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

lanufacturer: Arada
Model: Farringdon 16
Date: 2/21/2017
Run: 1
Control #: 035-S-075-1
est Duration: 420
urn Category 1

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

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

Wood Moisture (% DRY): 20.6
Wood Moisture (% wet): 17.08
Load Weight (lb wet): 10.90
Burn Rate (dry kg/h): 0.59
Total Particulate Emissions: 6.36 g

Fuel Data

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

Averages	**165.5**	**69.9**	**8.36**	**11.99**	**0.41**	
	Temp. (F)					
Elapsed Time (min)	**Fuel Weight Remaining (lb)**	**Flue Gas**	**Room Temp**	**Flue Gas Composition (%) O2**	**CO2**	**CO**
0	10.9	206.0	69.0	13.31	6.61	0.02
10	10.4	212.0	69.0	12.98	7.44	0.02
20	9.9	194.0	69.0	11.14	9.67	0.03
30	9.4	200.0	69.0	9.74	11.28	0.03
40	8.8	204.0	69.0	9.05	12.14	0.03
50	8.2	211.0	70.0	6.82	14.33	0.04
60	7.6	233.0	70.0	5.71	14.34	2.74
70	6.8	246.0	70.0	5.63	13.68	4.23
80	5.9	252.0	71.0	5.52	13.11	5.00
90	5.2	239.0	71.0	5.77	14.35	1.55
100	4.8	223.0	71.0	7.89	12.59	0.06
110	4.5	199.0	71.0	10.22	10.13	0.01
120	4.4	181.0	71.0	10.37	9.91	0.02
130	4.2	170.0	71.0	10.21	10.03	0.01
140	4.1	161.0	71.0	9.71	10.58	0.02
150	3.9	153.0	71.0	9.77	10.49	0.01
160	3.8	148.0	71.0	9.72	10.52	0.01
170	3.7	143.0	71.0	9.71	10.48	0.01
180	3.5	139.0	71.0	9.55	10.65	0.01
190	3.5	135.0	72.0	8.63	11.54	0.01
200	3.1	147.0	72.0	7.11	13.75	0.01
210	2.9	148.0	73.0	6.34	14.53	0.01
220	2.6	159.0	73.0	5.01	15.72	0.57
230	2.2	173.0	73.0	5.04	15.31	1.66
240	1.8	181.0	73.0	4.92	15.07	1.44
250	1.5	177.0	71.0	5.50	15.10	0.02
260	1.3	169.0	70.0	7.32	13.30	0.01
270	1.2	158.0	69.0	8.26	12.10	0.02
280	1.1	150.0	69.0	8.33	12.04	0.01
290	1.0	144.0	69.0	7.96	12.28	0.01
300	0.9	140.0	69.0	8.16	12.06	0.01
310	0.9	137.0	69.0	8.17	12.00	0.01
320	0.8	134.0	68.0	7.89	12.51	0.02

330	0.7	131.0	68.0	7.99	12.34	0.02
340	0.6	129.0	68.0	8.06	12.36	0.01
350	0.5	128.0	68.0	8.53	11.82	0.01
360	0.4	127.0	68.0	8.77	11.65	0.01
370	0.4	125.0	68.0	8.45	11.96	0.02
380	0.3	124.0	68.0	8.63	11.72	0.02
390	0.2	123.0	67.0	9.32	11.02	0.01
400	0.1	122.0	68.0	9.33	11.33	0.02
410	0.1	120.0	69.0	9.09	11.41	0.02
420	0.0	120.0	69.0	9.98	10.40	0.02

ellet)

Manufacturer:	Arada
Model:	Farringdon 16
Date:	2/21/2017
Run:	1
Control #:	035-S-075-1
Test Duration:	420 min

	HHV	LHV
Eff	81.1%	87.7%
Comb Eff	95.0%	95.0%
HT Eff	85.4%	92.3%
Output	9,411	kJ/h
Burn Rate	0.59	kg/h
Grams CO	285	g
Input	11,605	kJ/h
MC wet	17.08	

