TEST REPORT

SCOPE: EMISSIONS, EFFICIENCY AND OUTPUT

FUEL: PELLET

TEST STANDARD: EPA (ASTM E2779-10)

MODEL: CAMBRIDGE PELLET STOVE

TEST REPORT

REPORT NUMBER: 102163747MTL-001
REPORT DATE: July 19th, 2016

EVALUATION CENTER
Intertek Testing Services NA Ltd.
1829, 32nd Avenue
Lachine, Qc.

RENDERED TO

Stove Builder International Inc.
250, Copenhague
St-Augustin-de-Desmaures, G3A 2H3
Canada

PRODUCT EVALUATED:

Model Cambridge Pellet Stove

Report of Testing of Cambridge Pellet for compliance with the applicable requirements of the following criteria: ASTM E2779-10 Standard Test Method for Determining Particulate Matter Emissions from Pellet Heaters in conjunction with ASTM E2515-11.

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I. INTRODUCTION

Intertek Testing Services NA (Intertek) has conducted testing for Stove Builder International (SBI), on the Cambridge pellet stove to evaluate compliance to the amended Standards of Performance for New Residential Wood Heaters (40 CFR Part 60, subpart AAA).

A. GENERAL

Tests were conducted by Claude Pelland, the undersigned. Tests were conducted at the client facility in St-Augustin-de-Desmaures, Quebec located at 250 de Copenhague, St-Augustin-de-Desmaures, Quebec, G3A 2H3. The laboratory elevation is 213 feet above sea level.

Per §60.534 (a)(1)(i), ASTM E2779-10 was used for certification test conditions and the particulate matter emission values, CAN/CSA B415.1-2010 “Performance Testing of Solid-Fuel-Burning Heating Appliances” was used for determination of heat output, efficiency and CO emissions and ASTM E2515-11 “Standard Test Method for Determination of Particulate Matter Emissions Collected by a Dilution Tunnel” to measure particulate matter emissions. This evaluation was conducted from June 6th to June 7th, 2016.

B. TEST UNIT DESCRIPTION

Information removed for production of Non-confidential Business Information version of report.

C. REPORT ORGANIZATION

This report includes summaries of all data necessary to determine compliance with the regulations. Raw data, calibration records, intermediate calculations, drawings, specifications and other supporting information are contained in appendices of this report.

II. SUMMARY OF TEST RESULTS

A. PRETEST INFORMATION

A sample was submitted to Intertek directly from the client. The sample was not independently selected for testing. The test unit was handed to the Intertek representative at client's facility in St-Augustin-de-Desmaures, Quebec. The unit was inspected upon receipt and found to be in good condition. The unit was set up following manufacturer's instructions without difficulty. Following assembly, the unit was placed on the test stand and instrumented with thermocouples in the specified locations.

Prior to beginning the emissions tests, the unit was operated for a minimum of 50 hours at medium burn rates to break-in the heater. (See data found in Appendix F) The fuel used for the break-in process was wood pellet of premium grade rated by the PFI and made by Energex. The unit was found to be operating satisfactory during this break-in.

Following the pre-burn break-in process the unit was allowed to cool. The unit's chimney system and laboratory dilution tunnel were cleaned using standard wire brush chimney equipment. On June 6th, 2016 the unit was ready for testing.

1. TEST STANDARD

From June 6th to June 7th, 2016, the Cambridge pellet stove particulate emission rates, burn-rates, heat outputs, efficiencies and CO emission rates were evaluated using all applicable sections of ASTM E2779-10, CSA B415.1-10 and ASTM E2515-11 standards.

2. DEVIATION FROM STANDARD METHOD

A deviation was implemented for the measurement of the first hour of particulate matter emissions. A third independent and complete sampling train was installed. During the development of ASTM WK47329, some labs observed that doing a filter switch on one of the sampling train ended most of the time in a deviation between the two filter trains. That is the rationale for using a third independent sampling train.

No other deviations from the standard were performed, however, only applicable sections of standards were used during all testing.

III. SUMMARY OF TEST RESULTS

RUN #1 (June 6th, 2016). Control board was set at speed 12 out of 12 for the first hour, at speed 5 out of 12 for the following two hours and at speed 1 out of 12 for the following hour. Four hours into the test, it became impossible to maintain the proportionality rate of the filters due to the build-up on the filters. This test was therefore invalid.

RUN #2 (June 7th, 2016). Control board was set at speed 12 out of 12 for the first hour, at speed 5 out of 12 for the following two hours and at speed 1 out of 12 for the following three hours. Combustion, exhaust and convection fan and fuel feed system settings can be found in Appendix H. Burn time was 360 minutes. Burn-rate was 0.959 kg/h. This test led to a 2.89 g/h emission rate.

