNEL VEL	Proportional	Scale	Weight	TUNNEL	FLUE	FILTER	FB REAR	FB	METER	AMBIENT
ET	VOLUME	RATE(FT3/MIN)	DELTA P	DELTA H	VAC	FT/SEC	Rate (%)	Weight	Chg	TEMP	TEMP	TEMP	TEMP	INT	TEMP	TEMP
280	39.717	0.142	0.04	2.03	-0.74	13.308	99	0.5	0.1	79	127	74	145	4164.21	100	72
290	41.134	0.142	0.04	2.03	-0.87	13.295	99	0.4	0.1	78	125	74	142	4164.14	100	72
300	42.555	0.142	0.04	2.02	-1.48	13.295	99	0.3	0.1	78	123	74	140	4164.15	100	72
310	43.973	0.142	0.04	2.02	-1.32	13.295	99	0.3	0	78	121	74	139	4164.12	100	72
320	45.397	0.142	0.04	2.01	-1.19	13.295	99	0.2	0.1	78	121	74	136	4164.05	100	72
330	46.817	0.142	0.04	2.01	-1.5	13.295	99	0.1	0.1	78	120	74	135	4164.04	100	72
340	48.241	0.142	0.04	2.03	-1.14	13.295	99	0	0.1	78	120	74	134	4164.01	100	72

TEST START TIME:	14:18								1	2	3	4	5	6	
									TEMPERATURES						
	GAS METER	SAMPLE	TUNNEL	ORIFICE	FILTER	TUNNEL VEL	Proportional	Scale	Weight	TUNNEL	FLUE	FILTER	FB REAR	FB	METER	AMBIENT
ET	VOLUME	RATE(FT3/MIN)	DELTA P	DELTA H	VAC	FT/SEC	Rate (%)	Weight	Chg	TEMP	TEMP	TEMP	TEMP	INT	TEMP	TEMP
	48.241		0.040	2.02		13.385	100.3			85	209				96	72

JOB #	034-S-076-1										
TECHNICIAN	BTN										
DATE:	3_7_17										
RUN #:	EPA1C										
READING INTERVAL:	10										
SAMPLE BOX :	*B*	METER Y FACTOR:		1.002			PROBE MATERIAL:			**SS**	
FRONT FILTER #:	3078					REAR FILTER #:	3079				
FINAL LEAK RATE (CFM):	<0.01	@	18	IN-HG		FINAL LEAK RATE (CFM):	<0.01	@	18	IN-HG	

Run Time: 340 **Firebox Delta T** **119**

							1	2	3	4	5	6	
							TEMPERATURES						
ET	GAS METER VOLUME	SAMPLE RATE(FT3/MIN)	PROPORTIONAL RATE	FLUE DRAFT	ORIFICE DELTA H	FILTER VAC	LEFT SIDE	RIGHT SIDE	FILTER	FB TOP	FB BOT	METER	STOVE AVG T
0	0	0	NA	0	0	-1	366	351	71	219	365	73	302
10	1.358	0.136	102	-0.04	2	-1.89	372	362	76	349	351	74	348
20	2.734	0.138	102	-0.05	2	-1.43	332	310	77	377	341	77	313
30	4.110	0.138	102	-0.06	1.99	-1.47	317	288	78	434	322	81	306
40	5.491	0.138	102	-0.06	1.97	-1.94	324	290	78	472	304	84	311
50	6.886	0.140	102	-0.05	2	-1.39	342	296	79	484	292	87	316
60	8.281	0.140	102	-0.06	2	-1.44	364	304	79	478	284	89	321
70	9.680	0.140	102	-0.05	1.99	-1.66	383	318	79	471	278	91	326
80	11.083	0.140	101	-0.04	1.99	-1.96	394	330	78	453	275	93	328
90	12.487	0.140	101	-0.04	1.99	-2.01	396	339	78	410	273	94	323
100	13.892	0.141	101	-0.04	2	-1.54	393	341	78	366	273	95	315
110	15.302	0.141	101	-0.03	1.99	-1.97	382	341	77	329	273	96	305
120	16.709	0.141	100	-0.02	1.97	-1.7	367	335	77	279	274	97	290
130	18.120	0.141	100	-0.01	2	-1.6	350	324	76	242	275	97	276
140	19.529	0.141	100	-0.02	2.01	-1.36	333	311	76	218	272	98	263
150	20.940	0.141	100	-0.01	1.99	-2.01	317	301	75	204	270	98	254
160	22.351	0.141	100	-0.01	1.99	-1.57	303	290	75	193	266	98	245
170	23.762	0.141	100	-0.01	2	-1.97	290	281	75	186	262	98	237
180	25.176	0.141	100	-0.01	2	-1.42	279	274	75	179	257	98	231
190	26.585	0.141	99	0	2	-1.34	268	268	75	172	253	98	224
200	28.000	0.142	100	0	2	-1.99	258	262	74	167	247	98	218

							1	2	3	4	5	6	
							TEMPERATURES						
ET	GAS METER VOLUME	SAMPLE RATE(FT3/MIN)	PROPORTIONAL RATE	FLUE DRAFT	ORIFICE DELTA H	FILTER VAC	LEFT SIDE	RIGHT SIDE	FILTER	FB TOP	FB BOT	METER	STOVE AVG T
210	29.409	0.141	99	0	1.99	-1.99	249	261	74	163	242	98	214
220	30.823	0.141	100	-0.01	2.01	-1.35	242	257	74	159	237	99	209
230	32.236	0.141	99	0	2.01	-1.6	236	255	74	155	234	99	206
240	33.648	0.141	99	0	2	-1.91	232	253	74	154	232	99	204
250	35.060	0.141	99	0	2	-1.66	229	251	74	154	229	99	203
260	36.471	0.141	99	-0.01	2	-1.97	227	250	74	154	227	98	202
270	37.886	0.142	100	0	2.01	-1.41	224	247	74	155	227	98	200
280	39.298	0.141	100	-0.01	2	-1.87	220	244	74	154	227	98	198
290	40.713	0.142	100	0	2	-1.75	217	239	74	152	226	98	195
300	42.123	0.141	99	0	2	-1.78	214	233	74	150	224	98	192
310	43.538	0.142	100	0	2.01	-1.68	211	229	73	147	223	98	190
320	44.949	0.141	99	0	2	-1.34	208	221	73	146	222	98	187
330	46.364	0.142	100	0	2.01	-1.77	206	217	74	145	221	98	185
340	47.776	0.141	99	0	2	-1.71	205	213	74	144	221	98	183

							1	2	3	4	5	6	
							TEMPERATURES						
ET	GAS METER VOLUME	SAMPLE RATE(FT3/MIN)	PROPORTIONAL RATE	FLUE DRAFT	ORIFICE DELTA H	FILTER VAC	LEFT SIDE	RIGHT SIDE	FILTER	FB TOP	FB BOT	METER	STOVE AVG T
	47.776	0.141	100.259	-0.018	1.997647	-1.67	293	282	75	252	263	94	119
	TOTAL	AVG	AVG	AVG	AVG	AVG	AVG	AVG	AVG	AVG	AVG	AVG	DT

Ambient Sample Results:

JOB NUMBER: 034-S-076-1
TECHNICIAN: BTN
DATE: 3_7_17
RUN NUMBER: EPA1C

METER Y FACTOR: **0.997**

	Sample Volume (L)	Meter Temp °F	ΔH	ΔP
Start	0	79.5	0	0
End	1794.925	98	0	0

	SAMPLE INFORMATION	
Total Sample Volume - Vm	1794.925	Liters
Total Sample Volume - Vm	63.387	ft^3
Average Sample Rate	0.19	ft^3/min
Sample Time	340.00	Minutes
Average Meter Temperature	88.75	°F
Total Sample Volume (Standard Conditions) - Vmstd	61.173	dscf
Total Particulates	0.6	mg
Particulate Concentration (dry-standard)	0.000009808	grams/dscf
Particulate Emission Rate	0.000105882	grams/hour

JOB NUMBER 034-S-076-1

RUN # EPA1C

DATE: 3_7_17

BURN RATE 0.94 KG/HR DRY

FILTER A PARTICULATE 13.1 mg

FILTER B PARTICULATE 12.7 mg

	SAMPLE A INFORMATION		SAMPLE B INFORMATION	
Total Sample Volume - Vm	48.24		47.78	
Average Gas Velocity in Dilution Tunnel - vs	13.44	feet/second	13.44	feet/second
Average Gas Flow Rate in Dilution Tunnel - Qsd	9040.30	dscf/hour	9040.30	dscf/hour
Total Sample Volume (Standard Conditions) - Vmstd	46.81	dscf	46.12	dscf
Average Tunnel Temperature	85.5	F	85.5	F
Average Delta p	0.040		0.040	
Average Gas Meter Temperature	96	F	94	F
Average Delta H	2.02	in-h20	2.00	in-h20
Total Time of Test	340	min	340	min
Total Particulates	13.1	mg	12.7	mg
Particulate Concentration (dry-standard)	0.00028	grams/dscf	0.00028	grams/dscf
Ambient Train (dry-standard)	0.000009808	grams/dscf	0.000009808	grams/dscf
Net (dry-standard)	0.000270020	grams/dscf	0.00026554	grams/dscf
Particulate Emission Rate	2.44	grams/hour	2.40	grams/hour
Total PM Emissions	13.83	grams	13.60	grams
Average Total PM Emissions		13.72		grams
AVERAGE PARTICLATE EMISSIONS RATE		2.42		grams/hour
% OF AVERAGE	100.8		99.2	
Emissions Factor	2.595	g/Kg -Dry	2.552	g/Kg -Dry

Portland Troutdale, OR

History

Weather History for KTTD - March, 2017

March 11 2017 Saturday, March 11, 2017 View

Daily Weekly Monthly Custom

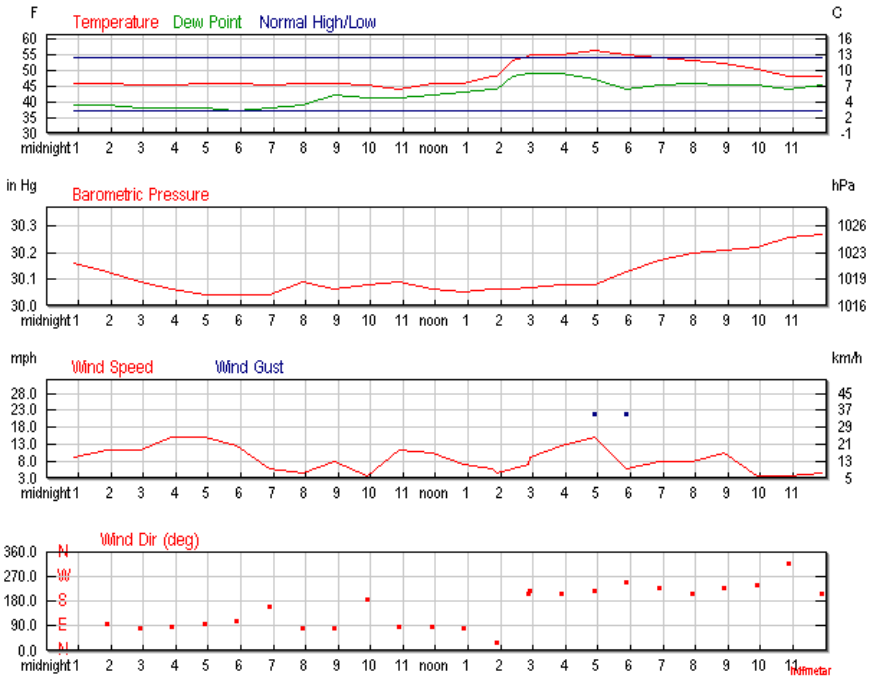
Actual	Average	Record
52 °F	**47** °F	
58 °F	**55** °F	**76** °F (2005)
45 °F	**38** °F	**27** °F (1988)
13	18	
202	213	
0	0	
0	0	
1 (Base 50)		
44 °F		
80		
93		
66		
0.24 in	**0.15** in	**0.42** in (1980)
1.45	1.66	
11.83	12.93	
30.11 in		
9 mph (SSE)		
18 mph		
24 mph		
10 miles		

Rain

T = Trace of Precipitation, MM = Missing Value

Source: NWS Daily Summary

Daily Weather History Graph



Search for Another Location

Airport or City:

KTTD

Submit

Trip Planner

Search our weather history database for the weather conditions in past years. The results will help you decide how hot, cold, wet, or windy it might be!

Date:

March 11

Submit

Astronomy

Mar. 11, 2017	Rise	Set
Actual Time	6:28 AM PST	6:10 PM PST
Civil Twilight	5:59 AM PST	6:40 PM PST
Nautical Twilight	5:25 AM PST	7:14 PM PST
Astronomical Twilight	4:50 AM PST	7:49 PM PST
Moon	5:28 PM PST (3/11)	6:09 AM PST (3/11)
Length of Visible Light	12h 40m	
Length of Day	11h 41m	

Waxing Gibbous, 99% of the Moon is Illuminated

Mar 11	Mar 12	Mar 20	Mar 27	Apr 3
Waxing Gibbous	Full	Last Quarter	New	First Quarter

Hourly Weather History & Observations

Temp.	Windchill	Dew Point	Humidity	Pressure	Visibility	Wind Dir	Wind Speed	Gust Speed	Precip	Events	Conditions
46.9 °F	-	**39.9** °F	77%	**30.16** in	**10.0** mi	East	**9.2** mph	-	N/A		Clear
46.9 °F	-	**39.9** °F	77%	**30.13** in	**10.0** mi	East	**11.5** mph	-	N/A		Clear
46.0 °F	**40.6** °F	**39.0** °F	76%	**30.09** in	**10.0** mi	East	**11.5** mph	**17.3** mph	N/A		Clear
46.0 °F	**39.6** °F	**39.0** °F	76%	**30.06** in	**10.0** mi	East	**15.0** mph	-	N/A		Clear
46.9 °F	-	**39.0** °F	74%	**30.04** in	**10.0** mi	East	**15.0** mph	-	N/A		Clear
46.9 °F	-	**37.9** °F	71%	**30.04** in	**10.0** mi	ESE	**12.7** mph	-	N/A		Clear
46.0 °F	**43.1** °F	**39.0** °F	76%	**30.04** in	**10.0** mi	SSE	**5.8** mph	-	N/A		Overcast
46.9 °F	-	**39.9** °F	77%	**30.09** in	**10.0** mi	East	**4.6** mph	-	N/A		Overcast

46.9 °F	-	**43.0** °F	86%	**30.06** in	**9.0** mi	East	**8.1** mph	-	**0.08** in	Rain	Light Rain
46.0 °F	**44.8** °F	**42.1** °F	86%	**30.08** in	**6.0** mi	South	**3.5** mph	-	**0.05** in	Rain	Light Rain
45.0 °F	**39.3** °F	**42.1** °F	90%	**30.09** in	**8.0** mi	East	**11.5** mph	-	**0.07** in	Rain	Light Rain
46.9 °F	-	**43.0** °F	86%	**30.06** in	**10.0** mi	East	**10.4** mph	-	**0.03** in		Overcast
46.9 °F	-	**44.1** °F	90%	**30.05** in	**10.0** mi	East	**6.9** mph	-	**0.00** in		Overcast
48.9 °F	-	**45.0** °F	86%	**30.06** in	**10.0** mi	Variable	**5.8** mph	-	N/A		Overcast
48.9 °F	-	**45.0** °F	86%	**30.06** in	**10.0** mi	NNE	**4.6** mph	-	**0.00** in	Rain	Light Rain
54.0 °F	-	**48.9** °F	83%	**30.06** in	**9.0** mi	Variable	**5.8** mph	-	**0.01** in	Rain	Light Rain
55.4 °F	-	**50.0** °F	82%	**30.07** in	**10.0** mi	SSW	**6.9** mph	-	**0.01** in	Rain	Light Rain
55.9 °F	-	**50.0** °F	80%	**30.07** in	**10.0** mi	SW	**9.2** mph	-	**0.01** in	Rain	Light Rain
55.9 °F	-	**50.0** °F	80%	**30.08** in	**10.0** mi	SSW	**12.7** mph	**20.7** mph	**0.00** in		Mostly Cloudy
57.0 °F	-	**48.0** °F	72%	**30.08** in	**10.0** mi	SW	**15.0** mph	**21.9** mph	**0.00** in		Clear
55.9 °F	-	**45.0** °F	67%	**30.13** in	**10.0** mi	WSW	**5.8** mph	**21.9** mph	N/A		Mostly Cloudy
55.0 °F	-	**46.0** °F	72%	**30.17** in	**10.0** mi	SW	**8.1** mph	-	N/A		Overcast
54.0 °F	-	**46.9** °F	77%	**30.20** in	**10.0** mi	SSW	**8.1** mph	-	N/A		Mostly Cloudy
53.1 °F	-	**46.0** °F	77%	**30.21** in	**10.0** mi	SW	**10.4** mph	-	N/A		Clear
51.1 °F	-	**46.0** °F	83%	**30.22** in	**10.0** mi	WSW	**3.5** mph	-	N/A		Clear
48.9 °F	-	**45.0** °F	86%	**30.26** in	**10.0** mi	NW	**3.5** mph	-	N/A		Partly Cloudy
48.9 °F	-	**46.0** °F	90%	**30.27** in	**10.0** mi	SSW	**4.6** mph	-	N/A		Overcast

Portland Troutdale, OR

History

Weather History for KTTD - March, 2017

March 10 2017 Friday, March 10, 2017 View

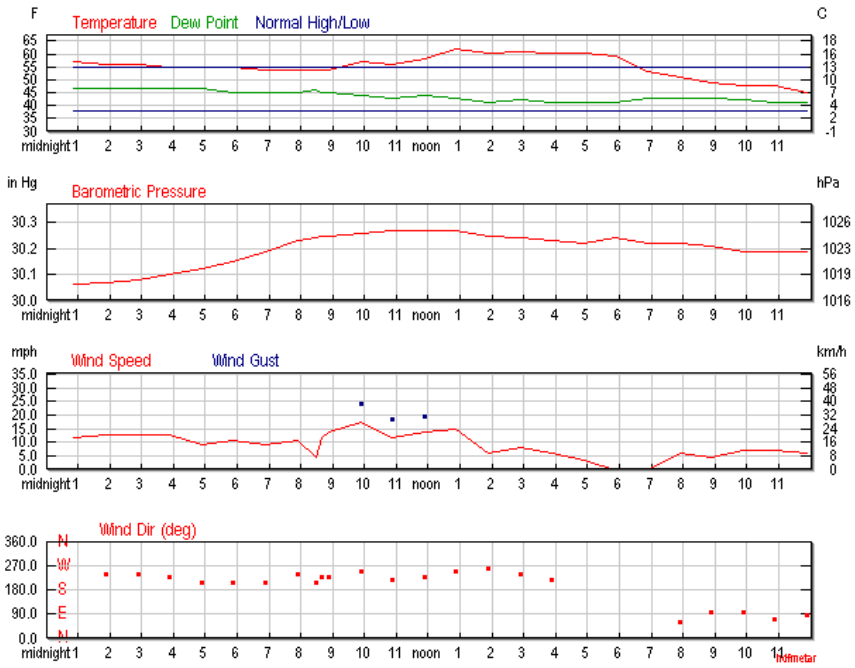
Daily Weekly Monthly Custom

Actual	Average	Record
54 °F	**46** °F	
62 °F	**55** °F	**75** °F (1965)
45 °F	**38** °F	**28** °F (1956)
11	19	
189	195	
0	0	
0	0	
5 (Base 50)		
44 °F		
64		
80		
48		
T in	**0.15** in	**1.26** in (1983)
1.21	1.51	
11.59	12.78	
30.20 in		
9 mph (SW)		
20 mph		
29 mph		
10 miles		

T = Trace of Precipitation, MM = Missing Value

Source: NWS Daily Summary

Daily Weather History Graph



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Airport or City:

KTTD

Submit

Trip Planner

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Date:

March 10 Submit

Astronomy

Mar. 10, 2017	Rise	Set
Actual Time	6:30 AM PST	6:09 PM PST
Civil Twilight	6:01 AM PST	6:38 PM PST
Nautical Twilight	5:27 AM PST	7:13 PM PST
Astronomical Twilight	4:52 AM PST	7:48 PM PST
Moon	4:22 PM PST (3/10)	5:36 AM PST (3/10)
Length of Visible Light	12h 37m	
Length of Day	11h 38m	

Waxing Gibbous, 96% of the Moon is Illuminated

Mar 10	Mar 12	Mar 20	Mar 27	Apr 3
Waxing Gibbous	Full	Last Quarter	New	First Quarter

Hourly Weather History & Observations

Temp.	Windchill	Dew Point	Humidity	Pressure	Visibility	Wind Dir	Wind Speed	Gust Speed	Precip	Events	Conditions
57.0 °F	-	**46.9** °F	69%	**30.06** in	**10.0** mi	SW	**11.5** mph	**25.3** mph	N/A		Mostly Cloudy
55.9 °F	-	**46.9** °F	72%	**30.07** in	**10.0** mi	WSW	**12.7** mph	-	N/A		Clear
55.9 °F	-	**46.9** °F	72%	**30.08** in	**10.0** mi	WSW	**12.7** mph	-	N/A		Overcast
55.0 °F	-	**46.9** °F	74%	**30.10** in	**10.0** mi	SW	**12.7** mph	-	**0.00** in		Overcast
55.0 °F	-	**46.9** °F	74%	**30.12** in	**10.0** mi	SSW	**9.2** mph	-	N/A		Overcast
55.0 °F	-	**45.0** °F	69%	**30.15** in	**10.0** mi	SSW	**10.4** mph	**20.7** mph	N/A		Overcast
54.0 °F	-	**45.0** °F	72%	**30.19** in	**10.0** mi	SSW	**9.2** mph	-	N/A		Overcast
54.0 °F	-	**45.0** °F	72%	**30.23** in	**10.0** mi	WSW	**10.4** mph	**19.6** mph	N/A		Mostly Cloudy
54.0 °F	-	**46.0** °F	75%	**30.24** in	**10.0** mi	SSW	**4.6** mph	-	N/A		Overcast
54.0 °F	-	**45.0** °F	72%	**30.25** in	**10.0** mi	SW	**11.5** mph	-	N/A		Overcast

54.0 °F	-	**45.0** °F	72%	**30.25** in	**10.0** mi	SW	**13.8** mph	**23.0** mph	N/A	Overcast
57.0 °F	-	**44.1** °F	62%	**30.26** in	**10.0** mi	WSW	**17.3** mph	**24.2** mph	N/A	Scattered Clouds
55.9 °F	-	**43.0** °F	62%	**30.27** in	**10.0** mi	SW	**11.5** mph	**18.4** mph	N/A	Mostly Cloudy
57.9 °F	-	**44.1** °F	60%	**30.27** in	**10.0** mi	SW	**13.8** mph	**19.6** mph	N/A	Scattered Clouds
62.1 °F	-	**43.0** °F	50%	**30.27** in	**10.0** mi	WSW	**15.0** mph	-	N/A	Mostly Cloudy
60.1 °F	-	**41.0** °F	49%	**30.25** in	**10.0** mi	West	**5.8** mph	-	N/A	Mostly Cloudy
61.0 °F	-	**42.1** °F	50%	**30.24** in	**10.0** mi	WSW	**8.1** mph	-	N/A	Scattered Clouds
60.1 °F	-	**41.0** °F	49%	**30.23** in	**10.0** mi	SW	**5.8** mph	-	N/A	Partly Cloudy
60.1 °F	-	**41.0** °F	49%	**30.22** in	**10.0** mi	Variable	**3.5** mph	-	N/A	Partly Cloudy
59.0 °F	-	**41.0** °F	51%	**30.24** in	**10.0** mi	Calm	Calm	-	N/A	Clear
53.1 °F	-	**43.0** °F	69%	**30.22** in	**10.0** mi	Calm	Calm	-	N/A	Clear
51.1 °F	-	**43.0** °F	74%	**30.22** in	**10.0** mi	ENE	**5.8** mph	-	N/A	Clear
48.9 °F	-	**43.0** °F	80%	**30.21** in	**10.0** mi	East	**4.6** mph	-	N/A	Clear
48.0 °F	-	**42.1** °F	80%	**30.19** in	**10.0** mi	East	**6.9** mph	-	N/A	Clear
48.0 °F	-	**41.0** °F	77%	**30.19** in	**10.0** mi	ENE	**6.9** mph	-	N/A	Clear
45.0 °F	**41.8** °F	**41.0** °F	86%	**30.19** in	**10.0** mi	East	**5.8** mph	-	N/A	Clear

Portland Troutdale, OR

History

Weather History for KTTD - March, 2017

March 9 2017 Thursday, March 9, 2017 View

Daily Weekly Monthly Custom

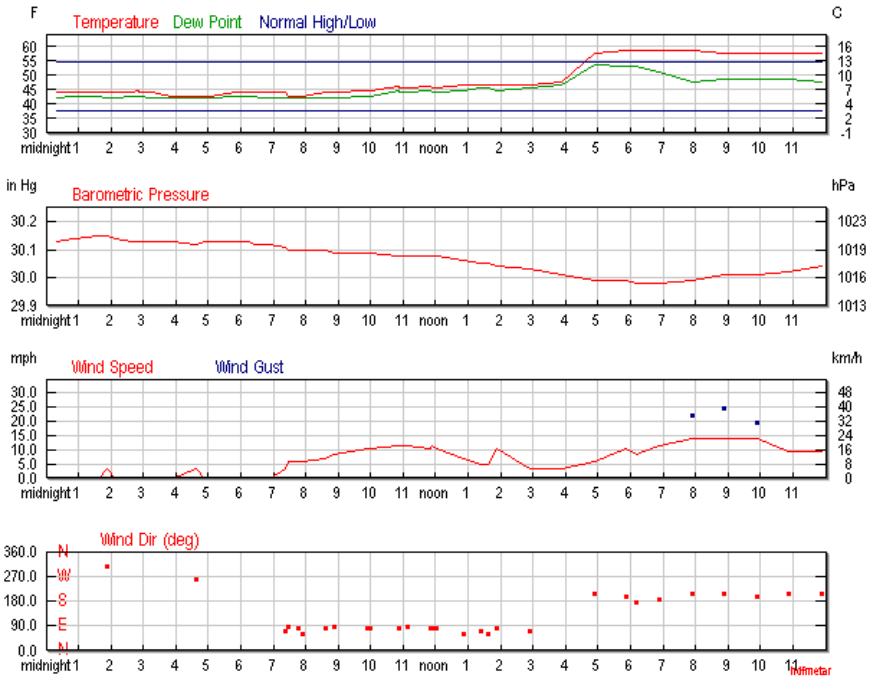
Actual	Average	Record
52 °F	**46** °F	
60 °F	**55** °F	**72** °F (1965)
43 °F	**38** °F	**29** °F (1999)
13	19	
178	176	
0	0	
0	0	
1 (Base 50)		
45 °F		
84		
100		
67		
0.53 in	**0.15** in	**0.98** in (1966)
1.21	1.36	
11.59	12.63	
30.08 in		
7 mph (ESE)		
18 mph		
26 mph		
4 miles		

Rain

T = Trace of Precipitation, MM = Missing Value

Source: NWS Daily Summary

Daily Weather History Graph



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Airport or City:

KTTD

Submit

Trip Planner

Search our weather history database for the weather conditions in past years. The results will help you decide how hot, cold, wet, or windy it might be!