Ultimate CO2

CO2-ult 19.64

F0 1.063

Averages	0.41	11.99	65.3%	20.12	7.92	74.1

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	4.95	0.02	6.61	196.3%	20.50	13.88	96.7
10	4.72	0.02	7.44	163.3%	20.45	13.00	100.0
20	4.49	0.03	9.67	102.5%	20.30	10.61	90.0
30	4.26	0.03	11.28	73.7%	20.19	8.90	93.3
40	3.99	0.03	12.14	61.4%	20.14	7.98	95.6
50	3.72	0.04	14.33	36.7%	19.99	5.64	99.4
60	3.45	2.74	14.34	15.0%	19.81	4.10	111.7
70	3.09	4.23	13.68	9.7%	19.76	3.96	118.9
80	2.68	5.00	13.11	8.5%	19.74	4.13	122.2
90	2.36	1.55	14.35	23.5%	19.89	4.77	115.0
100	2.18	0.06	12.59	55.3%	20.10	7.48	106.1
110	2.04	0.01	10.13	93.7%	20.27	10.14	92.8
120	2.00	0.02	9.91	97.8%	20.28	10.36	82.8
130	1.91	0.01	10.03	95.6%	20.28	10.24	76.7
140	1.86	0.02	10.58	85.3%	20.24	9.65	71.7
150	1.77	0.01	10.49	87.1%	20.25	9.75	67.2
160	1.72	0.01	10.52	86.5%	20.24	9.72	64.4
170	1.68	0.01	10.48	87.3%	20.25	9.76	61.7
180	1.59	0.01	10.65	84.3%	20.24	9.58	59.4
190	1.59	0.01	11.54	70.1%	20.18	8.63	57.2
200	1.41	0.01	13.75	42.8%	20.03	6.28	63.9
210	1.32	0.01	14.53	35.1%	19.98	5.44	64.4
220	1.18	0.57	15.72	20.6%	19.86	3.86	70.6
230	1.00	1.66	15.31	15.8%	19.82	3.68	78.3
240	0.82	1.44	15.07	19.0%	19.85	4.06	82.8
250	0.68	0.02	15.10	29.9%	19.94	4.83	80.6
260	0.59	0.01	13.30	47.6%	20.06	6.76	76.1

270	0.54	0.02	12.10	62.1%	20.14	8.03	70.0
280	0.50	0.01	12.04	63.0%	20.14	8.10	65.6
290	0.45	0.01	12.28	59.8%	20.13	7.84	62.2
300	0.41	0.01	12.06	62.7%	20.14	8.08	60.0
310	0.41	0.01	12.00	63.6%	20.15	8.14	58.3
320	0.36	0.02	12.51	56.8%	20.11	7.59	56.7
330	0.32	0.02	12.34	58.9%	20.12	7.77	55.0
340	0.27	0.01	12.36	58.8%	20.12	7.76	53.9
350	0.23	0.01	11.82	66.0%	20.16	8.33	53.3
360	0.18	0.01	11.65	68.5%	20.17	8.52	52.8
370	0.18	0.02	11.96	64.0%	20.15	8.18	51.7
380	0.14	0.02	11.72	67.3%	20.16	8.43	51.1
390	0.09	0.01	11.02	78.1%	20.21	9.19	50.6
400	0.05	0.02	11.33	73.1%	20.19	8.85	50.0
410	0.05	0.02	11.41	71.9%	20.19	8.77	48.9
420	0.00	0.02	10.40	88.5%	20.25	9.84	48.9

				Air Fuel Ratio (A/F)		
Overall Heating Efficiency:	81.1%		Dry Molecular Weight (Md)		30.24	
Combustion Efficiency:	95.0%		Dry Moles Exhaust Gas (Nr):		319.88	%HC
Heat Transfer Efficiency:	85.4%		Air Fuel Ratio (A/F)		9.16	0.88

Heat Output:	8,928	Btu/h	9,411	kJ/h
Heat Input:	11,009	Btu/h	11,605	kJ/h

2

Burn Duration:	7	h		
Burn Rate:	1.3	lb/h	0.6	kg/h
Stack Temp:	164.5	Deg. F	73.6	Deg. C