IV. SUMMARY OF OTHER DATA

Table 1 - Emission rates and Efficiencies

Run No.	Test Date	Burn rate	Emission rate	Overall Efficiency(1)	Overall Efficiency(1)	CO rate	First hour emissions
		kg/h	g/h	% HHV	% LHV	g/h	g/h
1	June 6th, 2016	-	-	-	-	-	-
2	June 7th, 2016	0.96	2.89	69.8%	75.3%	41	2.88

Table 2 - Efficiencies per categories

Run No.	Burn rate	(DE) Overall Efficiency	(OE) Overall Efficiency
	-	% HHV	% LHV
2	High	71.5%	77.2%
2	Medium	66.2%	71.4%
2	Low	65.6%	70.8%

Table 3 – Test Facility Conditions

Run No.	Room temperature start	Room temperature end	Barometric pressure start	Barometric pressure end	Air Velocity before	Air Velocity after
	°F	°F	in. Hg.	in. Hg.	ft/min	ft/min
1	77	86	29.2	29.5	0	0
2	76	86	29.5	29.4	0	0

Table 4 - Flow measurements

Run No.	Burn time	Velocity	Volumetric Flow rate	Total temperature	Volume sampled		Particulate catch	
					Train 1	Train 2	Train 1	Train 2
	min	ft/s	dscf/min	R	dscf	dscf	mg	mg
1	240	7.78	144.71	570.13	48.350	44.361	-	-
2	360	10.86	207.41	558.42	38.215	34.888	9.3	7.7

Table 5 - Heat output rates

Run No.	Category	Burn rate	Average Total Output	Average Total Output	CO rate
		kg/h	kJ/h	BTU/h	g/h
2	High	0.51	30,900	29,300	22.6
2	Medium	1.04	13,900	13,200	50.1
2	Low	2.15	6,800	6,400	44.8

Table 6 - Dual train precision

Run No.	Sample ratios		Total emissions		First hour	Deviation	Deviation
	Train 1	Train 2	Train 1	Train 2	Train 3		
	-	-	g	g	g	%	g/kg
1	-	-	-	-		-	-
2	1953.90	2140.20	18.17	16.48	2.88 (16.6%)	4.88%	0.28

V. PROCESS DESCRIPTION

A. AIR SUPPLY SYSTEM

Primary combustion air enters on the bottom rear of the heater through a 3" pipe. This air is then split and fed through underneath the burn pot and to the glass air wash system. Combustion gases are then routed through the heat exchanger and to the exhaust at the rear of the heater.

Feed rate as well as combustion, exhaust and convection fans are controlled by an LCD touchscreen on the side of the heater. (See product drawings in Appendix D)

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B. TEST FUEL PROPERTIES

Fuel used was a wood pellet of premium grade made by Energex. This pellet has been graded under a licensing agreement with the Pellet Fuels Institute (PFI). Its properties are as follows:

Energy content :	8650 TU/lb
Ash content :	0.615%
Moisture content :	4.75%
Density:	44.5 lb/ft^3.

VI. SAMPLING SYSTEMS

The sampling procedure used was as specified in ASTM E2515-11.

A. SAMPLING LOCATIONS

Particulate samples are collected from the dilution tunnel at a point 20 feet from the tunnel entrance. The tunnel has two elbows ahead of the sampling section. (See Figure 1) The sampling section is a continuous 15-foot section of 8-inches diameter pipe straight over its entire length. Tunnel velocity pressure is determined by a Type “S” Pitot tube located 100 inches from the beginning of the sampling section. The dry bulb thermocouple is located six inches downstream from the Pitot tube. Tunnel samplers are located 48 inches downstream of the Pitot tube and 32 inches upstream from the end of this section. (See Figure 1.)

Stack gas samples are collected from the type “L” pellet vent section 8 feet ± 6 inches above the scale platform. (See Figure 2.)