Date:

March 9 Submit

Astronomy

Mar. 09, 2017	Rise	Set
Actual Time	6:32 AM PST	6:08 PM PST
Civil Twilight	6:03 AM PST	6:37 PM PST
Nautical Twilight	5:28 AM PST	7:11 PM PST
Astronomical Twilight	4:54 AM PST	7:46 PM PST
Moon	3:16 PM PST (3/9)	4:58 AM PST (3/9)
Length of Visible Light	12h 34m	
Length of Day	11h 35m	

Waxing Gibbous, 91% of the Moon is Illuminated

Mar 9	Mar 12	Mar 20	Mar 27	Apr 3
Waxing Gibbous	Full	Last Quarter	New	First Quarter

Hourly Weather History & Observations

Temp.	Windchill	Dew Point	Humidity	Pressure	Visibility	Wind Dir	Wind Speed	Gust Speed	Precip	Events	Conditions
44.1 °F	-	**42.1** °F	93%	**30.13** in	**3.0** mi	Calm	Calm	-	**0.00** in		Overcast
44.1 °F	-	**43.0** °F	96%	**30.14** in	**4.0** mi	Calm	Calm	-	**0.00** in		Overcast
44.1 °F	-	**43.0** °F	96%	**30.15** in	**4.0** mi	Calm	Calm	-	N/A		Overcast
44.1 °F	**42.5** °F	**42.1** °F	93%	**30.15** in	**3.0** mi	NW	**3.5** mph	-	N/A		Overcast
44.1 °F	-	**42.1** °F	93%	**30.14** in	**2.5** mi	Calm	Calm	-	N/A		Overcast
44.1 °F	-	**43.0** °F	96%	**30.13** in	**1.5** mi	Calm	Calm	-	N/A		Overcast
44.6 °F	-	**42.8** °F	93%	**30.13** in	**2.0** mi	Calm	Calm	-	N/A		Overcast
44.1 °F	-	**43.0** °F	96%	**30.13** in	**2.0** mi	Calm	Calm	-	N/A		Overcast
44.1 °F	-	**42.1** °F	93%	**30.13** in	**1.8** mi	Calm	Calm	-	N/A		Overcast
43.0 °F	-	**42.1** °F	97%	**30.13** in	**1.8** mi	Calm	Calm	-	**0.00** in	Rain	Light Rain
43.0 °F	**41.3** °F	**42.1** °F	97%	**30.12** in	**1.5** mi	West	**3.5** mph	-	**0.01** in	Rain	Light Rain
43.0 °F	-	**42.1** °F	97%	**30.13** in	**1.8** mi	Calm	Calm	-	**0.01** in		Overcast
43.0 °F	-	**42.1** °F	97%	**30.13** in	**1.5** mi	Calm	Calm	-	**0.00** in	Rain	Light Rain
44.1 °F	-	**43.0** °F	96%	**30.13** in	**1.8** mi	Calm	Calm	-	**0.02** in	Rain	Light Rain
44.1 °F	-	**43.0** °F	96%	**30.13** in	**2.0** mi	Calm	Calm	-	**0.01** in	Rain	Light Rain
44.1 °F	-	**43.0** °F	96%	**30.12** in	**2.0** mi	Calm	Calm	-	**0.01** in	Rain	Light Rain
44.1 °F	-	**42.1** °F	93%	**30.12** in	**1.5** mi	Calm	Calm	-	**0.02** in	Rain	Light Rain
44.1 °F	-	**42.1** °F	93%	**30.12** in	**1.8** mi	Calm	Calm	-	**0.02** in	Rain	Light Rain
44.1 °F	**42.5** °F	**42.1** °F	93%	**30.11** in	**3.0** mi	ENE	**3.5** mph	-	**0.02** in	Rain	Light Rain
43.0 °F	**39.5** °F	**42.1** °F	97%	**30.10** in	**2.5** mi	East	**5.8** mph	-	**0.02** in	Rain	Light Rain
43.0 °F	**39.5** °F	**42.1** °F	97%	**30.10** in	**2.5** mi	East	**5.8** mph	-	**0.03** in	Rain	Light Rain
43.0 °F	**39.5** °F	**42.1** °F	97%	**30.10** in	**2.5** mi	ENE	**5.8** mph	-	**0.03** in	Rain	Light Rain
44.1 °F	**40.1** °F	**42.1** °F	93%	**30.10** in	**2.5** mi	East	**6.9** mph	-	**0.04** in	Rain	Light Rain
44.1 °F	**39.5** °F	**42.1** °F	93%	**30.09** in	**2.5** mi	East	**8.1** mph	-	**0.05** in	Rain	Light Rain
45.0 °F	**39.7** °F	**43.0** °F	93%	**30.09** in	**2.5** mi	East	**10.4** mph	-	**0.05** in	Rain	Light Rain
45.0 °F	**39.7** °F	**43.0** °F	93%	**30.09** in	**4.0** mi	East	**10.4** mph	-	**0.00** in	Rain	Light Rain
46.4 °F	**41.1** °F	**44.6** °F	93%	**30.08** in	**2.5** mi	East	**11.5** mph	-	**0.04** in	Rain	Light Rain
46.0 °F	**40.6** °F	**44.1** °F	93%	**30.08** in	**2.5** mi	East	**11.5** mph	-	**0.04** in	Rain	Light Rain
46.0 °F	**40.6** °F	**44.1** °F	93%	**30.08** in	**2.5** mi	East	**11.5** mph	-	**0.02** in	Rain	Light Rain
46.4 °F	**41.5** °F	**44.6** °F	93%	**30.08** in	**2.5** mi	East	**10.4** mph	-	**0.09** in	Rain	Light Rain
46.0 °F	**40.6** °F	**44.1** °F	93%	**30.08** in	**2.5** mi	East	**11.5** mph	-	**0.09** in	Rain	Light Rain
46.0 °F	**41.0** °F	**44.1** °F	93%	**30.08** in	**4.0** mi	East	**10.4** mph	-	**0.02** in	Rain	Light Rain
46.9 °F	-	**45.0** °F	93%	**30.06** in	**10.0** mi	ENE	**6.9** mph	-	**0.02** in	Rain	Light Rain
46.9 °F	-	**46.0** °F	97%	**30.05** in	**2.5** mi	ENE	**4.6** mph	-	**0.02** in	Rain	Light Rain
46.9 °F	-	**46.0** °F	97%	**30.05** in	**5.0** mi	ENE	**4.6** mph	-	**0.03** in	Rain	Light Rain

46.9 °F	-	**45.0** °F	93%	**30.04** in	**8.0** mi	East	**10.4** mph	-	**0.04** in	Rain	Light Rain
46.9 °F	-	**46.0** °F	97%	**30.03** in	**4.0** mi	ENE	**3.5** mph	-	**0.04** in	Rain	Light Rain
48.0 °F	-	**46.9** °F	96%	**30.01** in	**8.0** mi	Variable	**3.5** mph	-	**0.06** in	Rain	Light Rain
57.9 °F	-	**54.0** °F	87%	**29.99** in	**10.0** mi	SSW	**5.8** mph	-	**0.04** in	Rain	Light Rain
59.0 °F	-	**53.1** °F	81%	**29.99** in	**10.0** mi	SSW	**10.4** mph	**17.3** mph	**0.00** in		Overcast
59.0 °F	-	**53.1** °F	81%	**29.98** in	**10.0** mi	South	**8.1** mph	-	N/A		Overcast
59.0 °F	-	**51.1** °F	75%	**29.98** in	**10.0** mi	South	**11.5** mph	**24.2** mph	N/A		Overcast
59.0 °F	-	**48.0** °F	67%	**29.99** in	**10.0** mi	SSW	**13.8** mph	**21.9** mph	N/A		Overcast
57.9 °F	-	**48.9** °F	72%	**30.01** in	**10.0** mi	SSW	**13.8** mph	**24.2** mph	**0.01** in	Rain	Light Rain
57.9 °F	-	**48.9** °F	72%	**30.01** in	**10.0** mi	SSW	**13.8** mph	**19.6** mph	**0.01** in		Overcast
57.9 °F	-	**48.9** °F	72%	**30.02** in	**10.0** mi	SSW	**9.2** mph	-	N/A		Overcast
57.9 °F	-	**48.0** °F	70%	**30.04** in	**10.0** mi	SSW	**9.2** mph	**20.7** mph	N/A		Mostly Cloudy

Portland Troutdale, OR

History

Weather History for KTTD - March, 2017

March 8 2017 Wednesday, March 8, 2017 View

Daily Weekly Monthly Custom

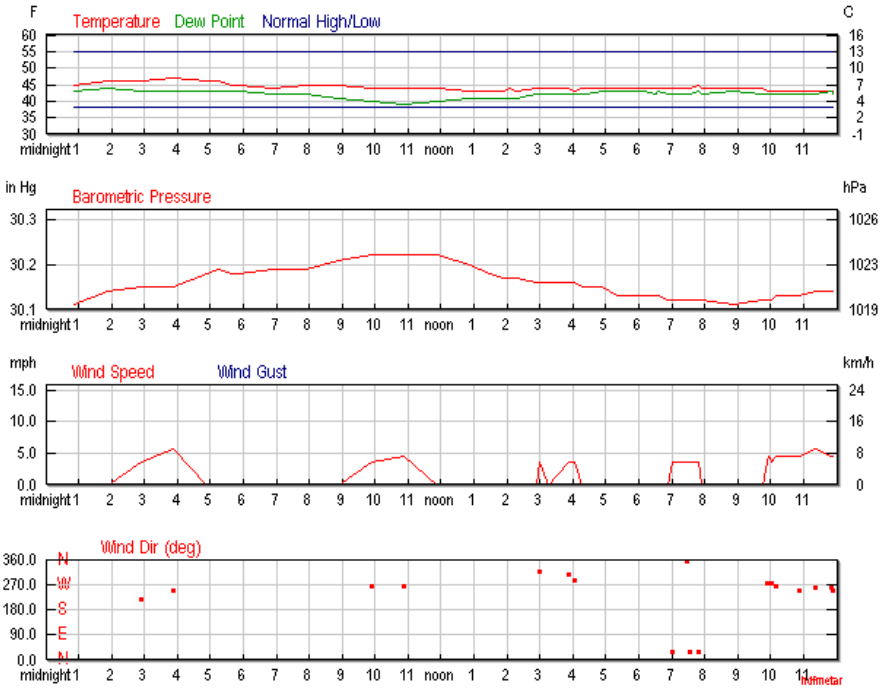
Actual	Average	Record
45 °F	**46** °F	
47 °F	**55** °F	**72** °F (2005)
43 °F	**38** °F	**29** °F (1982)
20	19	
165	157	
0	0	
0	0	
42 °F		
91		
96		
86		
0.23 in	**0.14** in	**1.09** in (1951)
0.68	1.21	
11.06	12.48	
30.15 in		
1 mph (WNW)		
8 mph		
9 mph		
5 miles		

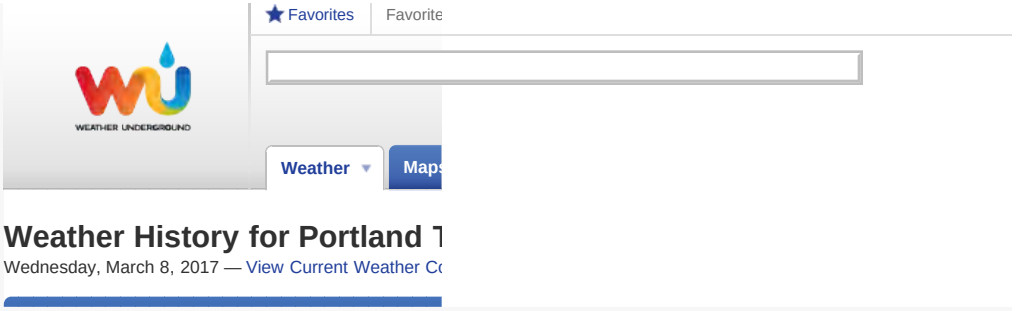
Rain

T = Trace of Precipitation, MM = Missing Value

Source: NWS Daily Summary

Daily Weather History Graph





Astronomy

Mar. 08, 2017	Rise	Set
Actual Time	6:34 AM PST	6:06 PM PST
Civil Twilight	6:05 AM PST	6:36 PM PST
Nautical Twilight	5:30 AM PST	7:10 PM PST
Astronomical Twilight	4:56 AM PST	7:45 PM PST
Moon	2:10 PM PST (3/8)	4:14 AM PST (3/8)
Length of Visible Light	12h 31m	
Length of Day	11h 32m	

Waxing Gibbous, 84% of the Moon is Illuminated

Mar 8	Mar 12	Mar 20	Mar 27	Apr 3
Waxing Gibbous	Full	Last Quarter	New	First Quarter

Hourly Weather History & Observations

Temp.	Windchill	Dew Point	Humidity	Pressure	Visibility	Wind Dir	Wind Speed	Gust Speed	Precip	Events	Conditions
45.0 °F	-	**43.0** °F	93%	**30.11** in	**10.0** mi	Calm	Calm	-	N/A		Overcast
46.0 °F	-	**44.1** °F	93%	**30.14** in	**10.0** mi	Calm	Calm	-	N/A		Overcast
46.0 °F	**44.8** °F	**43.0** °F	89%	**30.15** in	**10.0** mi	SW	**3.5** mph	-	**0.00** in		Overcast
46.9 °F	-	**43.0** °F	86%	**30.15** in	**10.0** mi	WSW	**5.8** mph	-	**0.00** in	Rain	Light Rain
46.0 °F	-	**43.0** °F	89%	**30.18** in	**8.0** mi	Calm	Calm	-	**0.00** in	Rain	Light Rain
46.0 °F	-	**43.0** °F	89%	**30.19** in	**6.0** mi	Calm	Calm	-	**0.00** in	Rain	Light Rain
45.0 °F	-	**43.0** °F	93%	**30.18** in	**7.0** mi	Calm	Calm	-	**0.00** in	Rain	Light Rain

45.0 °F	-	**43.0** °F	93%	**30.18** in	**10.0** mi	Calm	Calm	-	**0.00** in	Rain	Light Rain
44.1 °F	-	**42.1** °F	93%	**30.19** in	**10.0** mi	Calm	Calm	-	**0.00** in	Rain	Light Rain
45.0 °F	-	**42.1** °F	90%	**30.19** in	**10.0** mi	Calm	Calm	-	**0.00** in	Rain	Light Rain
45.0 °F	-	**41.0** °F	86%	**30.21** in	**10.0** mi	Calm	Calm	-	N/A	Rain	Light Rain
44.1 °F	**42.5** °F	**39.9** °F	85%	**30.22** in	**10.0** mi	West	**3.5** mph	-	N/A	Rain	Light Rain
44.1 °F	**41.5** °F	**39.0** °F	82%	**30.22** in	**10.0** mi	West	**4.6** mph	-	**0.00** in		Overcast
44.1 °F	-	**39.9** °F	85%	**30.22** in	**10.0** mi	Calm	Calm	-	**0.00** in	Rain	Light Rain
43.0 °F	-	**41.0** °F	93%	**30.20** in	**10.0** mi	Calm	Calm	-	**0.01** in		Overcast
43.0 °F	-	**41.0** °F	93%	**30.18** in	**2.5** mi	Calm	Calm	-	N/A		Overcast
43.0 °F	-	**41.0** °F	93%	**30.17** in	**2.5** mi	Calm	Calm	-	**0.01** in		Overcast
44.1 °F	-	**41.0** °F	89%	**30.17** in	**2.5** mi	Calm	Calm	-	**0.00** in	Rain	Light Rain
43.0 °F	-	**41.0** °F	93%	**30.17** in	**2.5** mi	Calm	Calm	-	**0.01** in	Rain	Light Rain
44.1 °F	-	**42.1** °F	93%	**30.16** in	**2.5** mi	Calm	Calm	-	**0.02** in	Rain	Light Rain
44.1 °F	**42.5** °F	**42.1** °F	93%	**30.16** in	**4.0** mi	NW	**3.5** mph	-	**0.00** in	Rain	Light Rain
44.1 °F	-	**42.1** °F	93%	**30.16** in	**2.5** mi	Calm	Calm	-	**0.03** in	Rain	Light Rain
44.1 °F	**42.5** °F	**42.1** °F	93%	**30.16** in	**3.0** mi	NW	**3.5** mph	-	**0.05** in	Rain	Light Rain
43.0 °F	**41.3** °F	**42.1** °F	97%	**30.16** in	**2.0** mi	WNW	**3.5** mph	-	**0.00** in	Rain	Light Rain
44.1 °F	-	**42.1** °F	93%	**30.15** in	**2.0** mi	Calm	Calm	-	**0.02** in	Rain	Light Rain
44.1 °F	-	**42.1** °F	93%	**30.15** in	**3.0** mi	Calm	Calm	-	**0.02** in	Rain	Light Rain
44.1 °F	-	**43.0** °F	96%	**30.15** in	**3.0** mi	Calm	Calm	-	**0.02** in	Rain	Light Rain
44.1 °F	-	**43.0** °F	96%	**30.14** in	**2.5** mi	Calm	Calm	-	**0.01** in	Rain	Light Rain
44.1 °F	-	**43.0** °F	96%	**30.13** in	**3.0** mi	Calm	Calm	-	**0.02** in	Rain	Light Rain
44.1 °F	-	**43.0** °F	96%	**30.13** in	**2.5** mi	Calm	Calm	-	**0.02** in	Rain	Light Rain
44.1 °F	-	**43.0** °F	96%	**30.13** in	**2.5** mi	Calm	Calm	-	**0.04** in	Rain	Light Rain
44.1 °F	-	**43.0** °F	96%	**30.13** in	**2.0** mi	Calm	Calm	-	**0.00** in	Rain	Light Rain
44.1 °F	-	**42.1** °F	93%	**30.13** in	**2.0** mi	Calm	Calm	-	**0.02** in	Rain	Light Rain
44.1 °F	-	**43.0** °F	96%	**30.13** in	**2.0** mi	Calm	Calm	-	**0.03** in	Rain	Light Rain
44.1 °F	-	**42.1** °F	93%	**30.12** in	**2.0** mi	Calm	Calm	-	**0.04** in	Rain	Light Rain
44.1 °F	**42.5** °F	**42.1** °F	93%	**30.12** in	**4.0** mi	NNE	**3.5** mph	-	**0.00** in	Rain	Light Rain
44.1 °F	**42.5** °F	**42.1** °F	93%	**30.12** in	**4.0** mi	North	**3.5** mph	-	**0.02** in	Rain	Light Rain
44.1 °F	**42.5** °F	**42.1** °F	93%	**30.12** in	**5.0** mi	NNE	**3.5** mph	-	**0.02** in	Rain	Light Rain
44.6 °F	**43.1** °F	**42.8** °F	93%	**30.12** in	**7.0** mi	NNE	**3.5** mph	-	**0.02** in	Rain	Light Rain
44.1 °F	-	**42.1** °F	93%	**30.12** in	**8.0** mi	Calm	Calm	-	**0.02** in	Rain	Light Rain
44.1 °F	-	**43.0** °F	96%	**30.11** in	**5.0** mi	Calm	Calm	-	**0.00** in	Rain	Light Rain
44.1 °F	-	**42.1** °F	93%	**30.12** in	**4.0** mi	Calm	Calm	-	**0.01** in	Rain	Light Rain
43.0 °F	**41.3** °F	**42.1** °F	97%	**30.12** in	**3.0** mi	West	**3.5** mph	-	**0.01** in	Rain	Light Rain

43.0 °F	**40.3** °F	**42.1** °F	97%	**30.12** in	**2.5** mi	West	**4.6** mph	-	**0.00** in	Rain	Light Rain
43.0 °F	**41.3** °F	**42.1** °F	97%	**30.12** in	**3.0** mi	West	**3.5** mph	-	**0.00** in	Rain	Light Rain
43.0 °F	**40.3** °F	**42.1** °F	97%	**30.13** in	**4.0** mi	West	**4.6** mph	-	**0.00** in	Rain	Light Rain
43.0 °F	**40.3** °F	**42.1** °F	97%	**30.13** in	**5.0** mi	WSW	**4.6** mph	-	**0.01** in		Overcast
43.0 °F	**39.5** °F	**42.1** °F	97%	**30.14** in	**4.0** mi	West	**5.8** mph	-	N/A		Overcast
42.8 °F	**40.1** °F	**42.8** °F	100%	**30.14** in	**3.0** mi	West	**4.6** mph	-	N/A		Overcast
43.0 °F	**40.3** °F	**42.1** °F	97%	**30.14** in	**2.5** mi	WSW	**4.6** mph	-	**0.00** in	Rain	Light Rain

Portland Troutdale, OR

History

Weather History for KTTD - March, 2017

March 7 2017 Tuesday, March 7, 2017 View

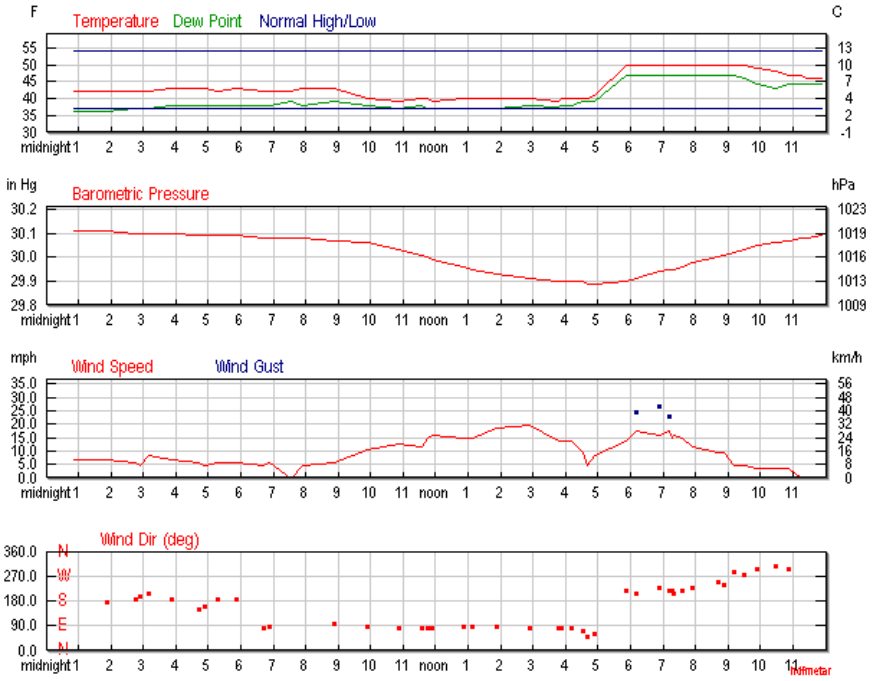
Daily Weekly Monthly Custom

Actual	Average	Record
45 °F	**46** °F	
50 °F	**54** °F	**72** °F (1965)
39 °F	**37** °F	**27** °F (1951)
20	19	
145	138	
0	0	
0	0	
41 °F		
85		
93		
76		
0.01 in	**0.15** in	**1.50** in (2003)
0.45	1.07	
10.83	12.34	
30.01 in		
9 mph (SSE)		
23 mph		
28 mph		
8 miles		
Rain		

T = Trace of Precipitation, MM = Missing Value

Source: NWS Daily Summary

Daily Weather History Graph



Search for Another Location

Airport or City:

KTTD

Submit

Trip Planner

Search our weather history database for the weather conditions in past years. The results will help you decide how hot, cold, wet, or windy it might be!