21.1	98.2%	86.4%	84.9%	10.0	1.56	68.40	0.06	68.40
Data	**Combust**	**Heat**	**Net**	**Air**	**Wet Wt**	**% Wet**	**Dry Wt.**	**% Dry**
Room Temp (ºC)	**Eff %**	**Transfer %**	**Eff %**	**Fuel Ratio**	**Now Wt**	**Consumed x**	**Now Wtdn**	**Comsumed y**
20.6	100.4%	82.2%	82.5%	17.9	4.95	0.00	4.10	0.00
20.6	100.3%	82.6%	82.9%	15.9	4.72	4.59	3.91	4.59
20.6	100.1%	84.8%	84.9%	12.2	4.49	9.17	3.72	9.17
20.6	100.0%	85.2%	85.2%	10.5	4.26	13.76	3.54	13.76
20.6	100.0%	85.4%	85.3%	9.8	3.99	19.27	3.31	19.27
21.1	99.9%	85.7%	85.6%	8.3	3.72	24.77	3.08	24.77
21.1	86.7%	84.1%	73.0%	6.7	3.45	30.28	2.86	30.28
21.1	80.6%	83.1%	67.0%	6.3	3.09	37.61	2.56	37.61
21.7	77.5%	82.4%	63.9%	6.1	2.68	45.87	2.22	45.87
21.7	91.9%	84.4%	77.6%	7.3	2.36	52.29	1.96	52.29
21.7	99.8%	84.9%	84.7%	9.4	2.18	55.96	1.81	55.96
21.7	100.2%	84.9%	85.1%	11.7	2.04	58.72	1.69	58.72
21.7	100.1%	85.5%	85.6%	12.0	2.00	59.63	1.66	59.63
21.7	100.2%	86.0%	86.2%	11.8	1.91	61.47	1.58	61.47
21.7	100.1%	86.5%	86.6%	11.2	1.86	62.39	1.54	62.39
21.7	100.2%	86.8%	86.9%	11.3	1.77	64.22	1.47	64.22
21.7	100.2%	87.0%	87.1%	11.3	1.72	65.14	1.43	65.14
21.7	100.2%	87.1%	87.3%	11.3	1.68	66.06	1.39	66.06
21.7	100.2%	87.3%	87.5%	11.2	1.59	67.89	1.32	67.89
22.2	100.1%	87.7%	87.8%	10.3	1.59	67.89	1.32	67.89
22.2	100.1%	87.6%	87.6%	8.7	1.41	71.56	1.17	71.56
22.8	100.1%	87.7%	87.7%	8.2	1.32	73.39	1.09	73.39
22.8	97.1%	87.3%	84.8%	7.3	1.18	76.15	0.98	76.15
22.8	91.9%	86.5%	79.5%	6.9	1.00	79.82	0.83	79.82
22.8	92.7%	86.3%	80.0%	7.1	0.82	83.49	0.68	83.49
21.7	100.0%	86.9%	86.9%	7.9	0.68	86.24	0.56	86.24
21.1	100.1%	86.8%	86.9%	8.9	0.59	88.07	0.49	88.07

20.6	100.1%	86.9%	86.9%	9.8	0.54	88.99	0.45	88.99
20.6	100.1%	87.1%	87.2%	9.9	0.50	89.91	0.41	89.91
20.6	100.1%	87.4%	87.5%	9.7	0.45	90.83	0.38	90.83
20.6	100.1%	87.5%	87.6%	9.9	0.41	91.74	0.34	91.74
20.6	100.1%	87.6%	87.7%	9.9	0.41	91.74	0.34	91.74
20.0	100.0%	87.7%	87.7%	9.5	0.36	92.66	0.30	92.66
20.0	100.0%	87.8%	87.8%	9.6	0.32	93.58	0.26	93.58
20.0	100.1%	87.8%	87.9%	9.6	0.27	94.50	0.23	94.50
20.0	100.1%	87.8%	87.9%	10.1	0.23	95.41	0.19	95.41
20.0	100.1%	87.8%	87.9%	10.2	0.18	96.33	0.15	96.33
20.0	100.1%	87.9%	88.0%	9.9	0.18	96.33	0.15	96.33
20.0	100.1%	87.9%	88.0%	10.1	0.14	97.25	0.11	97.25
19.4	100.2%	87.8%	88.0%	10.8	0.09	98.17	0.08	98.17
20.0	100.1%	87.9%	88.0%	10.5	0.05	99.08	0.04	99.08
20.6	100.1%	88.0%	88.1%	10.4	0.05	99.08	0.04	99.08
20.6	100.1%	87.9%	88.0%	11.4	0.00	100.00	0.00	100.00

Combustion Efficiency:	95.0%		
Total Input (kJ):	81,237	77,049	(Btu)
Total Output (kJ):	65,880	62,484	(Btu)
Efficiency:	81.1%		
Total CO (g):	285.48		