B. DILUTION TUNNEL

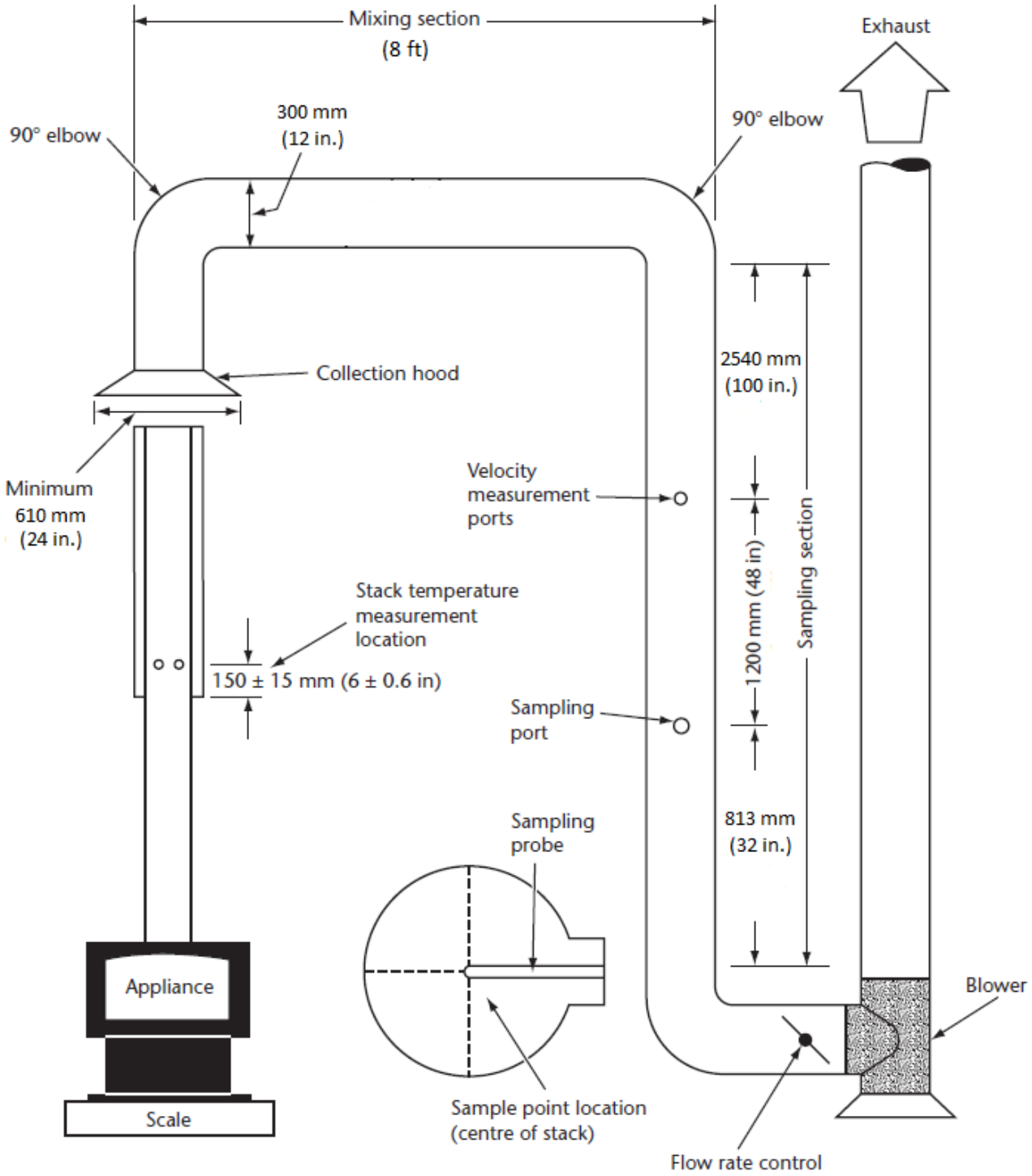
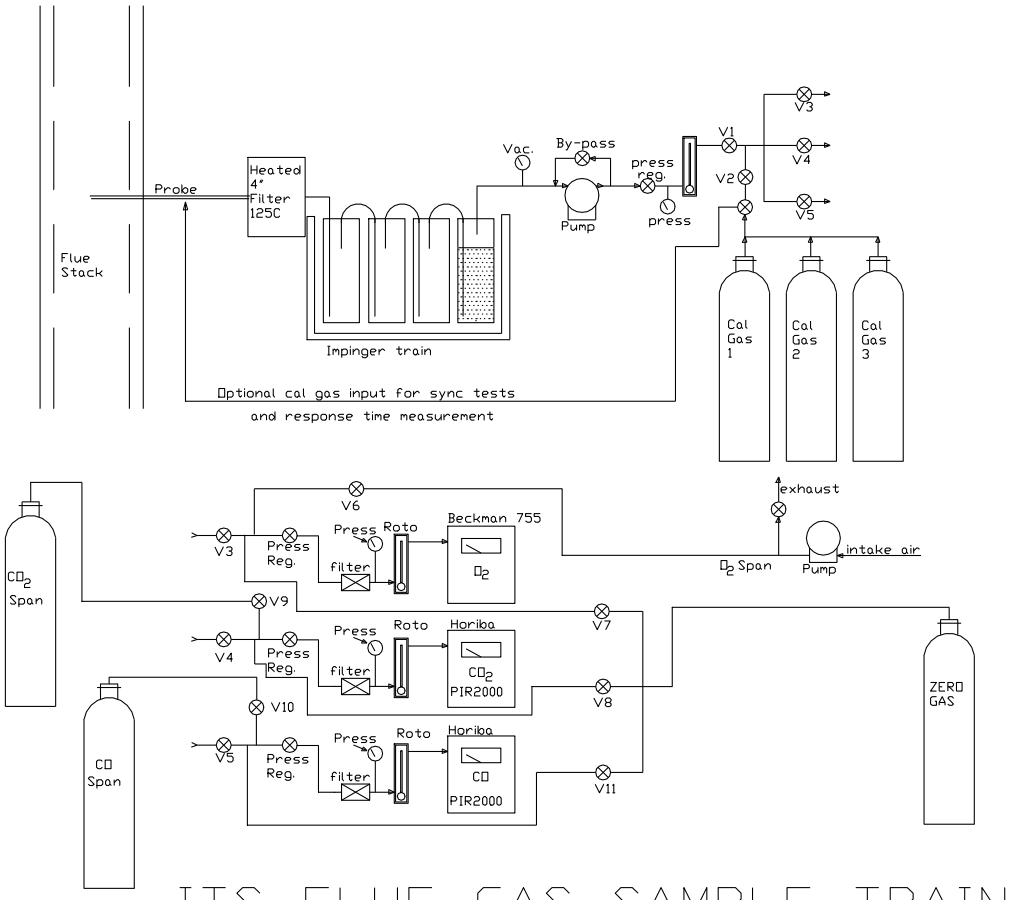