Date:

March 9 Submit

Astronomy

Mar. 07, 2017	**Rise**	**Set**
Actual Time	6:36 AM PST	6:05 PM PST
Civil Twilight	6:06 AM PST	6:34 PM PST
Nautical Twilight	5:32 AM PST	7:09 PM PST
Astronomical Twilight	4:57 AM PST	7:43 PM PST
Moon	1:07 PM PST (3/7)	3:23 AM PST (3/7)
Length of Visible Light	12h 28m	
Length of Day	11h 28m	

Waxing Gibbous, 75% of the Moon is Illuminated

Mar 7	Mar 12	Mar 20	Mar 27	Apr 3
Waxing Gibbous	Full	Last Quarter	New	First Quarter

Hourly Weather History & Observations

Temp.	Windchill	Dew Point	Humidity	Pressure	Visibility	Wind Dir	Wind Speed	Gust Speed	Precip	Events	Conditions

42.1 °F	**37.7** °F	**36.0** °F	79%	**30.11** in	**10.0** mi	South	**6.9** mph	-	N/A		Mostly Cloudy
42.1 °F	**37.7** °F	**36.0** °F	79%	**30.11** in	**10.0** mi	South	**6.9** mph	-	N/A		Overcast
42.1 °F	**38.4** °F	**37.0** °F	82%	**30.10** in	**9.0** mi	South	**5.8** mph	-	**0.00** in	Rain	Light Rain
42.1 °F	**39.2** °F	**37.0** °F	82%	**30.10** in	**10.0** mi	SSW	**4.6** mph	-	**0.00** in	Rain	Light Rain
42.1 °F	**37.1** °F	**37.0** °F	82%	**30.10** in	**10.0** mi	SSW	**8.1** mph	-	**0.00** in		Overcast
43.0 °F	**38.8** °F	**37.9** °F	82%	**30.10** in	**10.0** mi	South	**6.9** mph	-	**0.00** in	Rain	Light Rain
43.0 °F	**39.5** °F	**37.9** °F	82%	**30.09** in	**10.0** mi	SSE	**5.8** mph	-	**0.00** in		Overcast
43.0 °F	**40.3** °F	**37.9** °F	82%	**30.09** in	**10.0** mi	SSE	**4.6** mph	-	**0.00** in	Rain	Light Rain
42.1 °F	**38.4** °F	**37.9** °F	85%	**30.09** in	**10.0** mi	South	**5.8** mph	-	**0.00** in	Rain	Light Rain
43.0 °F	**39.5** °F	**37.9** °F	82%	**30.09** in	**10.0** mi	South	**5.8** mph	-	**0.00** in	Rain	Light Rain
42.1 °F	**39.2** °F	**37.9** °F	85%	**30.08** in	**10.0** mi	East	**4.6** mph	-	**0.00** in		Overcast
42.1 °F	**38.4** °F	**37.9** °F	85%	**30.08** in	**10.0** mi	East	**5.8** mph	-	**0.00** in		Overcast
42.1 °F	-	**39.0** °F	89%	**30.08** in	**10.0** mi	Calm	Calm	-	**0.00** in	Rain	Light Rain
43.0 °F	**40.3** °F	**37.9** °F	82%	**30.08** in	**10.0** mi	Variable	**4.6** mph	-	**0.00** in	Rain	Light Rain
43.0 °F	**39.5** °F	**39.0** °F	86%	**30.07** in	**10.0** mi	East	**5.8** mph	-	**0.00** in	Rain	Light Rain
39.9 °F	**33.4** °F	**37.9** °F	93%	**30.06** in	**10.0** mi	East	**10.4** mph	-	**0.00** in	Rain	Light Rain
39.0 °F	**31.4** °F	**37.0** °F	93%	**30.03** in	**10.0** mi	East	**12.7** mph	-	**0.00** in	Rain	Light Rain
39.9 °F	**32.9** °F	**37.9** °F	93%	**30.01** in	**10.0** mi	East	**11.5** mph	-	**0.00** in	Rain	Light Rain
39.9 °F	**31.8** °F	**37.0** °F	89%	**30.00** in	**10.0** mi	East	**15.0** mph	-	**0.00** in	Rain	Light Rain
39.0 °F	**30.3** °F	**37.0** °F	93%	**29.99** in	**10.0** mi	East	**16.1** mph	-	**0.00** in	Rain	Light Rain
39.9 °F	**31.8** °F	**37.0** °F	89%	**29.96** in	**6.0** mi	East	**15.0** mph	-	**0.00** in	Rain	Light Rain
39.9 °F	**31.8** °F	**37.0** °F	89%	**29.95** in	**6.0** mi	East	**15.0** mph	-	**0.00** in	Rain	Light Rain
39.9 °F	**30.8** °F	**37.0** °F	89%	**29.93** in	**4.0** mi	East	**18.4** mph	-	**0.01** in	Rain	Light Rain
39.9 °F	**30.5** °F	**37.9** °F	93%	**29.91** in	**4.0** mi	East	**19.6** mph	-	**0.00** in	Rain	Light Rain
39.2 °F	**31.2** °F	**37.4** °F	93%	**29.90** in	**2.5** mi	East	**13.8** mph	-	**0.00** in	Rain	Light Rain
39.9 °F	**32.1** °F	**37.9** °F	93%	**29.90** in	**2.5** mi	East	**13.8** mph	-	**0.00** in	Rain	Light Rain
39.9 °F	**32.1** °F	**37.9** °F	93%	**29.90** in	**2.5** mi	East	**13.8** mph	-	**0.00** in	Rain	Light Rain
39.9 °F	**33.9** °F	**39.0** °F	97%	**29.90** in	**2.5** mi	ENE	**9.2** mph	-	**0.00** in	Rain	Light Rain
39.9 °F	**36.7** °F	**39.0** °F	97%	**29.89** in	**2.5** mi	NE	**4.6** mph	-	**0.00** in	Rain	Light Rain
41.0 °F	**35.8** °F	**39.0** °F	93%	**29.89** in	**4.0** mi	ENE	**8.1** mph	-	**0.00** in	Rain	Light Rain
50.0 °F	-	**46.9** °F	89%	**29.90** in	**6.0** mi	SW	**13.8** mph	**21.9** mph	**0.00** in		Overcast
50.0 °F	-	**46.9** °F	89%	**29.91** in	**8.0** mi	SSW	**17.3** mph	**24.2** mph	**0.00** in	Rain	Light Rain
50.0 °F	-	**46.9** °F	89%	**29.94** in	**4.0** mi	SW	**16.1** mph	**26.5** mph	**0.00** in	Rain	Light Rain
50.0 °F	-	**46.9** °F	89%	**29.95** in	**3.0** mi	SW	**17.3** mph	**23.0** mph	**0.00** in	Rain	Light Rain
50.0 °F	-	**46.9** °F	89%	**29.95** in	**2.5** mi	SW	**15.0** mph	-	**0.00** in	Rain	Light Rain
50.0 °F	-	**46.9** °F	89%	**29.95** in	**3.0** mi	SSW	**16.1** mph	-	**0.00** in	Rain	Light Rain

50.0 °F	-	**46.9** °F	89%	**29.96** in	**5.0** mi	SW	**15.0** mph	**24.2** mph	**0.00** in	Rain	Light Rain
50.0 °F	-	**46.9** °F	89%	**29.98** in	**10.0** mi	SW	**11.5** mph	-	**0.00** in		Overcast
50.0 °F	-	**46.9** °F	89%	**30.00** in	**10.0** mi	WSW	**9.2** mph	-	N/A		Overcast
50.0 °F	-	**46.9** °F	89%	**30.01** in	**10.0** mi	WSW	**9.2** mph	-	N/A		Overcast
50.0 °F	-	**46.9** °F	89%	**30.02** in	**10.0** mi	WNW	**4.6** mph	-	N/A		Overcast
50.0 °F	-	**46.0** °F	86%	**30.03** in	**10.0** mi	West	**4.6** mph	-	**0.00** in	Rain	Light Rain
48.9 °F	-	**44.1** °F	83%	**30.05** in	**10.0** mi	WNW	**3.5** mph	-	**0.00** in		Overcast
48.0 °F	-	**43.0** °F	83%	**30.06** in	**10.0** mi	NW	**3.5** mph	-	**0.00** in	Rain	Light Rain
46.9 °F	-	**44.1** °F	90%	**30.07** in	**10.0** mi	WNW	**3.5** mph	-	**0.00** in		Overcast
46.9 °F	-	**44.1** °F	90%	**30.08** in	**10.0** mi	Calm	Calm	-	N/A		Overcast
46.0 °F	-	**44.1** °F	93%	**30.08** in	**10.0** mi	Calm	Calm	-	N/A		Overcast
46.0 °F	-	**44.1** °F	93%	**30.09** in	**10.0** mi	Calm	Calm	-	N/A		Overcast


ATTENTION:
THIS SEAL IS NOT TO BE BROKEN WITHOUT PRIOR AUTHORIZATION
FROM THE UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
THIS APPLIANCE HAS BEEN SEALED IN ACCORDANCE WITH
REQUIREMENTS OF 40 CFR PART 60 SUBPART AAA
DATE SEALED
MANUFACTURER Pacific Energy
MODEL # Super


Project # 034-S-076-1
Pacific Energy: Super (Series E)
Run #5
14.0 lbs
3/11/17
3.48
3.46
1.70


3.48
3.46


Project # 034-S-076-1
Pacific Energy: Super (Series E)
Run #4
14.4 lbs
3/10/17
3.97 15%
3.96


3.97 15%
3.46
MID


Project # 034-S-076-1
Pacific Energy: Super (Series E)
Run #3
14.0 lbs
3/9/17
3.48
15 1/2
3.48
15 1/2
154


3.48
15½
3.48
15½
18'
18'
15'


Project # 034-S-076-1
Pacific Energy: Super (Series E)
Run #2
14.0 lbs
3/8/17


3.84 15/12


Project # 034-S-076-1
Pacific Energy: Super (Series E)
Run #1C
14.1 lbs
3/7/17
3.77
3.37
1.41
2.01
1.78


3.77
3.37


Project # 034-S-076-1
Pacific Energy: Super (Series E)
Run #1B
14.0 lbs
3.68 15½
3.26
1.48

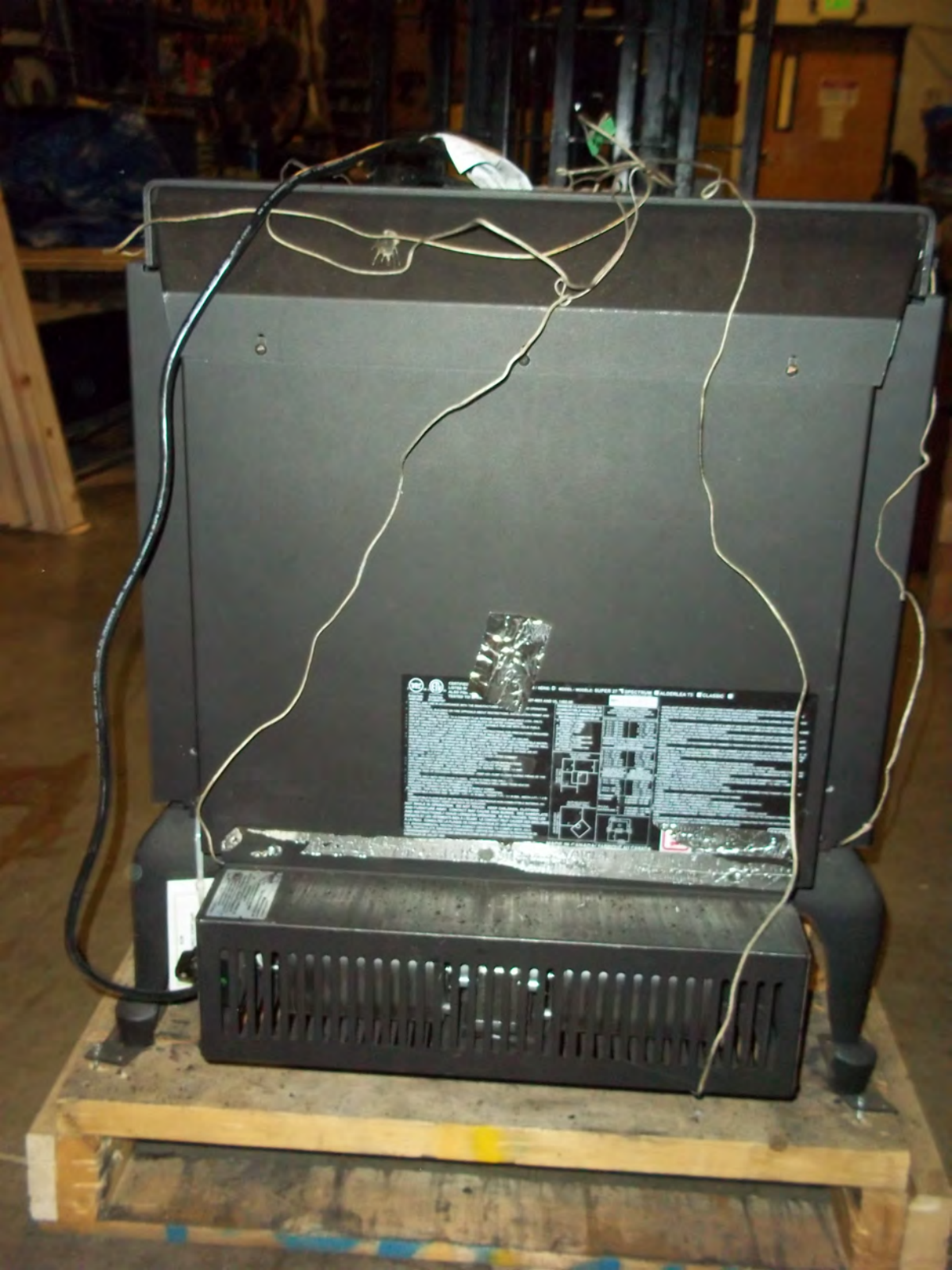

3.67 15½
3.26
1.48

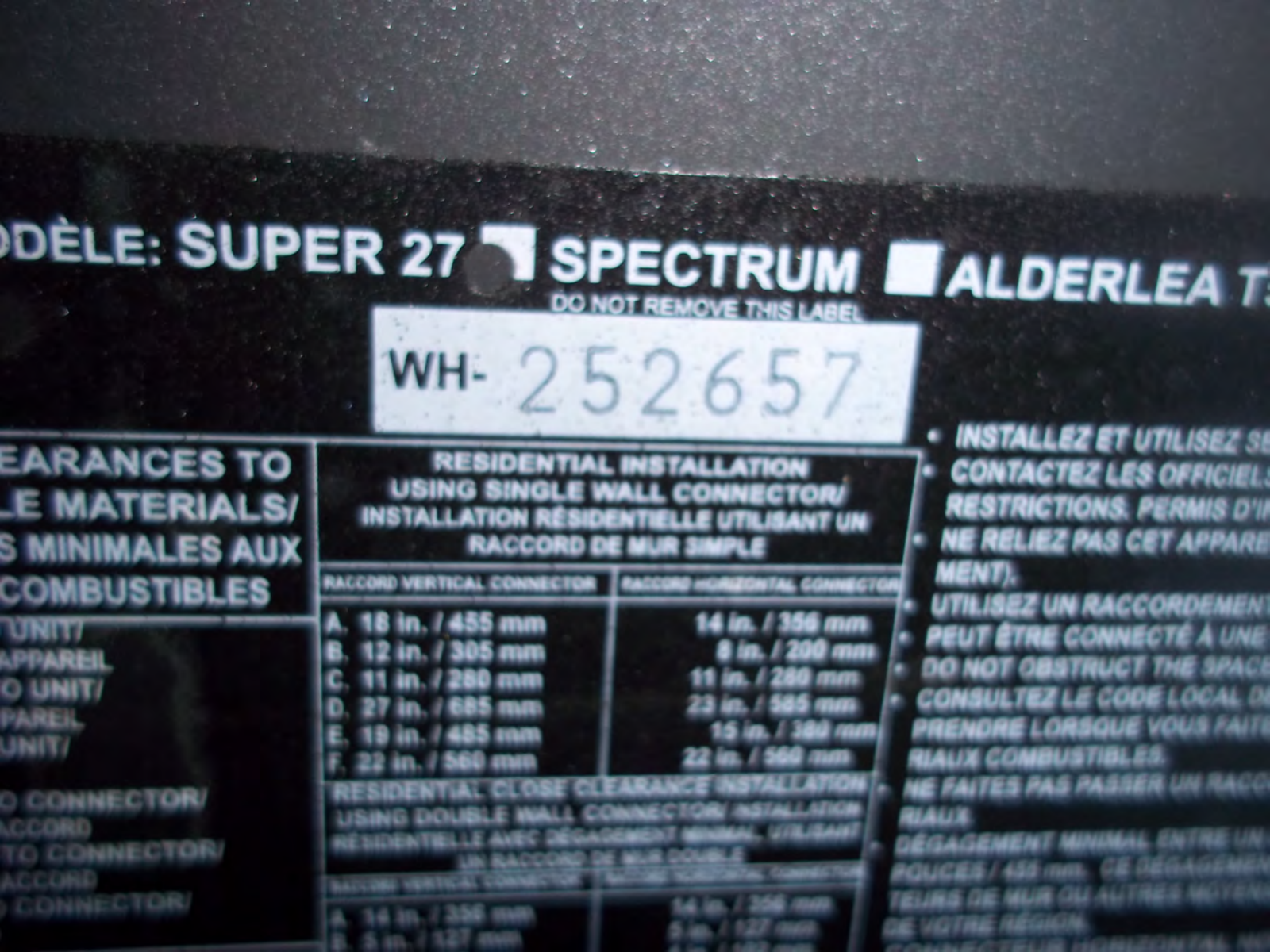

Project # 034-S-076-1
Pacific Energy: Super (Series E)
Run #1A
14.2 lbs
3.41
3.42
1.72


3.41b
3.42
1.72
10.2
19.1b


Project # 034-S-0116-1
Run #1
140 lbs


3.44
3.44




DÈLE: SUPER 27 SPECTRUM ALDERLEA T
DO NOT REMOVE THIS LABEL
WH- 252657
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RESIDENTIAL INSTALLATION
USING SINGLE WALL CONNECTOR/
INSTALLATION RÉSIDENTIELLE UTILISANT UN
RACCORD DE MUR SIMPLE
RACCORD VERTICAL CONNECTOR
RACCORD HORIZONTAL CONNECTOR
A. 18 in. / 455 mm
B. 12 in. / 305 mm
C. 11 in. / 280 mm
D. 27 in. / 685 mm
E. 19 in. / 485 mm
F. 22 in. / 560 mm
14 in. / 356 mm
8 in. / 200 mm
11 in. / 280 mm
23 in. / 585 mm
15 in. / 380 mm
22 in. / 560 mm
RESIDENTIAL CLOSE CLEARANCE INSTALLATION
USING DOUBLE WALL CONNECTOR/ INSTALLATION
RÉSIDENTIELLE AVEC DÉGAGEMENT MINIMAL UTILISANT
UN RACCORD DE MUR DOUBLE
A. 14 in. / 356 mm
14 in. / 356 mm
• INSTALLEZ ET UTILISEZ SE
• CONTACTEZ LES OFFICIELS
RESTRICTIONS. PERMIS D'I
• NE RELIEZ PAS CET APPARE
MENT).
• UTILISEZ UN RACCORDEMENT
• PEUT ÊTRE CONNECTÉ À UNE
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POUCES / 438 mm. CE DÉGAGEMEN
TEURS DE MUR OU AUTRES MOYEN
DE VOTRE RÉGION.

Report and Certificate of Calibration

by

Cal-Cert
6709 S.E. Lake Road Milwaukie, OR 97222 (800)356-4662 Fax (503)654-9670

ACCREDITED
Laboratory Code: CL-108 & CL-157

Report #:	56452-D-03	**Customer PO#:** 1032	
Customer Name:	Dirigo Laboratories		
Customer Address:	11785 Southeast Highway 212, Suite 305		
City:	Clackamas	**State:** OR	**Zip:** 97015
Contact:	John Steinert		
Service Address:	6709 Southeast Lake Road	Milwaukie, OR 97222	

Calibration System Information

10-SR1/00515 SPI 24" Steel Rule S/N: 00515 Cal Date: 3/4/16 Due Date: 3/31/17 Vendor: CC REPORT#: 55433-C-07

10-RH2/00391 Comark Thermohygrometer S/N: 6217150001 Cal Date: 7/17/15 Due Date: 7/31/16 Vendor: CC REPORT#: 53007-C-01

Instrument Data

Calibration Date:	May 31, 2016	**Method Used:**	Direct
Calibration Due Date:	May 31, 2017	**Number of Ranges:**	One
Calibration Frequency:	12 Months	**Indicating System:**	Scaling
Manufacturer:	Stanley	**Temperature:**	68 °F
Type:	Tape Measure	**Humidity:**	52% RH
Model Number:	33-428	**Cal Factor:**	None
Serial #:	JHJ-018-012/09	**Asset #:**	#101
Capacity:	312.00 Inches	**Service Location:**	Cal-Cert Lab
		As Found:	Pass
		As Left:	Pass

Instrument Range: 312.000 Inches **Range Resolution:** 0.0300 Inches

Calibration Standard	As Found Reading	Verification Reading #1	Verification Reading #2
1.000	1.000	1.000	1.000
6.000	6.000	6.000	6.000
24.000	24.000	24.000	24.000
72.000	72.000	72.000	72.000
156.000	156.000	156.000	156.000
240.000	240.000	240.000	240.000
312.000	312.000	312.000	312.000

Expanded Uncertainty ± 0.034642 Inches

Remarks:

We sincerely thank you for your business.