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

81609	4.06	6.87	2.74	19810.00	17.08	79.67	21.13	3.07
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	17.08	79.49	21.08	1.63
5590	4.06	6.87	2.74	19810.00	17.08	79.54	21.10	1.83
3726	4.06	6.87	2.74	19810.00	17.08	79.69	21.14	2.39
4099	4.06	6.87	2.74	19810.00	17.08	79.79	21.16	2.78
4472	4.06	6.87	2.74	19810.00	17.08	79.85	21.18	2.99
4472	4.06	6.87	2.74	19810.00	17.08	79.99	21.22	3.54
5217	4.06	6.87	2.74	19810.00	17.08	78.82	20.91	4.30
6335	4.06	6.87	2.74	19810.00	17.08	78.13	20.72	4.56
5962	4.06	6.87	2.74	19810.00	17.08	77.76	20.62	4.64
4099	4.06	6.87	2.74	19810.00	17.08	79.33	21.04	3.97
2609	4.06	6.87	2.74	19810.00	17.08	79.87	21.18	3.11
1491	4.06	6.87	2.74	19810.00	17.08	79.72	21.15	2.49
1118	4.06	6.87	2.74	19810.00	17.08	79.71	21.14	2.44
1118	4.06	6.87	2.74	19810.00	17.08	79.72	21.15	2.47
1118	4.06	6.87	2.74	19810.00	17.08	79.75	21.15	2.61
1118	4.06	6.87	2.74	19810.00	17.08	79.75	21.15	2.58
745	4.06	6.87	2.74	19810.00	17.08	79.75	21.15	2.59
1118	4.06	6.87	2.74	19810.00	17.08	79.75	21.15	2.58
745	4.06	6.87	2.74	19810.00	17.08	79.76	21.16	2.62
1491	4.06	6.87	2.74	19810.00	17.08	79.82	21.17	2.84
2236	4.06	6.87	2.74	19810.00	17.08	79.96	21.21	3.39
1863	4.06	6.87	2.74	19810.00	17.08	80.02	21.22	3.58
2609	4.06	6.87	2.74	19810.00	17.08	79.85	21.18	4.03
2981	4.06	6.87	2.74	19810.00	17.08	79.35	21.05	4.24
2609	4.06	6.87	2.74	19810.00	17.08	79.43	21.07	4.12
1863	4.06	6.87	2.74	19810.00	17.08	80.05	21.23	3.72
1118	4.06	6.87	2.74	19810.00	17.08	79.93	21.20	3.28

745	4.06	6.87	2.74	19810.00	17.08	79.85	21.18	2.98
745	4.06	6.87	2.74	19810.00	17.08	79.85	21.18	2.96
745	4.06	6.87	2.74	19810.00	17.08	79.87	21.18	3.02
373	4.06	6.87	2.74	19810.00	17.08	79.85	21.18	2.97
373	4.06	6.87	2.74	19810.00	17.08	79.85	21.18	2.95
745	4.06	6.87	2.74	19810.00	17.08	79.88	21.19	3.08
745	4.06	6.87	2.74	19810.00	17.08	79.87	21.18	3.04
745	4.06	6.87	2.74	19810.00	17.08	79.87	21.19	3.04
745	4.06	6.87	2.74	19810.00	17.08	79.84	21.18	2.91
373	4.06	6.87	2.74	19810.00	17.08	79.82	21.17	2.87
373	4.06	6.87	2.74	19810.00	17.08	79.84	21.18	2.95
745	4.06	6.87	2.74	19810.00	17.08	79.83	21.17	2.89
745	4.06	6.87	2.74	19810.00	17.08	79.78	21.16	2.71
373	4.06	6.87	2.74	19810.00	17.08	79.80	21.17	2.79
745	4.06	6.87	2.74	19810.00	17.08	79.80	21.17	2.81
373	4.06	6.87	2.74	19810.00	17.08	79.74	21.15	2.56

Moisture Content MCwb: 17.08

Moisture of Wood (wet basis): 17.08
Initial Dry Weight Wtdo (kg): 4.10
Moisture Content Dry 20.60