Figure 1- Dilution tunnel

C. STACK GAS SAMPLE TRAIN



ITS FLUE GAS SAMPLE TRAIN

FIGURE 2

D. DILUTION TUNNEL SAMPLE SYSTEMS

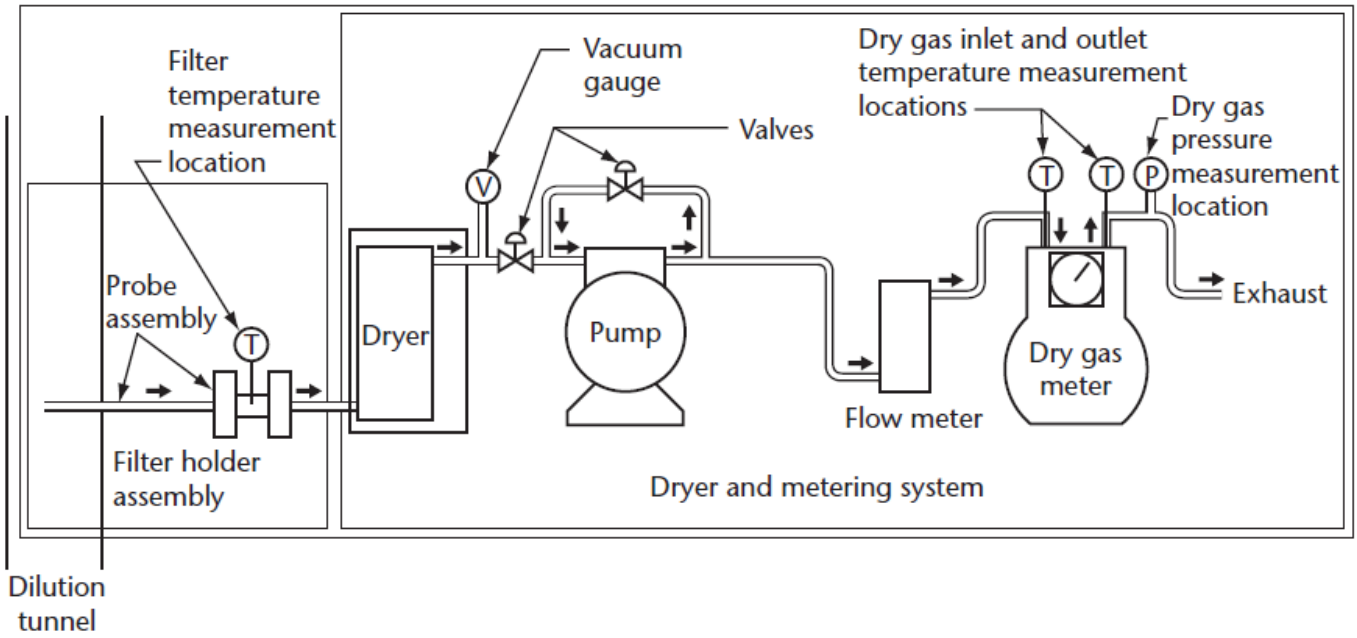


Figure 2 - Sampling trains

VII. SAMPLING METHODS

A. PARTICULATE SAMPLING

Particulates were sampled in strict accordance with ASTM E2515-11. Sample filters used were Pall TX-40. The dryers used in the sample systems are filled with "Drierite" before each test run.

VIII. QUALITY ASSURANCE

A. INSTRUMENT CALIBRATION

1. DRY GAS METERS

At the conclusion of each test program the dry gas meters are checked against a standard dry gas meter. Three runs are made on each dry gas meter used during the test program. The average calibration factors obtained are then compared with the six-month calibration factor and, if within 5%, the six-month factor is used to calculate standard volumes. Results of this calibration are contained in Appendix E.

An integral part of the post test calibration procedure is a leak check of the pressure side by plugging the system exhaust and pressurizing the system to 10" W.C. The system is judged to be leak free if it retains the pressure for at least 10 minutes.

The standard dry gas meter is calibrated every 12 months using a Spirometer designed by the EPA Emissions Measurement Branch. The process involves sampling the train operation for 1 cubic foot of volume. With readings made to .001 ft^3, the resolution is 0.1%, giving an accuracy higher than the ±2% required by the standard.

2. STACK SAMPLE ROTOMETER

The stack sample rotameter is checked by running three tests at each flow rate used during the test program. The flow rate is checked by running the rotometer in series with one of the dry gas meters for 10 minutes with the rotometer at a constant setting. The dry gas meter volume measured is then corrected to standard temperature and pressure conditions. The flow rate determined is then used to calculate actual sampled volumes.

3. GAS ANALYZERS

The continuous analyzers are zeroed and spanned before each test with appropriate gases. A mid-scale multi-component calibration gas is then analyzed. At the conclusion of a test, the instruments are checked again with zero, span and calibration gases. The drift in each meter is then calculated and must not exceed 5% of the scale used for the test.