Please call us at 1-800-356-4662 for all your calibration needs.

Cleaning and preventive maintenance were preformed before calibration of this equipment.

A Test Accuracy Ratio (TAR) of at least 4:1, if achievable, is maintained unless otherwise stated. This uncertainty expression is expanded at approximately 95% confidence level, coverage factor (k=2).

This is to certify that the equipment herein identified has been inspected and calibrated in accordance with standard procedures set forth and is found in accordance with manufacturer and ASTM specifications. Cal-Cert Procedure CP-115

Accredited by the International Accreditation Service, Inc. (IAS) under Calibration Laboratory Code CL-108 & CL-157.
This Laboratory meets the requirements of ISO/IEC 17025 AND ANSI/NCSL Z540.3

This Certificate is issued as a statement of the fact that on this date the above instrument(s) had an accuracy as indicated. It should not be construed or regarded as a Guarantee or Warranty of any kind (in favor of the client, the client's customers, or the public at large) that the instrument(s) will continue to retain the same percentage (%) of accuracy or efficiency as determined on the date when the calibration, and adjustments if required, was performed and reported by "CAL-CERT", since the calibrator has absolutely no control over the future operation, damage, maintenance, repairs, and overall condition of the instrument(s) and hereby expressly disclaims any and all liability for damage or loss sustained by all parties arising or resulting from deterioration, obsolescence, malfunction, or substandard performance of said instrument(s); which shall be deemed to be and which shall remain the sole responsibility of the machines regular custodian, owner, and/or manufacturer.

Service Engineer: CAMERON WALLING **Date:** May 31, 2016

Technical Manager: MARSHALL DOYLE **Signature:** MDoyle

Established 1974

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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

Report and Certificate of Calibration

CAL-CERT CALIBRATION CERTIFICATION

by

Cal-Cert
6709 S.E. Lake Road Milwaukie, OR 97222 (800)356-4662 Fax (503)654-9670

ACCREDITED Calibration Laboratory

Laboratory Code: CL-108

Report #:	57576-D-02	**Customer PO#:**	
Customer Name:	Dirigo Laboratories		
Customer Address:	11785 Southeast Highway 212, Suite 305		
City:	Clackamas	**State:** OR	**Zip:** 97015
Contact:	John Steinert		
Service Address:	6709 Southeast Lake Road	Milwaukie, OR 97222	

Calibration Standards

LP-M-5500A/00050 Fluke Electronic Calibrator S/N: 6725008 Cal Date: 11/18/15 Due Date: 11/30/16 Vendor: Fluke REPORT#: 192222
LP-8845A/00051 Fluke Bench Multimeter S/N: 9663004 Cal Date: 11/16/15 Due Date: 11/30/16 Vendor: Fluke REPORT#: 191247
10-RH2/00391 Comark Thermohygrometer S/N: 6217150001 Cal Date: 8/1/16 Due Date: 8/31/17 Vendor: CC REPORT#: 56971-C-01

Instrument Data

Calibration Date:	September 19, 2016	**Reference:**	Manufactures Tolerances
Recommended Due Date:	September 19, 2017	**Cal-Cert Procedure:**	CP-080
Calibration Frequency:	12 Months	**Indicating System:**	Gauge
Manufacturer:	Delmhorst	**Temperature:**	69 °F
Type:	Resistance Artifact	**Humidity:**	51% RH
Model Number:	MCS-1	**Asset #:**	#994
Serial #:	#094	**Service Location:**	Cal-Cert Lab
Capacity:	120,000,000.0 Ohms	**As Found:**	Pass
Tolerance:	10.00 % of indication	**As Left:**	Pass

Instrument Range: 1 MΩ **Range Resolution:** N/A **Mode Verified:** Resistance

Standard Reading	UUT As Found	UUT Reading #1	Error Ω	UUT Reading #2	Error Ω
0.00	0.00	0.00	0.00	0.00	0.00
1,100,000	1,095,076	1,095,076	-4,924	1,095,076	-4,924
120,000,000	120,685,493	120,685,493	685,493	120,685,493	685,493
0.00	0.00	0.00	0.00	0.00	0.00

Expanded Uncertainty± **2.50 Ohms**

Remarks:

We sincerely thank you for your business. Please call us at 1-800-356-4662 for all your sales and calibration needs.
Cleaning and preventative maintenance were performed as part of this service.

Cal-Cert is accredited by the International Accreditation Service, Inc. (IAS) under Calibration Laboratory Code CL-108 & CL-157.
IAS is recognized under the ILAC mutual recognition agreement (MRA).

This certificate is hereby issued that the above instrument was tested for accuracy with calibrated standards traceable to the National Institute of Standards and Technology (NIST). The information provided on this form complies with the data gathering and reporting requirements of ISO/IEC 17025 and ANSI/NCSL Z540.3, and meets the requirements of all applicable references and Cal-Cert procedures listed above.
Any stated measurement uncertainty includes the uncertainty of the Calibration standards used, combined with the uncertainty of the measurement process using the RSS method with a k=2 for an approximate 95% level of confidence. The calibration process meets or exceeds a ratio of 4:1 unless otherwise stated.
All tolerances were derived from the applicable standards and pass/fail determination is based on those tolerances. The customer determined any recommended due dates indicated on the certificate.
This report shall not be reproduced except in full, without written approval from Cal-Cert.

Service Engineer: CAMERON WALLING **Date:** September 19, 2016

Technical Manager: MARSHALL DOYLE **Signature:** MDoyle

Tektronix®

Certificate of Calibration

11772126

Instrument Identification

Company ID: 691956
DIRIGO LABORATORIES
JOHN STEINERT
11785 SE HIGHWAY 212
SUITE 305
CLACKAMAS, OR 97015

PO Number: 1041

Instrument ID: **NX0202013**
Manufacturer: DWYER
Description: DIGITAL MANOMETER

Model Number: 475-000-FM
Serial Number: NX0202013

Accuracy: ±0.5% of Full Scale

Certificate Information

Reason For Service: CALIBRATION
Type of Cal: NORMAL
As Found Condition: IN TOLERANCE
Left Condition: IN TOLERANCE
Procedure: 375A1171CSP GENERAL PURPOSE PRESSURE GAUGES, REVISION G, 23 JUNE 2016
Remarks: *N/A*

Technician: MICHAEL RIVERA
Cal Date 20Oct2016
Cal Due Date: 20Oct2017
Interval: 12 MONTHS
Temperature: 20.0 C
Humidity: 45.0 %

Tektronix certifies the performance of the above instrument has been verified using test equipment of known accuracy, which is traceable to the International System of Units (SI), National Metrology Institutes (NIST, NPL, PTB), derived from ratio type measurements, compared to reference materials or recognized consensus standards. The policies and procedures comply with ANSI/NCSL Z540.1-1994.
The quality system complies with ISO9001.

Approved By: MICHAEL RIVERA
Service Representative

Issue Date: 10/20/2016

Calibration Standards

NI raceable#	Inst. ID#	Description	Manufacturer	Model	Cal Date	Date Due
11623168	15-183	DIGITAL PRESSURE CONTROLLER, 0 TO 30 II	RUSKA INSTRUMEN	7250LP	02Sep2016	02Sep2017

Established 1974

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ACCREDITED
Calibration Services
Certificate Number: 1550.01
Laboratory code: 115953

Dirigo Laboratories
11785 SE Hwy 212, Ste 305
Clackamas, OR 97015

Report Number: DIRI01167102161221

A2LA ACCREDITED
CERTIFICATE OF CALIBRATION WITH DATA

INSTRUMENT INFORMATION

Item	Make	Model	Serial Number	Customer ID	Location
Scale	Rice Lake	IQ+355-2A 10000	167102	N/A	Lab
Units	**Readability**	**SOP**	**Cal Date**	**Last Cal Date**	**Cal Due Date**
lbs	1	QC033	12/21/16	6/27/16	6/2017

FUNCTIONAL CHECKS

SHIFT TEST	LINEARITY	REPEATABILITY	ENVIRONMENTAL CONDITIONS
Test Wt: 1000 Tol: 1	Test Wt: HB44 Tol: HB44	Test Wt: 500 Tol: 1	☐ Good ☑ Fair ☐ Poor
As-Found: Pass:☑ Fail:☐	As-Found: Pass:☑ Fail:☐	As-Found: Pass:☑ Fail:☐	Temperature: 16.7°C
As-Left: Pass:☑ Fail:☐	As-Left: Pass:☑ Fail:☐	As-Left: Pass:☑ Fail:☐	

CALIBRATION DATA

Standard	As-Found	As-Left	Expanded Uncertainty
1000	1000	1000	0.5
700	700	700	0.5
500	500	500	0.5
300	300	300	0.5
100	100	100	0.5
50	50	50	0.5

CALIBRATION STANDARDS

Item	Make	Model	Serial Number	Cal Date	Cal Due Date	NIST ID
Avoirdupois Cast W	Rice Lake	25 and 50lb	PWO990-CA	11/4/15	11/2017	20152112

Permanent Information Concerning this Equipment:
10000 lb scale with a built-on furnace.

Comments/Information Concerning this Calibration
12/21/2016: Large Furnace on balance. Customer weighs difference in fuel at a load of around 100lbs. 6/16 Added woodstove(deadload) of 622 lbs. Check range from 1000-1622 on top of the 0-1000 lbs. Values had no count of errors.

Report prepared/reviewed by: N. KILMER **Date:** 12-21-16 **Technician:** N.Kilmer
Signature:

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.

DIRIGO LABORATORIES INC.

EPA Method 5 Dry Gas Meter Calibration for γ and ΔH@

Average DGM γ factor = **0.997**

Average Meter Orifice ΔH@ = **32.836**

Manufacturer / Model:	Apex-AK-600
ID:	Ambient Box
Serial Number	810016
Equipment No.:	Dirigo 055
Calibration Date:	1/18/2017
Next Calibration Due:	1/18/2018
Barometric Pressure:	29.47 inHg
Signature/Date:	DC Towne 1/18/2017

	Run 1	Run 2	Run 3
Standard DGM Initial Volume (L)	0.000	0.000	0.000
Standard DGM Final Volume (L)	178.603	158.956	159.555
Standard Ave. Meter Temperature (°F), (Tstd)	65.1	65.4	65.4
DGM Initial Volume (cuft)	0.000	0.000	0.000
DGM Final Volume (cuft)	6.358	5.617	5.592
DGM Average Temperature (°F), (T_{DGM})	65.0	67.0	70.0
Time (min)	30.0	30.0	35.0
Orifice ΔH ("H2O)	2.50	2.00	1.50
Vacuum ("H2O)	0.00	0.00	0.00
Total Volume for Standard DGM (Vstd) (cuft)	6.307	5.613	5.635
Total Volume for DGM (V_{DGM}) (cuft)	6.358	5.617	5.592

Dry Gas Meter γ Factor	0.984	0.996	1.011
γ Factor Deviation From Average	0.013	0.001	0.014
Meter Orifice ΔH@	32.677	32.834	32.996
Orifice ΔH@ Deviation From Average	0.159	0.002	0.161

Standard Meter Data

Date	2/4/2016
γ Factor	0.998
Model	SK25DA
Serial Number	1101001

Pre-Calibration Data

Date	8/5/2016
γ Factor	1.003
ΔH@	32.499
Tolerance (5%)	0.050
Deviation	0.006

Pass

DGM Calibration Data

γ Deviation Tolerance	0.020
Maximum γ Deviation	0.014
ΔH@ Deviation Tolerance	0.200
Maximum dH@ Deviation	0.161

Pass

Calculations:

1. Deviation = |Average value for all runs - current run value|
2. γ = (Vstd x (Std γ factor) x (P_{bar}) x (T_{DGM} + 460) / (V_{DGM} x (Tstd + 460) x (Pbar + (dH / 13.6)))
3. ΔH@ = 0.0319 x ΔH ((((T_{DGM}+ 460) x (Time^2)) / (P_{bar} x (γ factor^2) x (V_{DGM}^2)))

Measurement of uncertainty = +/- 0.14 cfm

DIRIGO LABORATORIES INC.

EPA Method 5 Dry Gas Meter Calibration for γ and ΔH@

Average DGM γ factor = **1.002**

Average Meter Orifice ΔH@ = **59.911**

Manufacturer / Model:	XC-60-ED
ID:	Box B
Serial Number	1902133
Equipment No.:	Dirigo 054
Calibration Date:	9/7/2016
Next Calibration Due:	3/7/2017
Barometric Pressure:	30.15 inHg
Signature/Date:	9/8/16

	Run 1	Run 2	Run 3
Standard DGM Initial Volume (L)	0.000	0.000	0.000
Standard DGM Final Volume (L)	151.554	154.122	150.749
Standard Ave. Meter Temperature (°F), (Tstd)	79.0	75.2	80.0
DGM Initial Volume (cuft)	0.000	0.000	0.000
DGM Final Volume (cuft)	5.464	5.587	5.505
DGM Average Temperature (°F), (T_{DGM})	97.7	93.6	101.6
Time (min)	35.0	40.0	45.0
Orifice ΔH ("H2O)	2.50	2.00	1.51
Vacuum ("H2O)	0.00	0.00	0.00
Total Volume for Standard DGM (Vstd) (cuft)	5.352	5.443	5.324
Total Volume for DGM (V_{DGM}) (cuft)	5.464	5.587	5.505

Dry Gas Meter γ Factor	1.005	1.001	1.000
γ Factor Deviation From Average	0.003	0.001	0.002
Meter Orifice ΔH@	59.869	59.935	59.930
Orifice ΔH@ Deviation From Average	0.043	0.024	0.019

Standard Meter Data

Date	2/4/2016
γ Factor	0.998
Model	SK25DA
Serial Number	1101001

Pre-Calibration Data

Date	3/8/2016
γ Factor	1.001
ΔH@	59.917
Tolerance (5%)	0.050
Deviation	0.001

Pass

DGM Calibration Data

γ Deviation Tolerance	0.020
Maximum γ Deviation	0.003
ΔH@ Deviation Tolerance	0.200
Maximum dH@ Deviation	0.043

Pass

Calculations:

1. Deviation = |Average value for all runs - current run value|
2. γ = (Vstd x (Std γ factor) x (P_{bar}) x (T_{DGM} + 460) / (V_{DGM} x (Tstd + 460) x (Pbar + (dH / 13.6)))
3. ΔH@ = 0.0319 x ΔH ((((T_{DGM}+ 460) x (Time^2)) / (P_{bar} x (γ factor^2) x (V_{DGM}^2)))

Measurement of uncertainty = +/- 0.14 cfm

DIRIGO LABORATORIES INC.

EPA Method 5 Dry Gas Meter Calibration for γ and ΔH@

Manufacturer / Model: XC-60-ED
ID: Box-A
Serial Number 1902130
Equipment No.: Dirigo 053
Calibration Date: 9/7/2016
Next Calibration Due: 3/7/2017
Barometric Pressure: 30.15 inHg
Signature/Date: 9/7/16

Average DGM γ factor = **1.007**

Average Meter Orifice ΔH@ = **58.571**

	Run 1	Run 2	Run 3
Standard DGM Initial Volume (L)	0.000	0.000	0.000
Standard DGM Final Volume (L)	153.398	157.354	153.013
Standard Ave. Meter Temperature (°F), (Tstd)	76.1	77.3	78.3
DGM Initial Volume (cuft)	0.000	0.000	0.000
DGM Final Volume (cuft)	5.433	5.674	5.594
DGM Average Temperature (°F), (T_{DGM})	89.0	96.2	100.7
Time (min)	35.0	40.0	45.0
Orifice ΔH ("H2O)	2.49	2.03	1.53
Vacuum ("H2O)	0.00	0.00	0.00
Total Volume for Standard DGM (Vstd) (cuft)	5.417	5.557	5.404
Total Volume for DGM (V_{DGM}) (cuft)	5.433	5.674	5.594

Dry Gas Meter γ Factor	1.013	1.007	1.001
γ Factor Deviation From Average	0.006	0.000	0.006
Meter Orifice ΔH@	58.489	58.554	58.670
Orifice ΔH@ Deviation From Average	0.082	0.017	0.099

Standard Meter Data

Date	2/4/2016
γ Factor	0.998
Model	SK25DA
Serial Number	1101001

Pre-Calibration Data

Date	3/8/2016
γ Factor	1.002
ΔH@	58.685
Tolerance (5%)	0.050
Deviation	0.005

Pass

DGM Calibration Data

γ Deviation Tolerance	0.020
Maximum γ Deviation	0.006
ΔH@ Deviation Tolerance	0.200
Maximum dH@ Deviation	0.099

Pass

Calculations:

1. Deviation = |Average value for all runs - current run value|
2. γ = (V_{std} x (Std γ factor) x (P_{bar}) x (T_{DGM} + 460) / (V_{DGM} x (Tstd + 460) x (Pbar + (dH / 13.6)))
3. ΔH@ = 0.0319 x ΔH ((((T_{DGM}+ 460) x (Time^2)) / (P_{bar} x (γ factor^2) x (V_{DGM}^2)))

Measurement of uncertainty = +/- 0.14 cfm

Established 1974

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ACCREDITED
Calibration Services
Certificate Number: 1550.01
Laboratory code: 115953

Dirigo Laboratories
11785 SE Hwy 212, Ste 305
Clackamas, OR 97015

Report Number: DIRI0182484A0912013i170627

A2LA ACCREDITED
CERTIFICATE OF CALIBRATION WITH DATA

INSTRUMENT INFORMATION

Item	Make	Model	Serial Number	Customer ID	Location
Scale	Digiweigh	DWP12i 400x.01	82484A0912013i	N/A	Lab
Units	**Readability**	**SOP**	**Cal Date**	**Last Cal Date**	**Cal Due Date**
lbs	0.01	QC033	6/27/17	12/21/16	12/2017

FUNCTIONAL CHECKS

SHIFT TEST	LINEARITY	REPEATABILITY	ENVIRONMENTAL CONDITIONS
Test Wt: 50 Tol: 0.05	Test Wt: HB44 Tol: HB44	Test Wt: 50 Tol: 0.01	☐ Good ☑ Fair ☐ Poor
As-Found: Pass:☑ Fail:☐	As-Found: Pass:☑ Fail:☐	As-Found: Pass:☑ Fail:☐	Temperature: 21.7°C
As-Left: Pass:☑ Fail:☐	As-Left: Pass:☑ Fail:☐	As-Left: Pass:☑ Fail:☐	

CALIBRATION DATA

Standard	As-Found	As-Left	Expanded Uncertainty
400	399.69	399.96	0.058
300	300.00	300.00	0.058
200	200.03	200.03	0.058
100	100.02	100.02	0.012
50	50.00	50.00	0.012
20	20.00	20.00	0.012

CALIBRATION STANDARDS

Item	Make	Model	Serial Number	Cal Date	Cal Due Date	NIST ID
Weight Set	Rice Lake	20kg to 1mg	7133	4/20/17	4/2018	20170720

Permanent Information Concerning this Equipment:

Comments/Information Concerning this Calibration

6/17 - RH = 52.5%

Report prepared/reviewed by: Jake C **Date:** 6/27/17 **Technician:** D.Oudeans

Signature: DOudeans

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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Dirigo Laboratories
11785 SE Hwy 212, Ste 305
Clackamas, OR 97015

Report Number: DIRI01A05026161221

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	N/A	Lab
Units	**Readability**	**SOP**	**Cal Date**	**Last Cal Date**	**Cal Due Date**
lbs	1	QC033	12/21/16	6/27/16	6/2017

FUNCTIONAL CHECKS

SHIFT TEST	LINEARITY	REPEATABILITY	ENVIRONMENTAL CONDITIONS
Test Wt: 250 Tol: 1	Test Wt: HB44 Tol: HB44	Test Wt: 100 Tol: 1	☐ Good ☑ Fair ☐ Poor
As-Found: Pass:☑ Fail:☐	As-Found: Pass:☑ Fail:☐	As-Found: Pass:☑ Fail:☐	Temperature: 16.9°C
As-Left: Pass:☑ Fail:☐	As-Left: Pass:☑ Fail:☐	As-Left: Pass:☑ Fail:☐	

CALIBRATION DATA

Standard	As-Found	As-Left	Expanded Uncertainty
1000	999.8	999.8	0.5
700	699.8	699.8	0.5
500	500.0	500.0	0.5
300	300.0	300.0	0.5
100	100.0	100.0	0.5
50	50.0	50.0	0.5

CALIBRATION STANDARDS

Item	Make	Model	Serial Number	Cal Date	Cal Due Date	NIST ID
Avoirdupois Cast W	Rice Lake	25 and 50lb	PWO990-CA	11/4/15	11/2017	20152112

Permanent Information Concerning this Equipment:
2000lbs platform. Has a custom pan.

Comments/Information Concerning this Calibration

Report prepared/reviewed by: N.KILMER **Date:** 12.21.16

Technician: N.Kilmer
Signature:

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.

IMPORTANT:
THESE INSTRUCTIONS ARE TO REMAIN WITH THE HOMEOWNER

PACIFIC ENERGY

SERIAL #

OPERATING AND INSTALLATION INSTRUCTIONS

SAFETY NOTICE

If this stove is not properly installed, a house fire may result. For your safety, follow the installation instructions. Contact local building or fire officials about restrictions and installation inspection requirements in your area.

Meets the Environmental Protection Agency's 2020 Particulate Emission Standards (Crib Wood).