Dry kg : 4.10
CA: 48.73
HY: 6.87
OX: 43.90

4.95

HHV	LHV		HHV	LHV
19810.00	18328.69	Btu/lb	8522.48	7885.21

10.44	0.05	0.31	39.75	28.90	0.97	0.09	273.38	34.33
flue gas)		kg Wood per 100 mole dfp	Moles per kg of Dry Wood					
[j]	[k]	Nk	CO2	O2	CO	HC	N2	H2O
5.63	-0.02	0.16	40.81	85.71	0.12	-0.12	490.74	34.76
6.33	-0.02	0.18	40.80	71.28	0.11	-0.10	436.22	34.72
8.22	-0.01	0.24	40.74	44.72	0.13	-0.05	335.71	34.63
9.58	-0.01	0.28	40.74	32.14	0.11	-0.04	288.18	34.59
10.30	-0.01	0.30	40.74	26.78	0.10	-0.03	267.96	34.58
12.16	0.00	0.35	40.71	16.03	0.11	-0.01	227.23	34.54
13.99	0.39	0.43	33.49	9.58	6.40	0.92	184.10	32.69
14.45	0.61	0.45	30.15	8.73	9.32	1.34	172.17	31.83
14.49	0.72	0.46	28.41	8.96	10.84	1.57	168.51	31.39
13.20	0.22	0.39	36.34	12.07	3.92	0.55	200.88	33.42
10.70	0.00	0.31	40.63	24.15	0.19	-0.01	257.73	34.54
8.59	-0.01	0.25	40.83	40.85	0.04	-0.06	321.35	34.64
8.42	-0.01	0.24	40.79	42.66	0.08	-0.06	328.05	34.64
8.51	-0.02	0.25	40.83	41.70	0.04	-0.06	324.54	34.64
8.98	-0.01	0.26	40.78	37.20	0.08	-0.05	307.42	34.62
8.90	-0.01	0.26	40.83	37.96	0.04	-0.06	310.39	34.63
8.92	-0.01	0.26	40.83	37.72	0.04	-0.06	309.51	34.63
8.89	-0.01	0.26	40.83	38.03	0.04	-0.06	310.69	34.63
9.03	-0.01	0.26	40.83	36.73	0.04	-0.05	305.76	34.63
9.78	-0.01	0.28	40.82	30.54	0.04	-0.04	282.34	34.61
11.65	-0.01	0.34	40.81	18.63	0.03	-0.03	237.32	34.57
12.31	-0.01	0.36	40.80	15.29	0.03	-0.02	224.71	34.56
13.69	0.08	0.40	39.20	9.62	1.42	0.19	199.12	34.14
14.08	0.24	0.42	36.31	8.73	3.94	0.56	188.22	33.40
13.73	0.20	0.41	36.80	9.91	3.52	0.50	193.96	33.53
12.80	0.00	0.37	40.77	13.05	0.05	-0.01	216.14	34.55
11.27	-0.01	0.33	40.81	20.73	0.03	-0.03	245.27	34.58

10.26	-0.01	0.30	40.78	27.06	0.07	-0.03	269.11	34.59
10.21	-0.01	0.29	40.82	27.46	0.03	-0.04	270.71	34.60
10.41	-0.01	0.30	40.82	26.07	0.03	-0.04	265.46	34.60
10.22	-0.01	0.30	40.82	27.34	0.03	-0.04	270.26	34.60
10.17	-0.01	0.29	40.82	27.69	0.03	-0.04	271.60	34.60
10.61	-0.01	0.31	40.78	24.75	0.07	-0.03	260.37	34.58
10.47	-0.01	0.30	40.78	25.69	0.07	-0.03	263.92	34.59
10.48	-0.01	0.30	40.82	25.62	0.03	-0.04	263.76	34.60
10.02	-0.01	0.29	40.82	28.78	0.03	-0.04	275.71	34.61
9.88	-0.01	0.29	40.82	29.84	0.04	-0.04	279.70	34.61
10.15	-0.01	0.29	40.78	27.89	0.07	-0.03	272.23	34.59
9.94	-0.01	0.29	40.78	29.35	0.07	-0.04	277.75	34.60
9.35	-0.01	0.27	40.82	34.03	0.04	-0.05	295.57	34.62
9.61	-0.01	0.28	40.78	31.86	0.07	-0.04	287.23	34.60
9.68	-0.01	0.28	40.78	31.33	0.07	-0.04	285.23	34.60
8.83	-0.01	0.25	40.78	38.60	0.08	-0.05	312.70	34.62