C ETL LISTED US
Intertek

MODEL(S): SUPER LE, SUPER CLASSIC LE

Visit www.pacificenergy.net for the most recent version of this manual

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PLEASE SAVE THESE INSTRUCTIONS

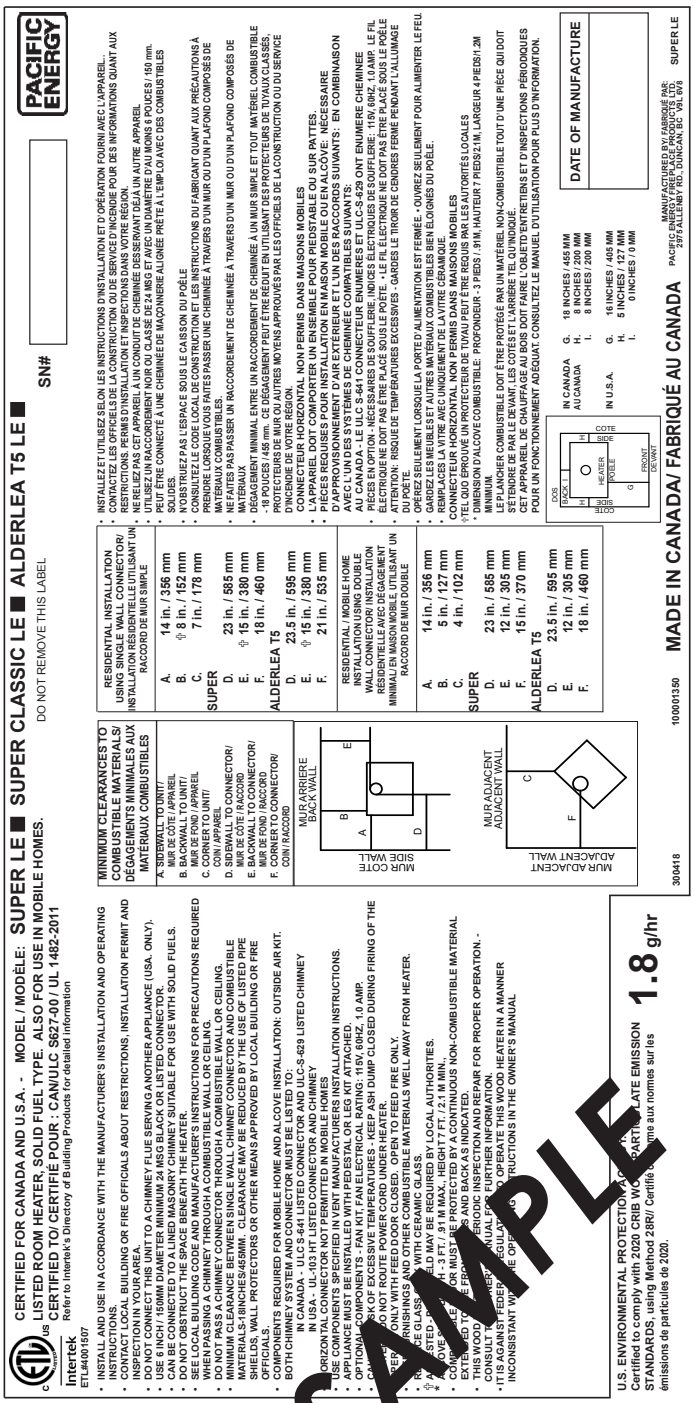
NOTE: WE STRONGLY RECOMMEND THAT SMOKE AND CARBON MONOXIDE DETECTORS BE INSTALLED IN THE AREA WHERE THE HEATER IS TO BE INSTALLED.
If smoke detectors have been previously installed, you may notice that they are operating more frequently. This may be due to curing of stove paint or fumes caused by accidentally leaving the fire door open. Do not disconnect the detectors.

SAFETY NOTICE: If this stove is not properly installed, a house fire may result. For your safety, follow the installation instructions. Contact local building or fire officials about restrictions and installation inspection requirements in you area.

Please read this entire manual before you install and use your new room heater. Failure to follow instructions may result in property damage, bodily injury, or even death.

Experience will give you the right settings for proper combustion and efficient burning. Remember the correct air inlet setting is affected by variables such as type of wood, outside temperature, chimney size and weather conditions. With practice, you will become proficient in operating your heater and will obtain the performance for which it was designed.

Rating Label



PLEASE SAVE THESE INSTRUCTIONS

This manual describes the installation and operation of the Pacific Energy, SUPER LE / SUPER CLASSIC LE Freestanding wood heater.

SAFETY NOTICE:
This wood heater needs periodic inspection and repair for proper operation. It is against federal regulations to operate this wood heater in a manner inconsistent with the operating instructions in this manual.

This heater meets the 2020 U.S. Environmental Protection Agency's crib wood emission limits for wood heaters sold after May 15, 2020 using Method 28R.

Model SUPER LE / SUPER CLASSIC LE: 1.8 g/hr..

Under specific test conditions this heater has been shown to deliver heat at rates ranging from 12,500 to 38,200Btu/ hr.

Efficiency and BTU Output

EPA Certified Emissions	1.8 grams per hour
LHV Tested Efficiency 1	77.1%
HHV Tested Efficiency 2	71.3%
EPA BTU Output 3	12,518 to 38,177 btu/hr.
Maximum Wood Length	18 inches
Ideal Wood Length	17 inches
Fuel	Seasoned Cord wood

1 Weighted Average Lower Heating Value (LHV) efficiency as tested using CSA B415 Performance testing of solid-fuel-burning heating appliances. LHV assumes the moisture is already in a vapour state so there is no loss of energy

2 Weighted Average Higher Heating Value (HHV) efficiency as tested using CSA B415 Performance testing of solid-fuel-burning heating appliances. HHV includes the energy required to vaporize the water in the fuel

3 The range of BTU outputs is based on efficiency using CSA B415 Performance testing of solid-fuel-burning heating appliances and burn rates from the low and high EPA tests using Douglas Fir dimensional lumber.

Safety

CAUTION: Never use gasoline, gasoline type lantern fuel, kerosene, charcoal lighter fluid or similar liquids to start or "freshen up" a fire in this heater. Keep all such liquids well away from the heater while it is in use.

Instruct all members of your family on the safe operation of the heater. Ensure they have enough knowledge of the entire system if they are expected to operate it. Stress the section on chimney fires and the importance of following the steps outlined "In Case of Chimney Fire".

Chimney Smoke and Creosote Formation

When wood is burned slowly, it produces tar and other organic vapours, which combine with expelled moisture to form creosote. The creosote vapours condense in the relatively cool chimney flue of a slow burning fire. As a result, creosote residue accumulates on the flue lining. When ignited, this creosote makes an extremely hot fire. The chimney connector and chimney should be inspected periodically (at least once every two months) during the heating season to determine if a creosote buildup has occurred. If creosote has accumulated (3 mm. or more), it should be removed to reduce the risk of a chimney fire.

1. Highest smoke densities and emissions occur when a large amount of wood is added to a bed of hot coals and the air inlet is closed. The heated wood generates smoke, but without ample air, the smoke cannot burn. Smoke-free, clean burning requires small fuel loads, two or three logs at a time or 1/4 to 1/2 of fuel load and leaving the air inlet relatively wide open, especially during the first 10 to 30 minutes after each loading, when most of the smoke generating reactions are occurring. After 30 minutes or so, the air inlet can be turned down substantially without excessive smoke generation. Wood coals create very little creosote-producing smoke.

2. The cooler the surface over which the wood smoke is passing, the more creosote will be condensed. Wet or green wood contributes significantly to creosote formation as the excess moisture that is boiled off cools the fire, making it difficult for the tars and gases to ignite, thus creating dense smoke and poor combustion. This moisture-laden smoke cools the chimney, compounding the problem by offering the smoke the ideal place to condense.

In summary, a certain amount of creosote is inevitable. Regular inspection and cleaning is the solution. The use of dry, seasoned wood and ample combustion air will help to minimize annoying smoke emissions and creosote buildup.

Chimney Fires

The dangerous side effect of excessive creosote buildup is a chimney fire. This causes much higher than normal temperatures in the chimney and on its exterior surfaces. Temperatures inside the chimney can exceed 2000°F (1100°C). Ignition of nearby or touching combustible material is more likely during a chimney fire. Proper clearances are critical to prevent damage during such a fire.

Chimney fires are easy to detect; they usually involve one or more of the following:

- Flames and sparks shooting out of the top of the chimney
- A roaring sound
- Vibration of the chimney

To Avoid a Chimney Fire

1. Burn wood cleanly. Do not burn wet wood or turn down the unit too quickly after loading.

2. Do not let creosote build up to a point where a chimney fire is possible.

3. Do not have fires in the heater that may ignite chimney fires. These are excessively hot fires, such as when burning household trash, cardboard, Christmas tree limbs, or even ordinary fuel wood; (e.g. with a full load on a hot bed of coals and with the air inlet wide open for more time than is needed to completely char a fresh fuel load.)

4. The Chimney and connector pipe should be inspected /cleaned periodically.

In Case of a Chimney Fire

1. Prepare to evacuate to ensure everyone's safety. Have a well understood plan of action for evacuation. Have a place outside where everyone is to meet.

2. Close air inlet on stove.

3. Call local fire department. Have a fire extinguisher handy. Contact your local municipal or provincial fire authority for further information on how to handle a chimney fire. It is most important that you have a clearly understood plan on how to handle a chimney fire.

4. After the chimney fire is out, the chimney must be cleaned and checked for stress and cracks before starting another fire. Also check combustibles around the chimney and the roof.

- The services of a competent or certified installer, (certified by the Wood Energy Technical Training program (WETT) - in Canada, Hearth Education Foundation (HEARTH) - in U.S.A.,) are strongly recommended.

Curing of the Paint Finish

To achieve the best finish, the paint on your stove must be baked on. When burning your stove for the first 2-3 times it is very important that the room be well ventilated. Open all windows and doors. Smoke and fumes caused by the curing process may cause discomfort to some individuals.

WARNING: Never use chemicals or any other volatile liquid to start a fire. Do not burn garbage, or flammable fluids such as gasoline, naptha, or engine oil.

Operation

CAUTION: Hot while in operation. Keep children, clothing and furniture away. Contact may cause skin burns.

WARNING: Always keep loading door closed when burning. This heater is not designed for open door burning.

WARNING: No alteration or modification of the combustion air control assembly is permitted. Any tampering will void warranty and could be very hazardous.

WARNING: Do not use grates or andirons to elevate the fuel. Burn directly on the fire bricks. Replace broken or missing bricks. Failure to do so may create a hazardous condition.

Wood Selection

This heater is designed to burn natural wood only. Higher efficiency and lower emissions generally result when burning air-dried seasoned hardwoods, as compared to softwoods or to green or freshly cut hardwoods.

Wood should be properly air dried (seasoned) for six months or more. Wet or undried wood will cause the fire to smoulder and produce large amounts of smoke and creosote. Wet wood also produces very little heat and tends to go out often. Wood should be stored under cover away from open flame or heat sources.

DO NOT BURN :

• Salt water wood *	• Treated wood
• Wet or green wood	• Coal/charcoal
• Garbage*	• Solvents
• Lawn clippings/yard waste	• Unseasoned wood
• Railroad ties	• Manure or animal remains
• Materials containing rubber, including tires	• Materials containing plastic
• Construction or demolition debris	• Materials containing asbestos
• Waste petroleum products, paints, paint thinners, or asphalt products	• Paper products, cardboard, plywood, or particleboard.

*** These materials contain chlorides which will rapidly destroy metal surfaces and void warranty.**

Burning these materials may result in the release of toxic fumes or render the heater ineffective and cause smoke.

Do not burn anything but wood. Other fuels, e.g. Charcoal, can produce large amounts of carbon monoxide, a tasteless, odourless gas that can kill. Under no circumstances should you attempt to barbecue in this heater.

The prohibition against burning these materials does not prohibit the use of fire starters made from paper, cardboard, saw dust, wax and similar substances for the purpose of starting a fire in an affected wood heater.

How to Test Your Wood

Add a large piece of wood to the stove when it has a good large bed of coals. It is dry if it is burning on more than one side within one minute. It is damp if it turns black and lights within three minutes. If it sizzles, hisses and blackens without igniting in five minutes it is too wet and should not be burnt

Lighting a fire

WARNING: Never use chemicals or any other volatile liquid to start a fire.

1. Adjust air control to “High” position (all the way to the left) and open door.

2. Place crumpled newspaper in the centre of the heater and crisscross with several pieces of dry kindling. Add a few small pieces of dry wood on top.

3. Ignite the paper and leave the door ajar approximately 1/2"(13mm) - 1"(25mm) until the wood kindling is fully engulfed in flame.

4. After the kindling is fully engulfed add a few small logs. Close door.

5. Begin normal operation after a good coal base exists and wood has charred.

Normal Operation

WARNING: This wood heater has a manufacturer-set minimum low burn rate that must not be altered. It is against federal regulations to alter this setting or otherwise operate this wood heater in a manner inconsistent with the operating instructions in this manual.

1. Set air control to a desired setting. If smoke pours down across the glass (waterfall effect) this indicates you have shut the control down too soon or you are using too low a setting. The wide range control panel makes finding the desired setting for your application easy. As every home's heating needs vary (i.e. Insulation, windows, climate, etc.) The proper setting can only be found by trial and error and should be noted for future burns.

2. To refuel, adjust air control to high, and give the fire time to brighten. Open the door slowly, this will prevent back puffing.

3. Use wood of different shape, diameter and length (up to 18"(457mm)). Load your wood endwise and try to place the logs so that the air can flow between them. Always use dry wood.

4. Do not load fuel to a height or in such a manner that would be hazardous when opening the door.

5. For extended or overnight burns, unsplit logs are preferred. Remember to char the wood completely on maximum setting before adjusting air control for overnight burn.

- Burn wood only, dry and well seasoned. The denser or heavier the wood when dry, the greater its heat value. This is why hardwoods are generally preferred. Green or wet wood will cause a rapid buildup of creosote. If you feel it is necessary to burn wet or unseasoned wood, do so only with the air inlet set open enough to maintain a good strong fire and fairly high chimney temperatures. Do not attempt to burn overnight using green wood or wet wood. Wet wood can cause up to 25% drop in heater output, as well as contributing significantly to creosote buildup.

DO NOT OVER FIRE THIS HEATER: Attempts to achieve heat output rates that exceed heater design specifications can result in permanent damage to the heater and chimney. A glowing red, top or vent pipe are indications of over firing. Failure to rectify an over firing condition can be hazardous and may void the manufacturer's warranty.

Restarting After Extended or Overnight Burns

1. Open door and rake hot embers towards the front of the heater. Add a couple of dry, split logs on top of embers, close door.

2. Adjust air control to high and in just a few minutes, logs should begin burning.

3. After wood has charred, reset air control to desired setting.

4. To achieve maximum firing rate, set control to high "H". Do not use this setting other than for starting or preheating fresh fuel loads.

Proper Draft

1. Draft is the force which moves air from the appliance up through the chimney. The amount of draft in your chimney depends on the length of the chimney, local geography, nearby obstructions and other factors.

2. Too much draft may cause excessive temperatures in the appliance. An uncontrollable burn or a glowing red stove part or chimney indicates excessive draft.

3. Inadequate draft may cause back puffing into the room and plugging of the chimney. Smoke leaking into the room through appliance and chimney connector joints indicates inadequate draft.

Remember the correct air inlet setting is affected by variables such as type of wood, outside temperature, chimney size and weather conditions.

Ash Removal

Caution: Ashes are to be removed only when the heater is cold. Whenever ashes get 3"(76mm) to 4"(102mm) deep in your firebox, and when fire has burned down and cooled, remove excess ashes. Leave an ash bed approximately 1" (25 mm) deep on the firebox bottom to help maintain a hot charcoal bed.

Ash Cleanout system (optional):

The ash dump handle is located under the ash lip on the left hand side. To operate ash dump, pull handle out 1/2"(13mm) and turn clockwise. This will unlock the ash dump and allow it to open. Hold handle open while pulling ashes into the opening. Avoid large embers as these still contain heat value. Release handle and push in to lock. Ensure ash dump door is properly engaged. Fill the cavity with the remaining ash level with the firebox floor. Lift and pull out ash pan and discard ashes into metal container. Replace ash pan and ensure it is seated properly.

Do not burn with ash dump door open. Doing so will create a hazardous condition. Always leave about 1"(25mm) of ash when cleaning.

Disposal of Ashes

Ashes should be placed in a metal container with a tight fitting lid. The closed container of ashes should be placed on a non-combustible floor or on the ground, well away from all combustible materials, pending final disposal. If the ashes are disposed of by burial in soil or otherwise locally dispersed, they should be retained in closed container until all cinders have thoroughly cooled. Other waste should not be placed in this container.

Maintenance

WARNING: Never use chemicals or any other volatile liquid to start a fire. Do not burn garbage, or flammable fluids such as gasoline, naptha, or engine oil.

WARNING: ONLY USE MATERIALS SUPPLIED BY MANUFACTURER WHEN DOING MAINTENANCE OR REPLACEMENTS.

1. If glass becomes darkened through slow burning or poor wood, it can readily be cleaned with fireplace glass cleaner when stove is cold. Never scrape with an object that might scratch the glass. The type and amount of deposit on the glass is a good indication of the flue pipe and chimney buildup. A light brown dusty deposit that is easily wiped off usually indicates good combustion and dry, well-seasoned wood and therefore relatively clean pipes and chimney. On the other hand, a black greasy deposit that is difficult to remove is a result of wet and green wood and too slow a burning rate. This heavy deposit is building up at least as quickly in the chimney.

2. DOOR GASKETS - The gasket used by Pacific Energy (7/8"(22mm) medium density fiberglass rope) requires only light pressure to seal. This will prolong seal life. It is important that the door seal be maintained in good condition. Periodically inspect seals and replace if necessary. Follow the instructions included in the kit (prt# 80000156), obtainable from your nearest Pacific Energy dealer.

3. DOOR GLASS - Do not slam loading door or otherwise impact glass. When closing door, make sure that no logs protrude to impact the glass. If the glass gets cracked or broken, it must be replaced before using the stove. Replacement glass can be obtained from your dealer. Use 8-13/16"(224mm) x 15-1/4"(387mm) x 5 mm. Ceramic glass only. **Do not substitute with any other type.**

- To remove broken glass, undo the four retaining screws and remove clamps and frame, noting position for re-assembly. Remove all particles of glass . Be careful as they are very sharp. Install new glass complete with gasket. Replace frame, clamps and screws.

CAUTION:

- Do not overtighten, tighten screws very carefully
- Do not clean glass when hot
- Do not use abrasive cleaners on glass

4. The area where boost combustion air enters the firebox must be kept clear of excessive ash buildup which will block air flow. This area is at the front of the firebox.

5. Do not store wood within heater installation clearances, or within the space required for fuel loading and ash removal. Keep the area around the heater clean and free of loose combustibles, furniture, newspapers, etc.

6. If the plated door requires cleaning, use mild soap and water only. Use of abrasive cleaners will void warranty.

7. Establish a routine for the fuel, wood burning and firing technique. Check daily for creosote buildup until experience shows how often you need to clean to be safe.

8. Be aware that the hotter the fire, the less creosote is deposited. Weekly cleaning may be necessary in mild weather, even though monthly cleaning is usually enough in the coldest months when burning rates are higher. When wood is burned slowly, it produces tar and other organic vapours, which combine with expelled

Maintenance Checks

Check the following parts for damage such as cracks, excessive corrosion, burned out sections and excessive warping: (See website for descriptions and more detail)

Weekly:

- Firebrick - Visual, for cracking.
- Door Gasket - sagging, placement, damage.

Monthly

- Brick rail tabs and brick rails.
- Air riser tube in the back of the firebox.
- Back side of airwash chamber.
- Baffle locking pin.
- Boost tube cover.

When Cleaning the Chimney System:

- Top baffle board/blanket.
- Baffle.
- Top heat shield and mounting bolt.
- Baffle Gasket.
- Brick Rails.
- Manifold.

Blower:

- The blower should be cleaned out a minimum every six months by using a vacuum on the grill openings in the back and bottom of the blower casing to remove any dust and debris.

Baffle:

- Some warping of the baffle is normal(up to 1/4” or .65cm). Replace if the baffle has permanent warping greater than this or has cracking or breakage.
- Please contact your Dealer if you experience any of the damage listed above. Continuing to operate your stove with broken parts can accelerate damage to other parts and may void your warranty

Baffle Removal

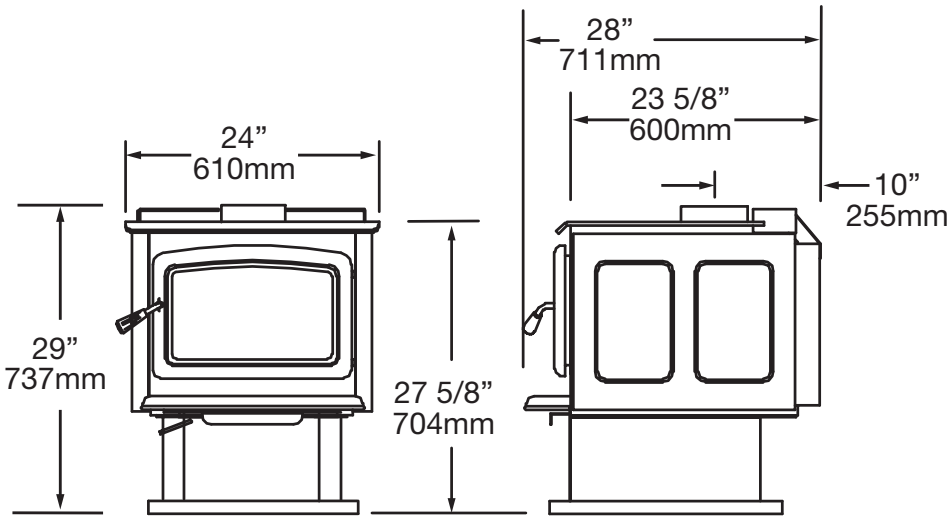
Chimney connector pipe should be disconnected from stove to clean and inspect. Only if this is not possible should you remove baffle assembly.

DO NOT OPERATE WITH BAFFLE ASSEMBLY OR INSULATION REMOVED.

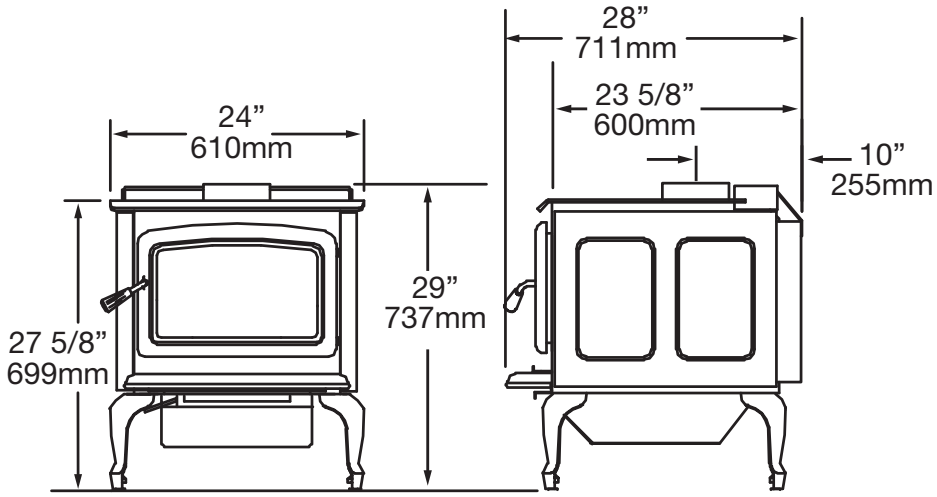
Removal

Remove retaining pin at the back top of the firebox, just under the baffle. Lift baffle up and pull forward to disconnect from the supply tube. Tilt baffle sideways to drop down and remove from firebox. Inspect gasket between baffle and supply tube. If necessary, replace with gasket (prt#80000365) available from your Pacific Energy dealer. Re-install baffle assembly in reverse order. The two side pieces of insulation must be tight against the side rails.

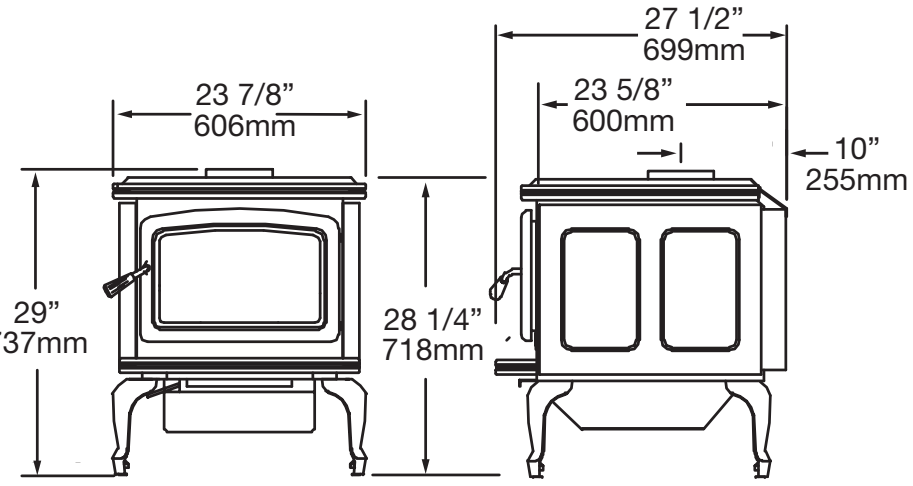
Dimensions



SUPER LE- Pedestal



SUPER LE- Leg



SUPER Classic LE

Figure 1: Super LE dimensions

Crate Removal

1. Carefully remove the crate top and supports.
2. Remove plastic cover.

Assembly - Legs (Leg Model)

1. Loosen the four bolts holding the Leg Adapter to the firebox bottom.
2. Insert the legs between the Leg Adapter flange and the washers.
3. Using the guides cast into the tops of the leg, align the guides into the notches in the Ash Box mounting flanges.
4. Tighten the bolts down.

Assembly - Optional Ash Cleanout

Pedestal Model

1. Remove the Ash Drawer Front Cover Plate by removing the center screw(1) and lifting up to dis-engage the bottom tab.
2. Remove the Knock-out in the top left corner of the opening
3. Install the Ash Dump mechanism, following the instructions on the next page.
4. Install the new Ash Pan into the Pedestal.

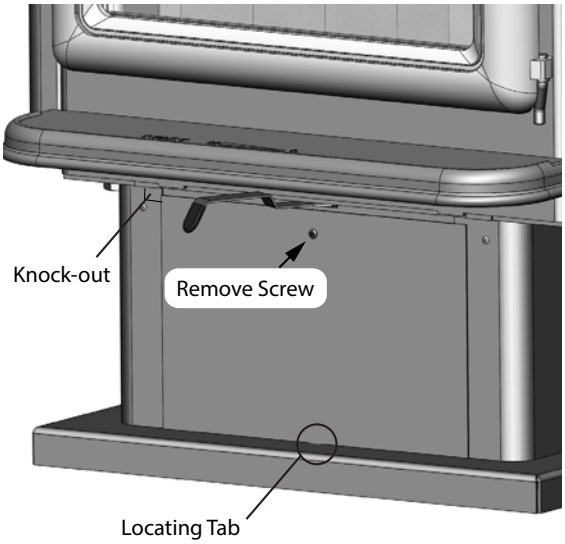


Figure 2: Ped Cover removal.

Leg Model

1. Remove the two screws holding the Leg Ash Box front cover (located on either side). Remove the cover
2. Remove the Knock-out in the top left corner of the opening
3. Install the Ash Dump mechanism, following the instructions.
4. Install the new Ash Pan into the Leg Ash Box.

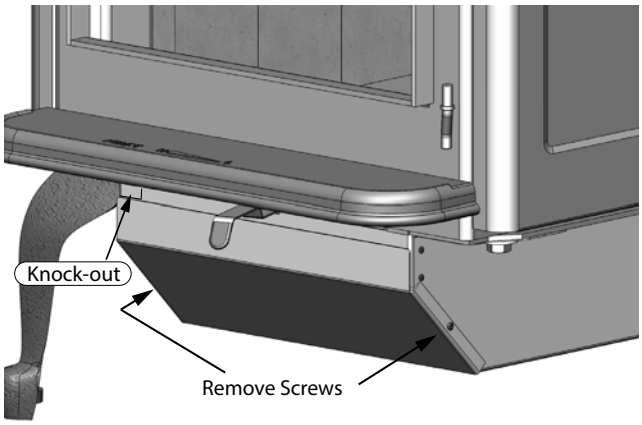


Figure 3: Leg Ash Cover removal.

Ash Dump Installation

1. Remove the Ash Cleanout hole cover plate and gasket, located under the stove. Discard the cover plate.

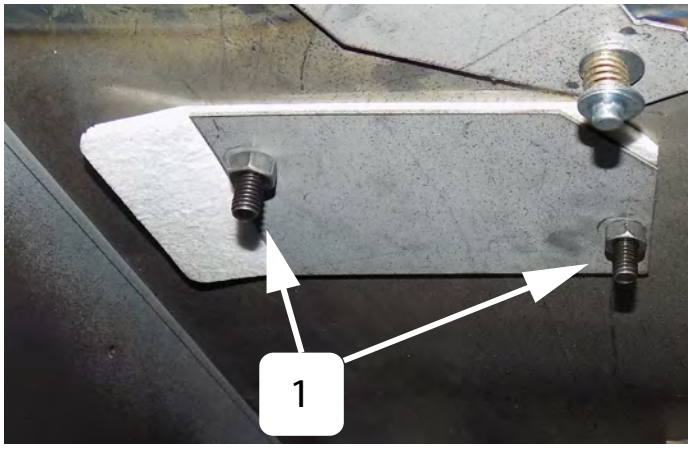


Figure 4: Cover Plate removal

2. Place the provided gasket around the upper tube portion of the new Ash Dump mechanism, as per the picture.

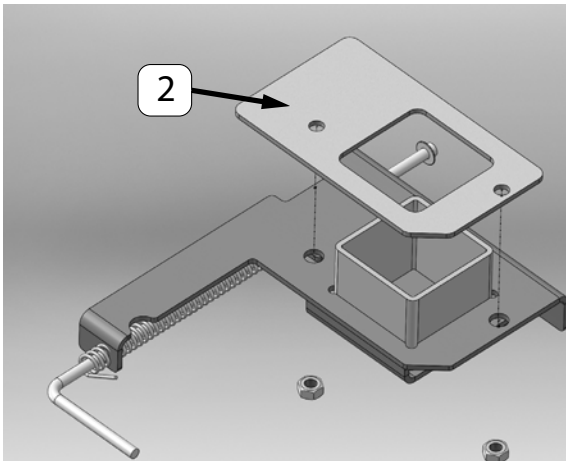


Figure 5: Ash Cleanout Gasket.

3. Insert The Ash Dump mechanism with gasket from underneath the firebox bottom up into the open hole and over the two bolts hanging down. - The release handle should be facing forward and on the left side, inserted in the slot located in the Pedestal or Leg adapter.

4. Re-attach the nuts onto the cairrage bolts. And tighten to gently compress the gasket.

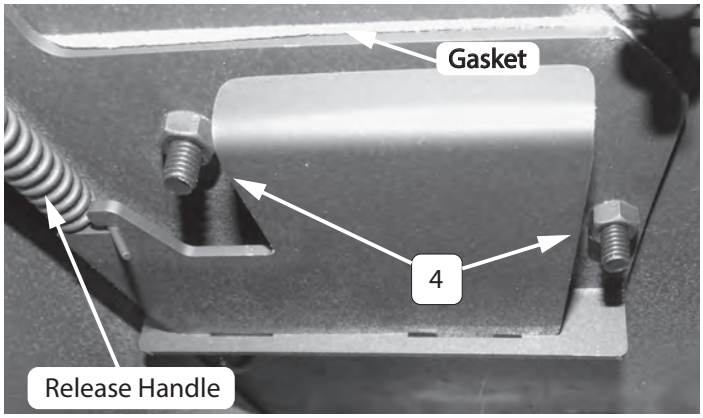


Figure 6: Under side of bolted ash Cleanout.

Floor Protector

The stove may be installed on a combustible floor provided noncombustible Ember protection is used. This protection must extend as follows:

In USA: 16" (406 mm) to the front and 8" (203 mm) to the sides of the fuel loading door opening. See Figure #7, below. This protection is also required under the chimney connector and 2" (51 mm) beyond each side.

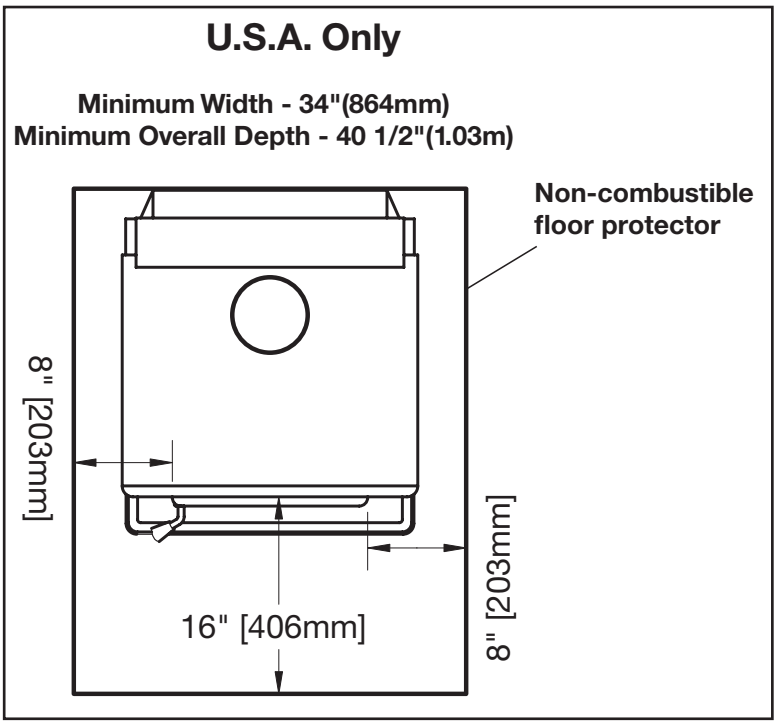


Figure 7: Floor protector - USA only.

In Canada: 18" (457 mm) on the firing side and 8" (203 mm) to the other sides.

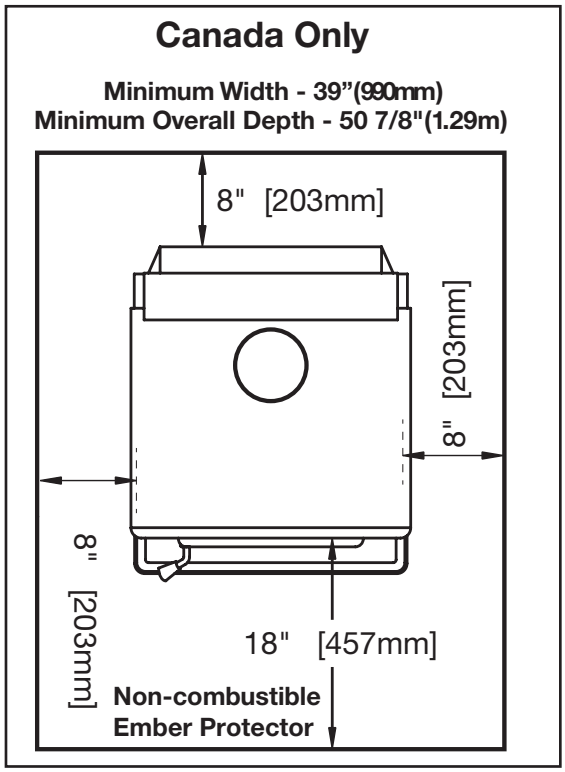
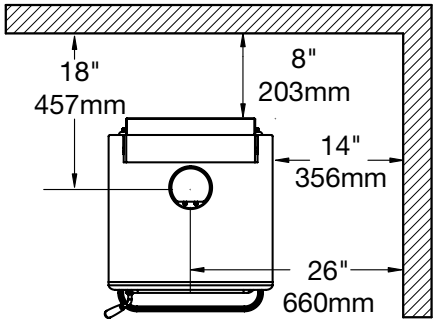
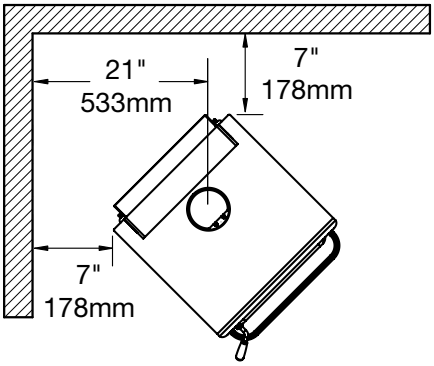


Figure 8: Floor protector - Canada only.

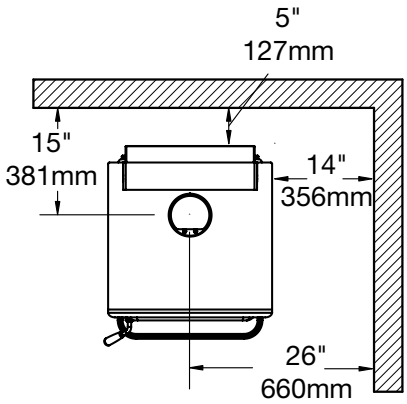
Clearances:

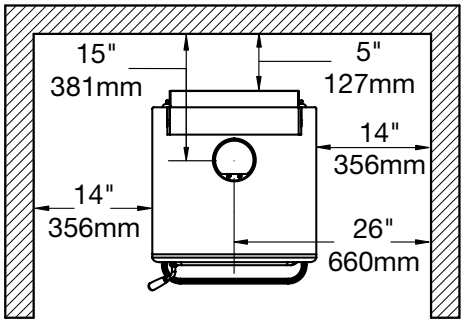
Single Wall Connector - Residential

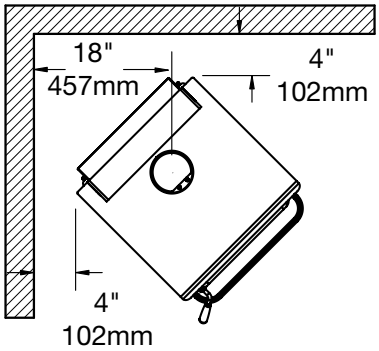




Double Wall Connector - Residential







Alcove: Min. Height 7' (2.13m)
Max. Depth 3' (915mm)

Clearances may be reduced with various heat shielding/insulating materials. Consult CSA B365 or NFPA 211 and local fire codes and authorities for approval. For close clearances, use a listed double-wall connector.

NOTE: local/national codes or regulations may override some guidelines in this manual

We recommend that our products be installed and/or serviced by professionals who are certified by a "Qualified agency";

NFI (National Fireplace Institute®) in the United States,
CSIA (Chimney Safety Institute of America) in the United States and Canada,
WETT (Wood Energy Technology Transfer) in Canada or
APC (Association des Professionnels du Chauffage) in Quebec

We endorse NFI NATIONAL FIREPLACE INSTITUTE

Wood Energy Technical Training www.wettinc.ca

Warning: Under no circumstances is this heater to be installed in a makeshift or "temporary" manner. It may be fired only after the following conditions have been met.

DO NOT ATTEMPT TO CONNECT THIS HEATER TO ANY AIR DISTRIBUTION DUCT.

Outside combustion air or fresh air into the room may be required in your area, consult local building codes (see Combustion Air section).

Chimney and Connector

- The chimney system must be a ULC-S629 or UL-130HT listed Stainless chimney or a Masonry chimney suitable for use with solid fuel, that is lined, in good condition and meets fire and building codes.
- The chimney flue size should be the same as the stove outlet (6 inches) for optimal performance. Reducing or increasing the flue size may adversely affect stove performance.
- Chimney flue exit is to be 3 feet (1 m.) above roof and two feet (0.6 m.) above highest projection within 10 feet (3 m.) horizontally.
- The installation must meet all local codes.
- Do not connect this unit to a chimney flue serving another appliance. Minimum system height is 15 feet (4.6 m.) (measured from base of appliance).

BOTH CHIMNEY SYSTEM AND CONNECTOR MUST BE LISTED TO:
IN CANADA - ULC S-641 LISTED for double wall connector and ULC-S629 LISTED CHIMNEY,
IN USA - UL-103 HT LISTED CONNECTOR AND CHIMNEY

When using a Double-Wall Connector

- Use a listed double-wall connector.
- If a listed chimney and double-wall connector are to be connected to the stove, install all components as per the chimney/connector manufacturer's installation requirements.

When using a Single-Wall (smoke pipe) Connector

The single wall pipe section must be:

- If you are using smoke pipe/chimney connector in conjunction with the listed chimney system, consult local/national fire or building codes for connector installation. Follow the chimney manufacturer's complete instructions for the installation of the chimney system.
- As short and straight as possible, use six inch diameter, 24 gauge black pipe that is clean and in new condition.
- Installed with the crimped or male ends pointing down. (This will carry any liquid creosote or condensation back into the stove) and secured at every joint and collar with 3 sheet metal screws.
- The chimney connector shall not pass through an attic, roof space, closet or similar concealed space, floor, or ceiling. Where passage through a wall, or partition of combustible material is desired, the installation shall conform to CAN/CSA-B365, Installation Code for Solid-Fuel-Burning Appliances and Equipment or NFPA 211 Standard for Chimneys, Fireplaces, Vents and Solid-Fuel Burning Appliances.

Installation Procedure

1. Select the position for your wood stove based on the clearances diagram. Position the floor protection and stove.

2. Mark the position for the hole in the ceiling and roof by using a string and plumb-bob hanging over the exact center of the stoves flue pipe.

3. Check that the intended location will not interfere with floor joists, ceiling joists or rafters before proceeding further. Adjust if necessary and reconfirm the clearance's from the stove to combustibles.

4. Carefully follow the directions of the listed chimney for installation of the chimney system from the ceiling through to the rain cap. This may include framing in holes etc.

5. Start installing smoke pipe / chimney connector, slip the crimped edge of the pipe inside the stove collar. Use holes provided in collar to secure pipe with two screws.

6. Install the remaining lengths of pipe one on top of the other up to the finished height of the chimney and using the manufacturers approved adapter, secure to each other. A slip section can make this easier.

Combustion Air

Intake or combustion air can be supplied to the stove in one of two ways. Consult your local building code or CAN/CSA-B365, Installation Code for Solid-Fuel-Burning Appliances and Equipment before proceeding.

Outside air supply - (Necessary for mobile home installation, optional for residential installation.)

To draw **outside air through the floor** - This hole must get its air from a ventilated crawl space or be extended with duct to the outdoors (see Figure #9, Page 18). The use of outside combustion air for residential installation requires the unit to be secured to the structure to prevent dislodging of the air duct.

- **Leg Model:** Cut or drill a hole in the floor, (large enough to fit 4" metal flex venting) behind the ash box enclosure. Once the stove is in place, attach the 4" Intake Starter to the Ash Box Enclosure. Connect to the floor with the 4"(100mm) i.d. metal flex pipe.
- **Pedestal Model:** Cut or drill a 4" (100mm) diameter hole in the floor anywhere inside the perimeter of the pedestal base. Cover the hole with a 4" x 4" (100 mm x 100 mm) rodent screen and staple/nail in place. Leave the cover over the hole on the back of the Pedestal. Place the stove over the hole.

To draw **outside air from behind the stove**, Use a 4"(100mm) Air intake. Cut or drill the recommended size hole through a wall behind the unit.

- Install the 4" Intake Starter over the hole in the rear of the Ash Box enclosure. Attach metal flex between the starter and the Air Intake.
- Pedestal Model: Remove the cover plate from the rear of the pedestal and install the cover plate over the hole located under the Pedestal. Install the 4" Intake Starter over the hole in the rear. Attach metal flex between the starter and the wall inlet.

Room air supply - The stove will draw its air from the room through the opening in the Ash Box Enclosure and into the firebox intake.

Note: The living space around the heater must be well ventilated with good air circulation. Anything that may cause a negative pressure can cause gases or fumes to be pulled into the living area. During extremely cold weather, and especially when burning at very slow rates, the upper parts of the exposed chimney may ice up, partially blocking the flue gases. If blockage occurs, flue gases may enter the living space.

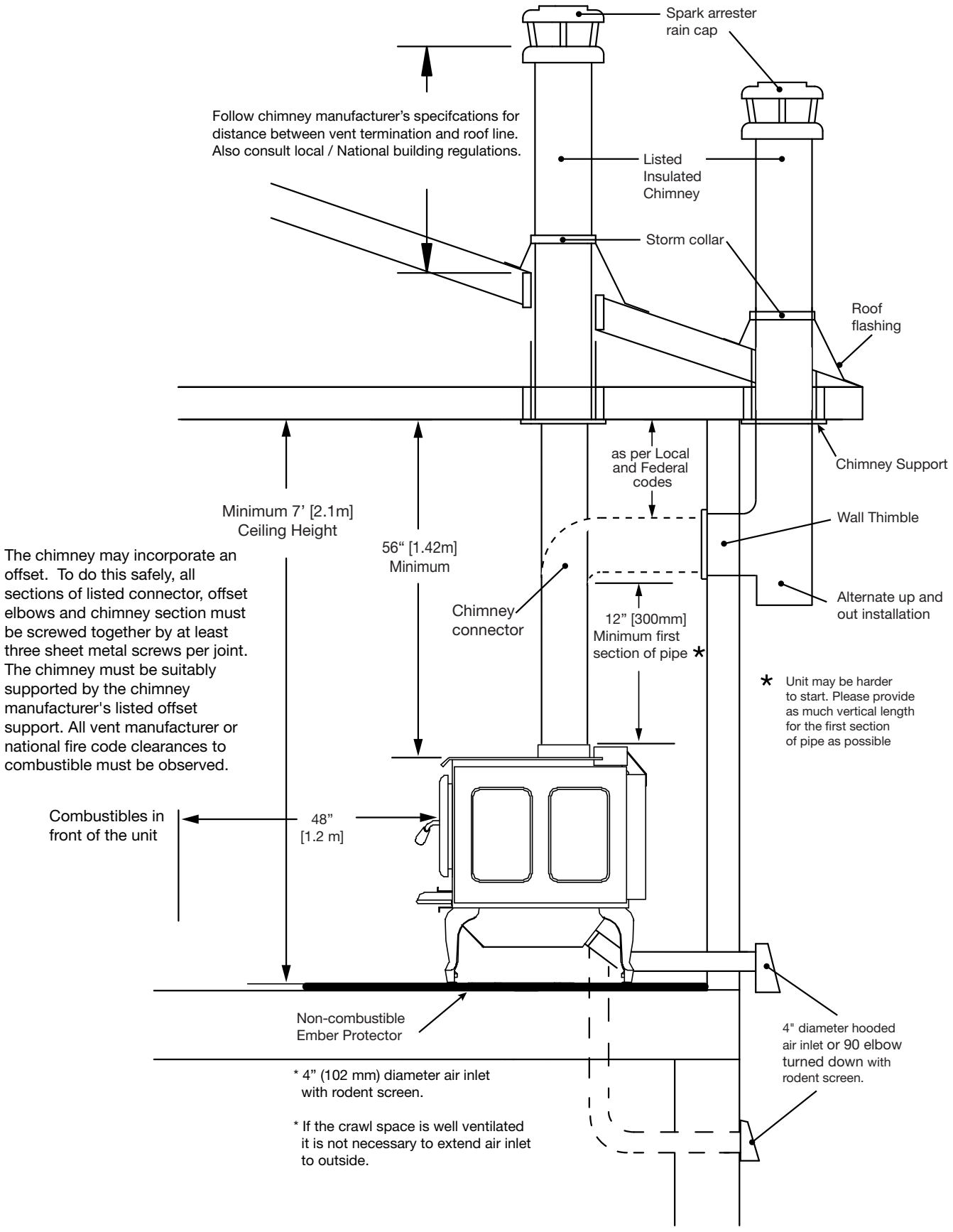


Figure 9: Super LE residential venting.