11.44	347.30	2067.93	1576.66	1538.19	1520.09	1946.06	1842.28	294.22
	Stack	**Heat Content Change - Ambient to Stack Temperature**						**Room**
Moisture	**Temp**	**Flue Gas Constituent**						**Temp**
Present	**K**	**CO2**	**O2**	**CO**	**N2**	**CH4**	**H2O**	**K**
11.44	369.82	2980.59	2265.66	2208.73	2183.09	2819.89	2644.86	293.71
11.44	373.15	3114.97	2366.08	2306.21	2279.52	2950.80	2761.45	293.71
11.44	363.15	2712.81	2065.13	2013.97	1990.43	2559.93	2411.88	293.71
11.44	366.48	2846.54	2165.35	2111.32	2086.73	2689.60	2528.34	293.71
11.44	368.71	2935.87	2232.21	2176.26	2150.96	2776.39	2606.02	293.71
11.44	372.59	3071.40	2332.99	2273.95	2247.64	2909.53	2722.83	294.26
11.44	384.82	3566.68	2701.98	2631.85	2601.76	3394.49	3150.82	294.26
11.44	392.04	3861.38	2920.66	2843.73	2811.46	3684.99	3404.13	294.26
11.44	395.37	3976.74	3005.39	2925.62	2892.54	3800.63	3501.95	294.82
11.44	388.15	3681.35	2786.50	2713.60	2682.70	3508.78	3248.51	294.82
11.44	379.26	3319.86	2517.74	2453.06	2424.88	3153.59	2936.99	294.82
11.44	365.93	2781.92	2115.94	2063.08	2039.06	2629.11	2470.55	294.82
11.44	355.93	2381.85	1815.63	1771.25	1750.42	2242.28	2121.39	294.82
11.44	349.82	2138.80	1632.56	1593.18	1574.34	2008.64	1908.29	294.82
11.44	344.82	1940.73	1483.02	1447.65	1430.44	1819.04	1734.10	294.82
11.44	340.37	1765.29	1350.28	1318.40	1302.67	1651.68	1579.38	294.82
11.44	337.59	1655.93	1267.41	1237.68	1222.87	1547.64	1482.74	294.82
11.44	334.82	1546.79	1184.61	1157.00	1143.11	1444.03	1386.14	294.82
11.44	332.59	1459.64	1118.42	1092.49	1079.35	1361.45	1308.89	294.82
11.44	330.37	1351.47	1035.92	1011.99	999.80	1259.71	1212.48	295.37
11.44	337.04	1612.92	1234.49	1205.53	1191.10	1507.44	1444.22	295.37
11.44	337.59	1613.59	1234.70	1205.66	1191.25	1508.73	1444.36	295.93
11.44	343.71	1854.48	1417.11	1383.31	1366.87	1738.19	1657.03	295.93
11.44	351.48	2162.64	1649.74	1609.71	1590.72	2033.25	1928.01	295.93
11.44	355.93	2339.51	1782.92	1739.23	1718.81	2203.38	2083.01	295.93
11.44	353.71	2293.34	1749.02	1706.47	1686.37	2157.08	2043.87	294.82
11.44	349.26	2137.91	1632.28	1593.01	1574.15	2006.93	1908.12	294.26

11.44	343.15	1917.18	1465.92	1431.18	1414.12	1794.98	1714.44	293.71
11.44	338.71	1741.95	1333.25	1301.97	1286.39	1628.03	1559.76	293.71
11.44	335.37	1610.90	1233.87	1205.14	1190.67	1503.55	1443.83	293.71
11.44	333.15	1523.72	1167.67	1140.62	1126.90	1420.91	1366.57	293.71
11.44	331.48	1458.42	1118.05	1092.25	1079.09	1359.10	1308.65	293.71
11.44	329.82	1414.34	1084.80	1059.90	1047.10	1316.85	1269.93	293.15
11.44	328.15	1349.21	1035.22	1011.56	999.32	1255.36	1212.04	293.15
11.44	327.04	1305.83	1002.19	979.34	967.48	1214.45	1173.45	293.15
11.44	326.48	1284.16	985.68	963.23	951.56	1194.02	1154.17	293.15
11.44	325.93	1262.49	969.17	947.13	935.65	1173.61	1134.88	293.15
11.44	324.82	1219.18	936.16	914.92	903.82	1132.85	1096.31	293.15
11.44	324.26	1197.54	919.66	898.82	887.91	1112.49	1077.02	293.15
11.44	323.71	1197.04	919.50	898.73	887.80	1111.52	1076.93	292.59
11.44	323.15	1154.29	886.66	866.63	856.10	1071.82	1038.46	293.15
11.44	322.04	1089.94	837.33	818.44	808.49	1011.84	980.73	293.71
11.44	322.04	1089.94	837.33	818.44	808.49	1011.84	980.73	293.71