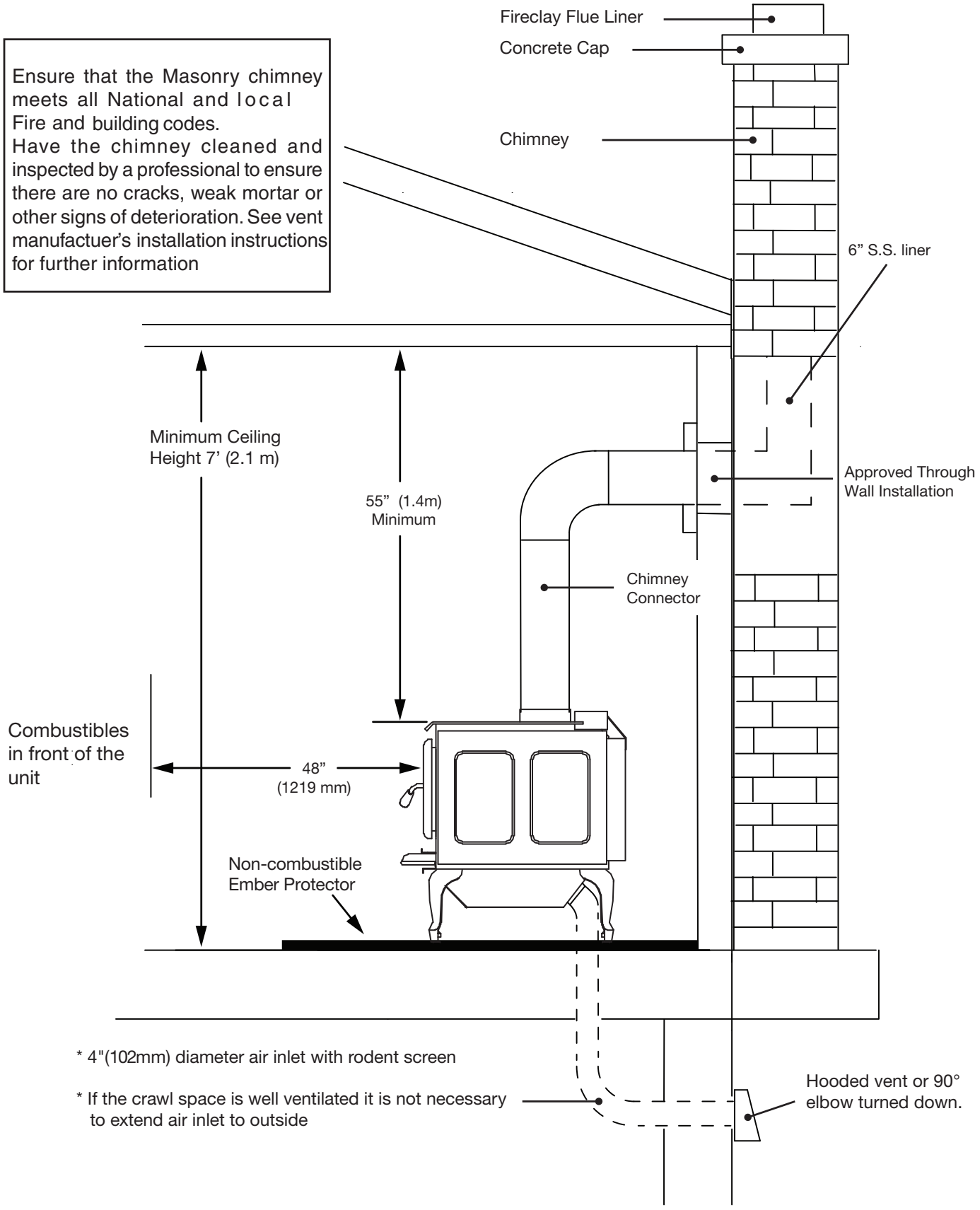


Figure 10: Super LE Venting to a masonry chimney.

Through Wall Installations (as per NFPA 211-2013)

ATTENTION: VAPOUR BARRIER MUST BE MAINTAINED WHEREVER CHIMNEY OR OTHER COMPONENTS PENETRATE TO THE EXTERIOR OF THE STRUCTURE. SEE LOCAL BUILDING CODES FOR PROPER AND APPROVED METHODS OF MAINTAINING VAPOUR BARRIER.

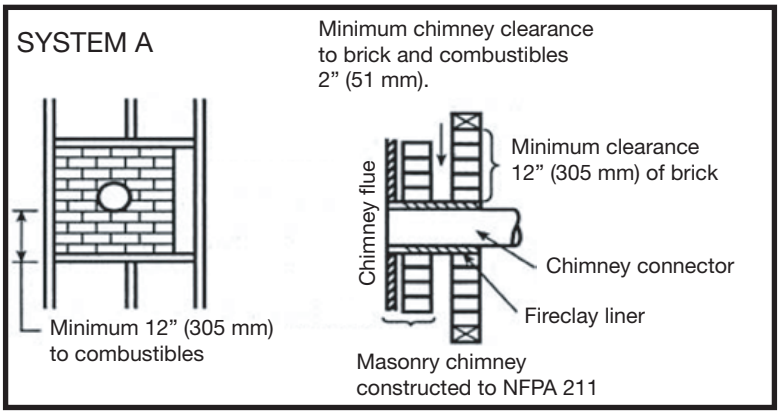


Figure 11: System A.ai

Minimum Clearance 12 in. (305mm) to combustibles

System A. Minimum 3.5 in. (90 mm) thick brick masonry wall framed into combustible wall with a minimum of 12 in. (305 mm) brick separation from clay liner to combustibles. Fireclay liner (ASTM C 315, Standard Specifications for Clay Fire Linings, or equivalent), minimum 5/8 in. (16 mm) wall thickness, shall run from outer surface of brick wall to, but not beyond, the inner surface of chimney flue liner and shall be firmly cemented in place.

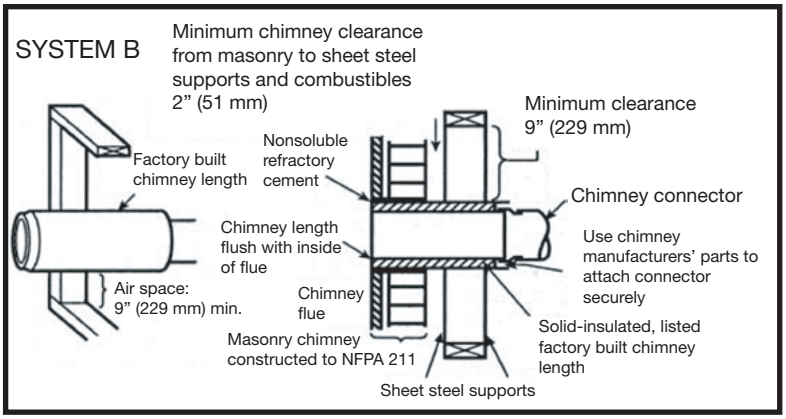


Figure 12: System B.ai

Minimum Clearance 9 in. (229mm) to combustibles

System B. Solid-Insulated, listed factory-built chimney length of the same inside diameter as the chimney connector and having 1 in. (25.4 mm) or more of insulation with a minimum 9 in. (229 mm) air space between the outer wall of the chimney length and combustibles.

The inner end of the chimney length shall be flush with the inside of the masonry chimney flue and shall be sealed to the flue and to the brick masonry penetration with non-water-soluble refractory cement. Supports shall be securely fastened to wall surfaces on all sides.

Fasteners between supports and the chimney length shall not penetrate the chimney liner.

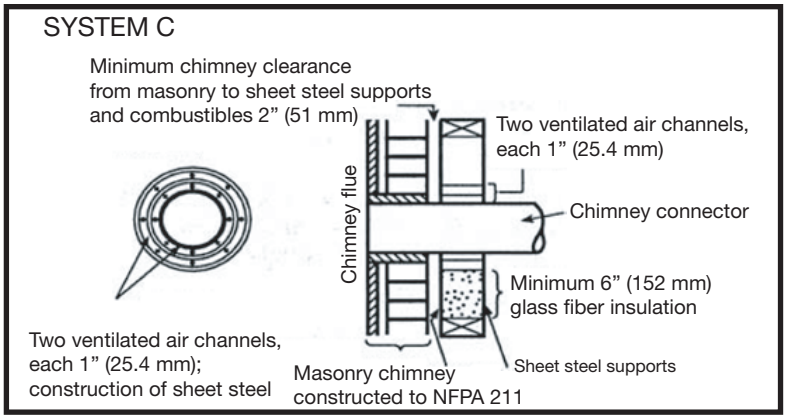


Figure 13: System C.ai

Minimum Clearance: 6 in. (152mm) to combustibles

System C. Sheet steel chimney connector, minimum 24 gauge [0.024 in. (0.61 mm)] in thickness, with a ventilated thimble, minimum 24 gauge [0.024 in. (0.61 mm)] in thickness, having two 1 in. (25.4 mm) air channels, separated from combustibles by a minimum of 6 in. (152 mm) of glass fiber insulation. Opening shall be covered, and thimble supported with a sheet steel support, minimum 24 gauge [0.024 in. (0.61 mm))] in thickness.

Supports shall be securely fastened to wall surfaces on all sides and shall be sized to fit and hold chimney section. Fasteners used to secure chimney section shall not penetrate chimney flue liner.

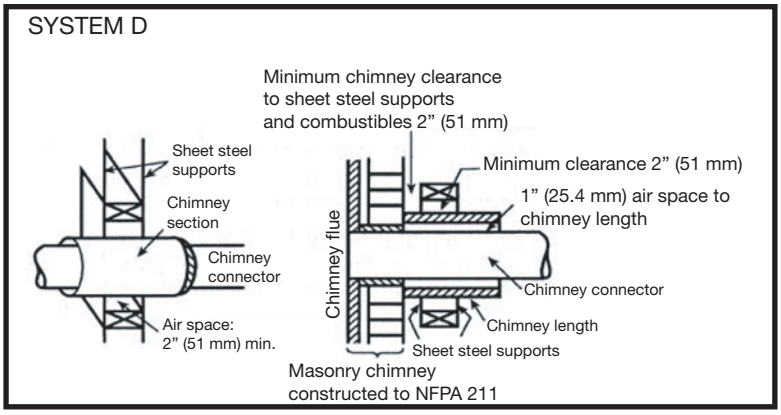


Figure 14: System D.ai

Minimum Clearance: 2 in. (51mm) to combustibles

System D. Solid-Insulated, listed factory-built chimney length with an inside diameter 2 in. (51 mm) larger than the chimney connector and having 1 in. (25.4mm) or more of insulation, serving as a pass-through for a single-wall sheet steel chimney connector of minimum 24 gauge [0.024 in. (0.61 mm)] thickness, with a minimum 2 in. (51 mm) air space between the outer wall of chimney section and combustibles.

Minimum length of chimney section shall be 12 in. (305 mm). Chimney section concentric with and spaced 1 in. (25.4 mm) away from connector by means of sheet steel support plates on both ends of chimney section. Opening shall be covered, and chimney section supported on both sides with sheet steel supports of minimum 24 gauge [0.024 in. (0.61 mm)] thickness.

Supports shall be securely fastened to wall surfaces on all sides and shall be sized to fit and hold chimney section. Fasteners used to secure chimney section shall not penetrate chimney flue liner.

Mobile Home Installation

Warning: Under no circumstances is this heater to be installed in a makeshift or "temporary" manner. It may be fired only after the following conditions have been met.

- **DO NOT CONNECT THIS UNIT TO A CHIMNEY FLUE SERVING ANOTHER APPLIANCE.**
- **DO NOT INSTALL IN A SLEEPING ROOM.**
- **CAUTION: THE STRUCTURAL INTEGRITY OF THE MOBILE HOME FLOOR, WALL AND CEILING/ ROOF MUST BE MAINTAINED.**
- Attach the stove to the floor using two 1/4" x 2" or longer lag screws through holes in the legs or the Pedestal base.
- Outside combustion air supply must be used for Mobile Home installations - see .pg.17
- The services of a competent or certified installer, (certified by the Wood Energy Technical Training program (WETT) - in Canada, Hearth Education Foundation (HEARTH) - in U.S.A.,) are strongly recommended.

Clearances

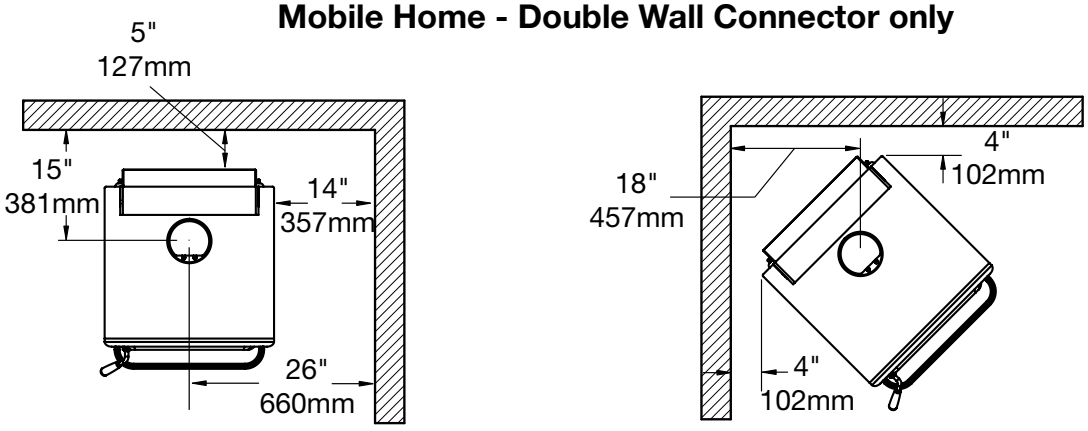
This heater must be installed with listed double-wall connector and compatible ULC-S629 or UL-103HT listed chimney system.

Clearances to combustible surfaces and materials are shown. See picture below.

Consult local fire codes and authorities for approval.

NOTE: Install all components to the connector or chimney manufacturer's installation requirements. Consult your chimney supplier/manufacturer for installation advice.

Mobile Home - Double Wall Connector only



Optional Blower

The optional blower kit (Part #: 11140001) is equipped with a three prong power cord and may be installed at any time. Follow the installation instructions supplied with the kit. Route power supply cord away from heater.

Electrical rating: 115 volts AC-1.02 amps.
Fan output rating: 140 CFM

Blower Operation

Proper blower speed matched with air control setting will ensure peak performance from your stove. Operate as follows:

- Air control set to "L" (low), operate blower speed control on "Low".
- Air control set between "L" and "H" (low and high), operate blower speed control at desired setting.

Automatic: To operate the blower automatically, set the rocker switch on the side of the fan housing to "Auto" and set the speed control to your desired setting. This will allow the fan to turn on as the stove heats up to operating temperature. It will also shut the blower off after the fire has gone out and the unit has cooled to below a useful heat output range.

Manual: To manually operate the blower, set the rocker switch to "Man" and set the speed control to your desired setting. This will bypass the temperature sensing device and allow full control of the blower. Switching from "Auto" to "Man" or selecting speed may be done anytime.
Note: The Blower will not shut off until it is manually turned off.

Firebrick Installation

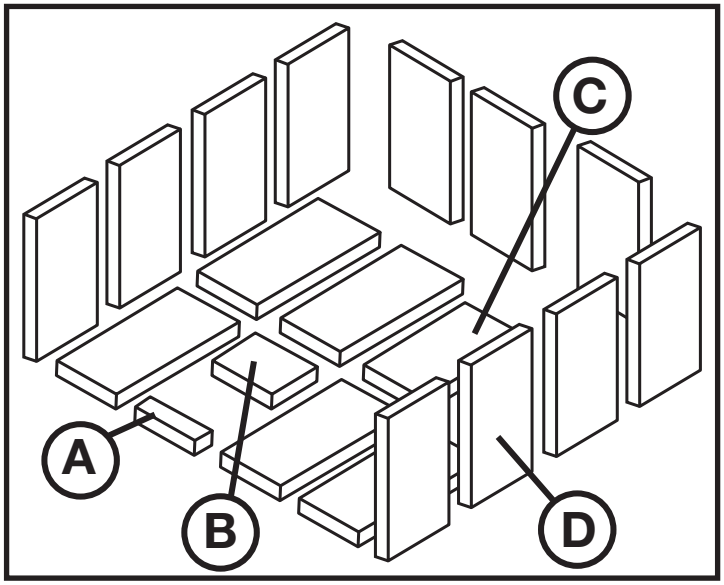


Figure 15: Brick lay out.

ITEM	DIMENSIONS
A	1 1/2” X 4 1/2” X 1 1/4”
B	4” X 4 1/2” X 1 1/4”
C	7 1/4” X 4 1/2” X 1 1/4”
D	9” X 4 1/2” X 1 1/4”

Firebrick Installation Con't

1. Install the floor firebricks; For units **without an Ash Dump** use full size "D" bricks See "Figure 19: Floor layout without ash dump." on page 24. For unit **with the Ash Dump** installed, 2 small bricks ("A & B" in Fig 20) will be used on either end of the ash dump in addition to the regular sized "D" bricks used in the rest of the installation.

There is one exception. Brick "C" is a shorter brick than the "D" bricks. Brick"C" fits up against the Baffle Tube on the rear wall of the firebox and is used in units with or without an ash dump.

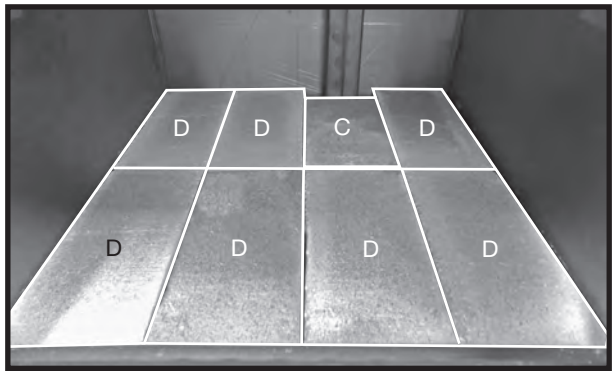


Figure 19: Floor layout without ash dump.

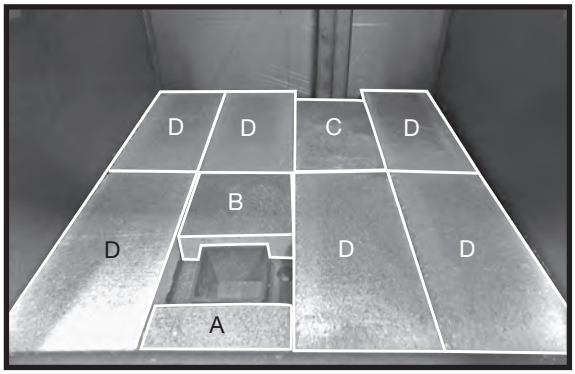


Figure 20: Firebricks on floor .

2. The firebricks for the side walls are next. The sides use "D" bricks. The bricks will stand on top of the floor bricks and will stand on their ends. They will be held in place by two tabs per wall. Install the end bricks first followed by the two center bricks.

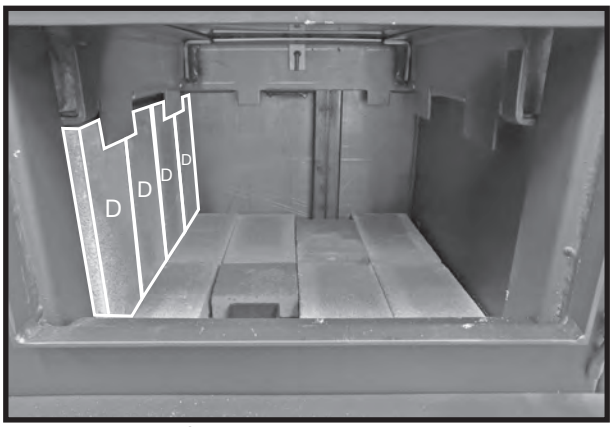


Figure 16: Left wall bricks in place.

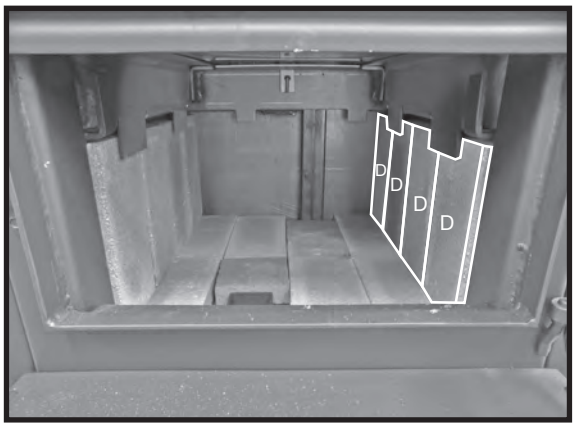


Figure 17: Bricks on right side wall in place.

3. The rear wall is last. The rear bricks also stand on end and will stand on top of the floor bricks.

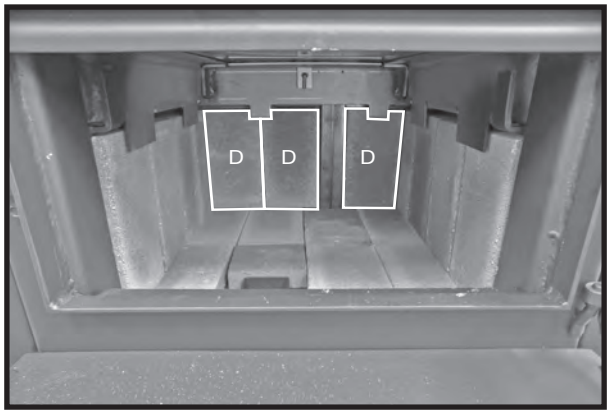


Figure 18: Rear wall firebrick installation complete.

Trouble Shooting

Problem	Cause	Cure
Excessive Creosote Build-up	1) Wood is too wet	- Use dry wood
	2) Turning down air control too soon	- Do not turn down until: a) there is a good bed of coals b) the wood is charred
	3) Draft too low	- Chimney plugged or restricted, check flue - Improper chimney height and/or diameter - Provide outside air for combustion - Check draft in chimney and system, alter as needed.
Glass is Dirty	1) See 1, 2, and 3 above	
	2) Door Gasket leakage	- Replace gasket - Check door latch
Low Heat Output	1) Wood may be wet	- Check wood and use drier wood if required.
	2) Fire too small	- Build a larger fire - Open draft control to increase burn rate.
	3) Draft too low	- Chimney plugged or restricted Inspect and clean
Won't Burn Overnight	1) Air control set too high	- Set control lower
	2) Not enough wood	- Unsplit wood is preferred for overnight burns
	3) Draft too high	- Excessive chimney height and/or diameter, see page 11
Stove Won't Burn	1) Combustion air supply is blocked	- Check outside air supply for obstructions - Check that room air cover is removed.
		- Chimney plugged or restricted Inspect and clean

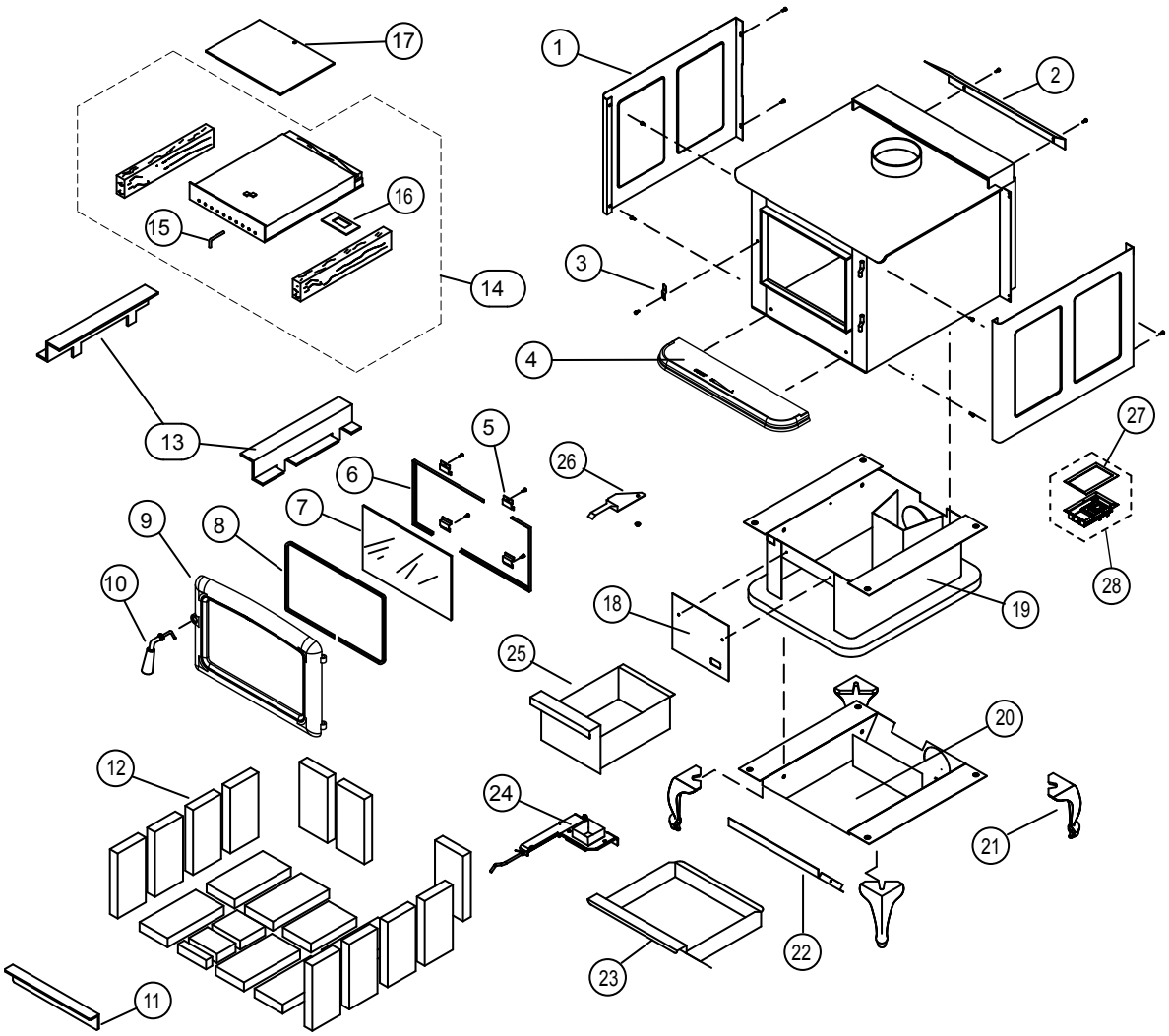
Replacement Parts - SUPER LE

(WHEN ORDERING, INCLUDE PART NUMBER WITH DESCRIPTION)

ITEM	DESCRIPTION	PART NO.
1	Shield, Side	80000408
2	Deflector, Rear, Super LE	80002206
3	Door, Catch	80000655
4	Ash Lip, Cast	80000018
5	Clamps, Glass (4 pc.)	80000369
6	Glass Frame, DR31 Door (2 pc.)	80000659
7	Glass /w Gasket, DR31, 8-13/16 x15-1/4	80000157
8	Gasket, DR31, 7/8"x 5ft	80000156
9	Door, Cast, Super, Met Black	80000145
	Door, Cast, Super, Nickel	80002306
	Door, Cast, Super, Brushed Nickel	80002307
10	Handle, Door,	80000660
11	Manifold, Boost, Super LE	80002207
12	Firebrick, D1 (set)	80000088
13	Brick Rails Set, D, Left/Right	80002169
14	Baffle (Kit)	80000376

ITEM	DESCRIPTION	PART NO.
15	Baffle, Pin, (10pc)	80000364
16	Gasket, Baffle, (10pc)	80000365
17	Flame Shield, Super	80000372
18	Front Cover, Pedestal, Super LE	80002208
19	Pedestal, Super LE,	80002209
20	Leg Adapter, Super	80002210
21	Casting, Leg, Black	80000148
	Casting, Leg, Brushed Nickel	80000147
	Casting, Leg, Nickel	80000783
22	Front Cover, Leg Adapter	80002211
23	Ash Box,Leg Model	80002212
24	Ash Dump	80001793
25	Ash Box, Pedestal Model, Super LE	80002214
26	Air Control, Primary	80002215
27	Gasket, Air Control, Secondary	80002222
28	Air Control, Secondary	80000841

All parts may be ordered from your nearest Pacific Energy dealer. Contact Pacific Energy for the location of the dealer nearest you.