SUMS							AVERAGE
3472.01	1921.83	11887.38	17615.53	3638.76	67618.68	22544.42	2992.99
Energy Losses (kJ/kg of Dry Fuel)							**Total**
Flue Gas Constituent							**Loss**
CO2	**O2**	**CO**	**N2**	**CH4**	**H2O Comb**	**H2O Fuel MC**	**Rate**
121.63	194.18	35.21	1071.33	-107.06	1620.41	533.47	3469.18
127.10	168.65	31.29	994.36	-88.14	1622.48	534.81	3390.55
110.52	92.35	36.02	668.22	-47.78	1606.15	530.81	2996.29
115.97	69.59	30.89	601.36	-32.06	1608.55	532.14	2926.44
119.61	59.79	28.71	576.37	-25.37	1610.54	533.03	2902.67
125.03	37.39	32.41	510.73	-8.23	1612.78	534.37	2844.48
119.47	25.89	1828.00	478.98	819.84	1540.23	539.26	5351.67
116.41	25.50	2664.43	484.04	1201.98	1508.04	542.16	6542.56
112.99	26.93	3098.16	487.42	1399.14	1490.23	543.28	7158.14
133.76	33.62	1121.31	538.90	493.91	1577.88	540.38	4439.77
134.88	60.81	55.27	624.97	-9.50	1620.32	536.82	3023.57
113.59	86.44	11.49	655.26	-53.44	1608.77	531.48	2953.60
97.15	77.45	23.44	574.22	-50.54	1596.38	527.48	2845.58
87.33	68.07	11.59	510.93	-54.56	1589.41	525.04	2737.83
79.15	55.17	21.93	439.75	-43.36	1582.23	523.05	2657.92
72.07	51.25	11.07	404.34	-49.40	1577.50	521.28	2588.11
67.61	47.81	11.03	378.49	-49.07	1574.12	520.17	2550.16
63.15	45.05	11.07	355.15	-49.49	1570.81	519.07	2514.82
59.59	41.08	10.89	330.02	-47.70	1567.96	518.18	2480.03
55.17	31.63	10.05	282.29	-39.20	1563.76	517.08	2420.77
65.82	23.00	8.43	282.68	-22.87	1570.11	519.73	2446.91
65.84	18.88	7.98	267.68	-18.29	1569.65	519.73	2431.48
72.69	13.64	404.20	272.16	170.98	1557.64	522.17	3013.48
78.54	14.40	1120.62	299.40	499.55	1533.09	525.27	4070.87
86.09	17.68	1001.21	333.38	443.16	1544.09	527.04	3952.67
93.50	22.82	15.37	364.49	-11.70	1589.69	526.60	2600.77
87.25	33.84	8.73	386.10	-25.77	1586.45	525.04	2601.64

78.18	39.67	19.17	380.55	-30.07	1580.19	522.83	2590.52
71.10	36.61	9.64	348.24	-34.99	1575.34	521.06	2527.00
65.75	32.17	9.45	316.08	-33.08	1571.14	519.73	2481.23
62.19	31.92	9.62	304.56	-34.82	1568.64	518.84	2460.96
59.53	30.96	9.66	293.08	-35.30	1566.69	518.18	2442.81
57.67	26.85	18.52	272.63	-27.02	1564.51	517.74	2430.89
55.02	26.59	18.77	263.74	-28.25	1562.63	517.08	2415.58
53.30	25.68	9.38	255.18	-32.45	1561.72	516.63	2389.44
52.42	28.37	9.81	262.35	-36.79	1561.49	516.41	2394.07
51.54	28.92	9.95	261.70	-38.23	1560.97	516.19	2391.03
49.72	26.11	19.36	246.05	-31.13	1558.92	515.75	2384.77
48.84	26.99	19.76	246.62	-33.04	1558.45	515.53	2383.14
48.87	31.29	10.52	262.40	-43.99	1559.55	515.53	2384.17
47.07	28.25	20.43	245.90	-36.33	1557.44	515.09	2377.86
44.45	26.23	20.29	230.61	-35.63	1555.38	514.43	2355.75
44.45	32.32	22.26	252.81	-45.15	1556.34	514.43	2377.46