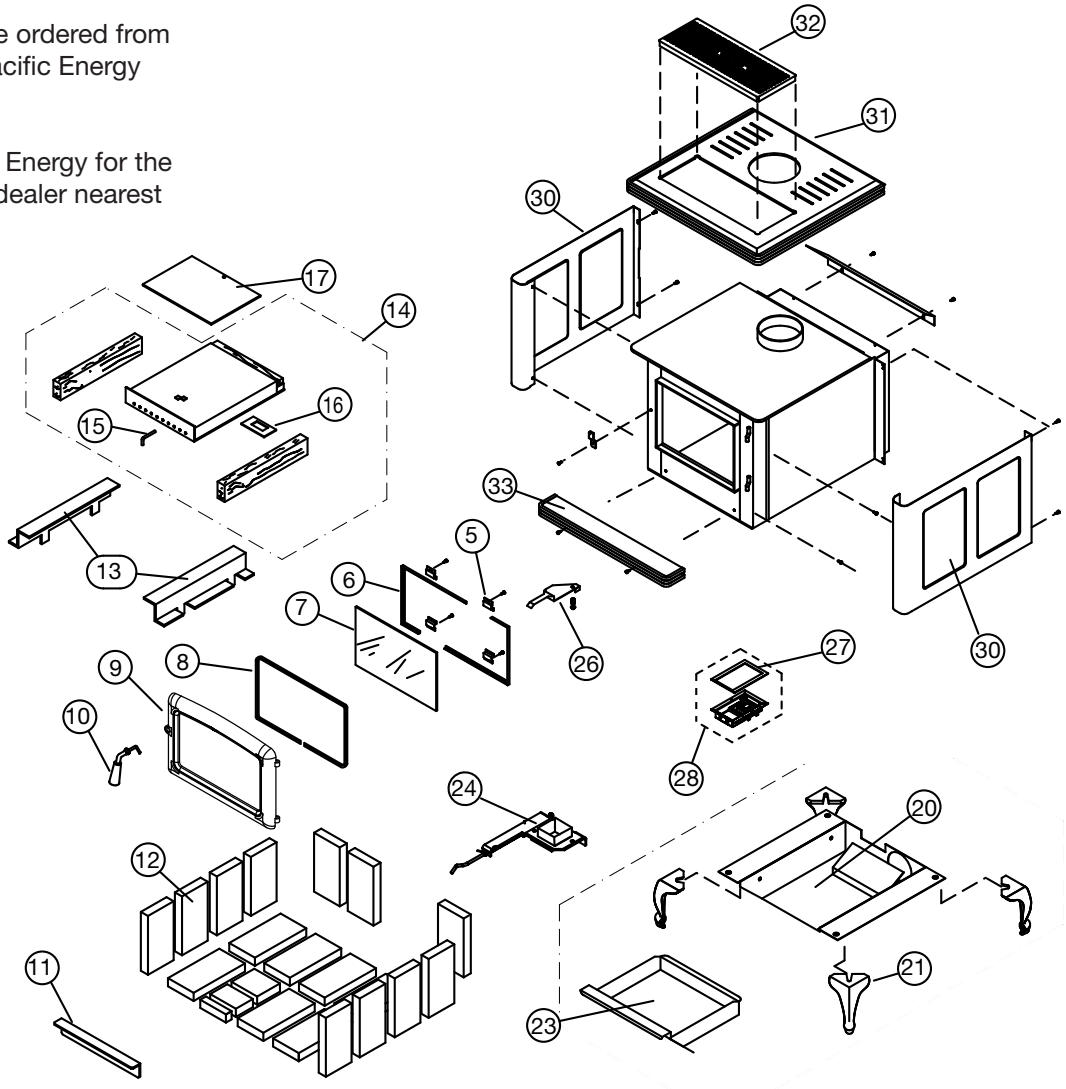
Replacement Parts - SUPER CLASSIC LE

(WHEN ORDERING, INCLUDE PART NUMBER WITH DESCRIPTION)

ITEM	DESCRIPTION	PART NO.
30	Side Shield, Left or Right	
	- Ebony	80001007
	- Ivory	80000345
	- Sunset Red	80000346
	- Modern Desert	80002554
31	Top Panel	
	- Ebony	80000336
	- Ivory	80000339
	- Sunset Red	80000340
	- Modern Desert	80002553
32	Trivet,	
	- Met Black	11260002
	- Trivet, Nickel	11260003
33	Ash Lip (c/w Trim & Hardware)	
	- Ebony	80001000
	- Ivory	80000342
	- Sunset Red	80001005
	- Modern Desert	80002555

All parts may be ordered from your nearest Pacific Energy dealer.

Contact Pacific Energy for the location of the dealer nearest you.



Wood Products Warranty

Pacific Energy extends the following warranty coverage to the original registered purchaser of the product:

LTD Lifetime Coverage (10 years)
Limited lifetime coverage is extended to the following components (parts only) porcelain finish, glass (glass for thermal breakage only, not impact), plating, firebox and baffle.

3 Year Comprehensive
Pacific Energy will replace or repair any part found to be defective (parts and labor) for three years from the date of purchase.

This coverage includes electrical components (blowers, speed controls and thermal switches).

Pacific Energy recommends using a certified installer.

Conditions
Your stove has been designed to perform in the harshest climates in North America. You can be confident that under normal use your stove will be trouble free for many years. If your stove is prematurely deteriorating this is a significant indicator of improper usage, for example; excessive draft, heating to large an area, contaminated fuel - such as high sodium content or plastics and chemicals. Please be aware, these conditions may be reasons to void your warranty.

- For wood products - All installations must be installed according to all applicable local and national codes. It is the responsibility of the installer to ensure the unit is operating correctly at installation.
- Any part that shows in our judgment evidence of defect shall be repaired, replaced or refunded at Pacific Energy's option. The defective part may be required to be returned to Pacific Energy or an accredited agent, transportation prepaid.
- Porcelain is warranted for gloss retention. Certain colors may darken when heated and return to the original shade when cool. As a man-made finish it is subject to minor imperfections.
- Glass is warranted against thermal breakage.
- Plating is warranted against tarnishing. Gold plating may attain a deeper color with use.

Exclusions
- Limited Lifetime coverage - Lifetime coverage is limited to the repair, replacement or refund of the indicated parts only. Labor charges are not covered under the lifetime warranty.
- The following items are not included in the Lifetime Warranty: firebox rails and heat shields.
- The following parts are not warranted: firebrick, gaskets and ceramic fiber blankets.
- This warranty does not apply to any part that shows evidence of misuse, abuse, improper installation, accident, lack of maintenance, or modification.
- Pacific Energy shall in no event be liable for any special, indirect or consequential damages of any nature whatsoever which are in excess of the original purchase price of the product.
- Pacific Energy is not responsible for installation, operational or environmental conditions beyond our control.
- (The company may, at its discretion, discharge all obligations by refunding the wholesale price of the defective part.)

REGISTER YOUR PRODUCT ONLINE

HAVE YOUR SERIAL NUMBER* AVAILABLE AND VISIT

pacificenergy.net/register

*Your serial number can be found on the product certification label or on the cover of your installation manual.

BLANK

BLANK

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PACIFIC ENERGY FIREPLACE PRODUCTS LTD.

2975 Allenby Rd., Duncan, B.C. V9L 6V8
Web site: http://www.pacificenergy.net

For additional technical support, please contact your dealer

Printed in Canada

CERTIFIED FOR CANADA AND U.S.A. - MODEL / MODÈLE: SUPER LE ■ SUPER CLASSIC LE ■ ALDERLEA T5 LE ■

LISTED ROOM HEATER, SOLID FUEL TYPE. ALSO FOR USE IN MOBILE HOMES.

DO NOT REMOVE THIS LABEL

SN#

CERTIFIED TO/ CERTIFIÉ POUR : CAN/ULC S627-00 / UL 1482-2011

Refer to Intertek's Directory of Building Products for detailed information

Intertek

ETL#4001507

PACIFIC ENERGY

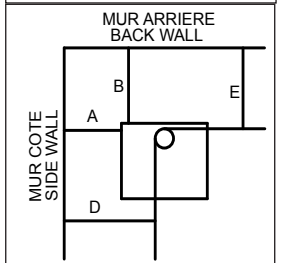
- INSTALL AND USE IN ACCORDANCE WITH THE MANUFACTURER'S INSTALLATION AND OPERATING INSTRUCTIONS.
- CONTACT LOCAL BUILDING OR FIRE OFFICIALS ABOUT RESTRICTIONS, INSTALLATION PERMIT AND INSPECTION IN YOUR AREA.
- DO NOT CONNECT THIS UNIT TO A CHIMNEY FLUE SERVING ANOTHER APPLIANCE (USA. ONLY).
- USE 6 INCH / 150MM DIAMETER MINIMUM 24 MSG BLACK OR LISTED CONNECTOR.
- CAN BE CONNECTED TO A LINED MASONRY CHIMNEY SUITABLE FOR USE WITH SOLID FUELS.
- DO NOT OBSTRUCT THE SPACE BENEATH THE HEATER.
- SEE LOCAL BUILDING CODE AND MANUFACTURER'S INSTRUCTIONS FOR PRECAUTIONS REQUIRED WHEN PASSING A CHIMNEY THROUGH A COMBUSTIBLE WALL OR CEILING.
- DO NOT PASS A CHIMNEY CONNECTOR THROUGH A COMBUSTIBLE WALL OR CEILING.
- MINIMUM CLEARANCE BETWEEN SINGLE WALL CHIMNEY CONNECTOR AND COMBUSTIBLE MATERIALS-18INCHES/455MM. CLEARANCE MAY BE REDUCED BY THE USE OF LISTED PIPE SHIELDS, WALL PROTECTORS OR OTHER MEANS APPROVED BY LOCAL BUILDING OR FIRE OFFICIALS.
- COMPONENTS REQUIRED FOR MOBILE HOME AND ALCOVE INSTALLATION: OUTSIDE AIR KIT. BOTH CHIMNEY SYSTEM AND CONNECTOR MUST BE LISTED TO:
  IN CANADA - ULC S-641 LISTED CONNECTOR AND ULC-S-629 LISTED CHIMNEY
  IN USA - UL-103 HT LISTED CONNECTOR AND CHIMNEY
- HORIZONTAL CONNECTOR NOT PERMITTED IN MOBILE HOMES
- USE COMPONENTS SPECIFIED IN VENT MANUFACTURERS INSTALLATION INSTRUCTIONS.
- APPLIANCE MUST BE INSTALLED WITH PEDESTAL OR LEG KIT ATTACHED.
- OPTIONAL COMPONENTS - FAN KIT, FAN ELECTRICAL RATING: 115V, 60HZ, 1.0 AMP.
- CAUTION: RISK OF EXCESSIVE TEMPERATURES - KEEP ASH DUMP CLOSED DURING FIRING OF THE HEATER. • DO NOT ROUTE POWER CORD UNDER HEATER.
- OPERATE ONLY WITH FEED DOOR CLOSED. OPEN TO FEED FIRE ONLY.
- KEEP FURNISHINGS AND OTHER COMBUSTIBLE MATERIALS WELL AWAY FROM HEATER.
- REPLACE GLASS ONLY WITH CERAMIC GLASS.
- ✞ AS TESTED - PIPE SHIELD MAY BE REQUIRED BY LOCAL AUTHORITIES.
- * ALCOVE SIZE : DEPTH - 3 FT. / .91 M MAX., HEIGHT 7 FT. / 2.1 M MIN.,
- COMBUSTIBLE FLOOR MUST BE PROTECTED BY A CONTINUOUS NON-COMBUSTIBLE MATERIAL EXTENDED TO THE FRONT, SIDES AND BACK AS INDICATED.
- THIS WOOD HEATER NEEDS PERIODIC INSPECTION AND REPAIR FOR PROPER OPERATION. - CONSULT THE OWNER'S MANUAL FOR FURTHER INFORMATION.
- IT IS AGAINST FEDERAL REGULATIONS TO OPERATE THIS WOOD HEATER IN A MANNER INCONSISTANT WITH THE OPERATING INSTRUCTIONS IN THE OWNER'S MANUAL

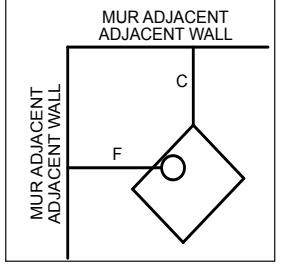
U.S. ENVIRONMENTAL PROTECTION AGENCY.
Certified to comply with 2020 CRIB WOOD PARTICULATE EMISSION STANDARDS, using Method 28R// Certifié conforme aux normes sur les émissions de particules de 2020.

1.8 g/hr

MINIMUM CLEARANCES TO COMBUSTIBLE MATERIALS/ DÉGAGEMENTS MINIMALES AUX MATÉRIAUX COMBUSTIBLES

- A. SIDEWALL TO UNIT/ MUR DE CÔTE / APPAREIL
- B. BACKWALL TO UNIT/ MUR DE FOND / APPAREIL
- C. CORNER TO UNIT/ COIN / APPAREIL
- D. SIDEWALL TO CONNECTOR/ MUR DE CÔTE / RACCORD
- E. BACKWALL TO CONNECTOR/ MUR DE FOND / RACCORD
- F. CORNER TO CONNECTOR/ COIN / RACCORD





RESIDENTIAL INSTALLATION USING SINGLE WALL CONNECTOR/ INSTALLATION RÉSIDENTIELLE UTILISANT UN RACCORD DE MUR SIMPLE

A.	14 in. / 356 mm
B.	✞ 8 in. / 152 mm
C.	7 in. / 178 mm
SUPER	
D.	23 in. / 585 mm
E.	✞ 15 in. / 380 mm
F.	18 in. / 460 mm
ALDERLEA T5	
D.	23.5 in. / 595 mm
E.	✞ 15 in. / 380 mm
F.	21 in. / 535 mm

RESIDENTIAL / MOBILE HOME INSTALLATION USING DOUBLE WALL CONNECTOR/ INSTALLATION RÉSIDENTIELLE AVEC DÉGAGEMENT MINIMAL/ EN MAISON MOBILE, UTILISANT UN RACCORD DE MUR DOUBLE

A.	14 in. / 356 mm
B.	5 in. / 127 mm
C.	4 in. / 102 mm
SUPER	
D.	23 in. / 585 mm
E.	12 in. / 305 mm
F.	15 in. / 370 mm
ALDERLEA T5	
D.	23.5 in. / 595 mm
E.	12 in. / 305 mm
F.	18 in. / 460 mm

- INSTALLEZ ET UTILISEZ SELON LES INSTRUCTIONS D'INSTALLATION ET D'OPÉRATION FOURNI AVEC L'APPAREIL..
- CONTACTEZ LES OFFICIELS DE LA CONSTRUCTION OU DE SERVICE D'INCENDIE POUR DES INFORMATIONS QUANT AUX RESTRICTIONS. PERMIS D'INSTALLATION ET INSPECTIONS DANS VOTRE RÉGION.
- NE RELIEZ PAS CET APPAREIL À UN CONDUIT DE CHEMINÉE DESSERVANT DÉJÀ UN AUTRE APPAREIL
- UTILISEZ UN RACCORDEMENT NOIR OU CLASSÉ DE 24 MSG ET AVEC UN DIAMÈTRE D'AU MOINS 6 POUCES / 150 mm.
- PEUT ÊTRE CONNECTÉ À UNE CHEMINÉE DE MAÇONNERIE ALIGNÉE PRÊTE À L'EMPLOI AVEC DES COMBUSTIBLES SOLIDES.
- N'OBSTRUEZ PAS L'ESPACE SOUS LE CAISSON DU POÊLE
- CONSULTEZ LE CODE LOCAL DE CONSTRUCTION ET LES INSTRUCTIONS DU FABRICANT QUANT AUX PRÉCAUTIONS À PRENDRE LORSQUE VOUS FAITES PASSER UNE CHEMINÉE À TRAVERS D'UN MUR OU D'UN PLAFOND COMPOSÉS DE MATÉRIAUX COMBUSTIBLES.
- NE FAITES PAS PASSER UN RACCORDEMENT DE CHEMINÉE À TRAVERS D'UN MUR OU D'UN PLAFOND COMPOSÉS DE MATÉRIAUX
- DÉGAGEMENT MINIMAL ENTRE UN RACCORDEMENT DE CHEMINÉE À UN MUR SIMPLE ET TOUT MATÉRIEL COMBUSTIBLE - 18 POUCES / 455 mm. CE DÉGAGEMENT PEUT ÊTRE RÉDUIT EN UTILISANT DES PROTECTEURS DE TUYAUX CLASSÉS, PROTECTEURS DE MUR OU AUTRES MOYENS APPROUVÉS PAR LES OFFICIELS DE LA CONSTRUCTION OU DU SERVICE D'INCENDIE DE VOTRE RÉGION.

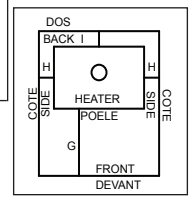
CONNECTEUR HORIZONTAL NON PERMIS DANS MAISONS MOBILES

- L'APPAREIL DOIT COMPORTER UN ENSEMBLE POUR PIEDSTABLE OU SUR PATTES.
- PIÈCES REQUISES POUR INSTALLATION EN MAISON MOBILE OU EN ALCÔVE: NÉCESSAIRE D'APPROVISIONNEMENT D'AIR EXTÉRIEUR ET L'UN DES RACCORDS SUIVANTS: EN COMBINAISON AVEC L'UN DES SYSTÈMES DE CHEMINÉE COMPATIBLES SUIVANTS:
  AU CANADA - LE ULC S-641 CONNECTEUR ENUMERES ET ULC-S-629 ONT ENUMERE CHEMINEE
- PIÈCES EN OPTION - NÉCESSAIRES DE SOUFFLERIE, INDICES ÉLECTRIQUES DE SOUFFLERIE: 115V, 60HZ, 1.0 AMP. LE FIL ÉLECTRIQUE NE DOIT PAS ÊTRE PLACÉ SOUS LE POÈTE. • LE FIL ÉLECTRIQUE NE DOIT PAS ÊTRE PLACÉ SOUS LE POÊLE
- ATTENTION: RISQUE DE TEMPÉRATURES EXCESSIVES - GARDES LE TIROIR DE CENDRES FERMÉ PENDANT L'ALLUMAGE DU POÈTE.
- OPÉREZ SEULEMENT LORSQUE LA PORTE D'ALIMENTATION EST FERMÉE. • OUVREZ SEULEMENT POUR ALIMENTER LE FEU.
- GARDEZ LES MEUBLES ET AUTRES MATÉRIAUX COMBUSTIBLES BIEN ÉLOIGNÉS DU POÊLE.
- REMPLACES LA VITRE AVEC UNIQUEMENT DE LA VITRE CÉRAMIQUE.

CONNECTEUR HORIZONTAL NON PERMIS DANS MAISONS MOBILES

✞TEL QUO ÉPROUVÉ UN PROTECTEUR DE TUYAU PEUT ÊTRE REQUIS PAR LES AUTORITÉS LOCALES

* DIMENSION D'ALCOVE COMBUSTIBLE: PROFONDEUR - 3 PIEDS / .91M, HAUTEUR 7 PIEDS/2.1M, LARGEUR 4 PIEDS/1.2M MINIMUM.
LE PLANCHER COMBUSTIBLE DOIT ÊTRE PROTÉGÉ PAR UN MATÉRIEL NON-COMBUSTIBLE TOUT D'UNE PIÈCE QUI DOIT S'ÉTENDRE DE PAR LE DEVANT, LES COTÉS ET L'ARRIÈRE TEL QU'INDIQUÉ.
CET APPRAREIL DE CHAUFFAGE AU BOIS DOIT FAIRE L'OBJETD'ENTRETIENS ET D'INSPECTIONS PÉRIODIQUES POUR UN FONCTIONNEMENT ADÉQUAT. CONSULTEZ LE MANUEL D'UTILISATION POUR PLUS D'INFORMATION.



IN CANADA	G.	18 INCHES / 455 MM
AU CANADA	H.	8 INCHES / 200 MM
	I.	8 INCHES / 200 MM
IN U.S.A.	G.	16 INCHES / 405 MM
	H.	5 INCHES / 127 MM
	I.	0 INCHES / 0 MM

DATE OF MANUFACTURE

300418 100001350

MADE IN CANADA/ FABRIQUÉ AU CANADA

MANUFACTURED BY/ FABRIQUÉ PAR:
PACIFIC ENERGY FIREPLACE PRODUCTS LTD.
2975 ALLENBY RD., DUNCAN, BC V9L 6V8

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