SUMS						
15357	4063	11293.84	66253	4063	285.48	21.16
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
957	-16	972.72	4633	-16	0.87	-0.45
564	-2	565.86	3163	-2	0.67	-0.16
606	0	605.81	3494	0	0.63	-0.12
655	1	654.50	3817	1	0.64	-0.10
642	5	636.68	3830	5	0.72	-0.03
1409	692	717.32	3808	692	47.19	3.87
2092	1226	865.86	4243	1226	83.46	6.88
2154	1342	812.18	3808	1342	91.32	7.54
919	332	587.06	3180	332	22.74	1.83
398	6	392.17	2210	6	0.71	-0.02
222	-3	225.39	1268	-3	0.08	-0.07
161	-2	162.11	957	-2	0.13	-0.05
155	-2	156.93	963	-2	0.06	-0.06
150	-1	151.20	968	-1	0.12	-0.04
146	-2	148.22	972	-2	0.06	-0.05
96	-1	97.37	649	-1	0.04	-0.03
142	-2	144.08	976	-2	0.06	-0.05
93	-1	94.69	652	-1	0.04	-0.03
182	-2	184.34	1308	-2	0.07	-0.05
276	-2	277.80	1960	-2	0.09	-0.05
229	-1	229.66	1635	-1	0.07	-0.03
397	75	321.37	2212	75	5.24	0.40
613	243	369.92	2369	243	16.59	1.35
520	189	331.23	2088	189	12.96	1.05
245	0	244.28	1619	0	0.14	-0.02
147	-1	147.78	971	-1	0.05	-0.03

97	0	97.87	648	0	0.07	-0.02
95	-1	96.02	650	-1	0.04	-0.02
93	-1	94.24	652	-1	0.04	-0.02
46	0	46.77	326	0	0.02	-0.01
46	0	46.43	327	0	0.02	-0.01
91	0	91.78	654	0	0.07	-0.02
91	0	91.24	654	0	0.07	-0.02
90	-1	90.76	655	-1	0.03	-0.02
90	-1	91.08	655	-1	0.04	-0.02
45	-1	45.51	328	-1	0.02	-0.01
45	0	45.08	328	0	0.04	-0.01
90	-1	90.16	656	-1	0.07	-0.02
90	-1	90.96	656	-1	0.04	-0.03
45	0	45.03	328	0	0.04	-0.01
89	-1	89.21	657	-1	0.08	-0.02
45	0	45.15	328	0	0.04	-0.02

Dirigo Laboratories, Inc.

Manufacturer:	**Arada**
Model:	**Farringdon 16**
Date:	**2/21/2017**
Run:	**1**
Control #:	**035-S-075-1**
Test Duration:	**420**
Output Category:	**1**

	HHV Basis	LHV Basis	
Overall Efficiency	81.1%	87.7%	
Combustion Efficiency	95.0%	95.0%	
Heat Transfer Efficiency	85.4%	92.3%	
HHV Output Rate (kJ/h)	9,411	8,928	**(Btu/h)**
Burn Rate (kg/h)	0.59	1.29	**(lb/h)**
Input (kJ/h)	11,605	11,009	**(Btu/h)**
Test Load Weight (dry kg)	4.1	9.0	**dry lb**
MC wet (%)	17.08		
MC dry (%)	20.60		
Particulate (g)	6.36		
CO (g)	285		
Test Duration (h)	7		

Emissions	**Particulate**	**CO**
g/MJ Output	0.10	4.33
g/kg Dry Fuel	1.55	69.62
g/h	0.91	40.78
lb/MM Btu Output	0.22	10.07

Air/Fuel Ratio (A/F)	9.16

Test Results in Accordance with CSA B415.1-10

Default Fuel Values

	D. Fir	Oak
HHV (kJ/kg)	19,810	19,887
%C	48.73	50
%H	6.87	6.6
%O	43.9	42.9
%Ash	0.5	0.5