At the conclusion of each unit test program, a five-point calibration check is made. This calibration check must meet accuracy requirements of the applicable standards. Consistent deviations between analyzer readings and calibration gas concentrations are used to correct data before computer processing. Data is also corrected for interferences as prescribed by the instrument manufacturer's instructions.

B. TEST METHOD PROCEDURES

1. LEAK CHECK PROCEDURES

Before and after each test, each sample train is tested for leaks. Leakage rates are measured and must not exceed 0.02 CFM or 4% of the sampling rate. Leak checks are performed checking the entire sampling train, not just the dry gas meters. Pre-test and post-test leak checks are conducted with a vacuum of 5 inches of mercury. Vacuum is monitored during each test and the highest vacuum reached is then used for the post test vacuum value. If leakage limits are not met, the test run is rejected. During these tests no vacuum were observed. Thus, leakage rates reported are expected to be much higher than actual leakage during the tests.

2. TUNNEL VELOCITY/FLOW MEASUREMENT

The tunnel velocity is calculated from a center point Pitot tube signal multiplied by an adjustment factor. This factor is determined by a traverse of the tunnel as prescribed in EPA Method 1. Final tunnel velocities and flow rates are calculated from EPA Method 2, Equation 6.9 and 6.10. (Tunnel cross sectional area is the average from both lines of traverse.)

Pitot tubes are cleaned before each test and leak checks are conducted after each test.

3. PM SAMPLING PROPORTIONALITY (ASTM E2515-11)

Proportionality was calculated in accordance with ASTM E2515-11. The data and results are included in Appendix B.

IX. RESULTS AND OBSERVATIONS

Stove Builder International Inc. model Cambridge pellet stove has been found to be in compliance with the applicable performance requirements of the following criteria:

Standards of Performance for New Residential Wood Heaters (40 CFR Part 60, subpart AAA)

This standard requires that the weighted average particulate emission rate for an appliance not equipped with a catalytic combustor not exceed 4.5 g/h. The unit as tested produced a weighted average emission rate of 2.89 g/h and therefore met this limit.

INTERTEK TESTING SERVICES NA

Reported by: _____
Claude Pelland, Eng.
Test Engineer

Reviewed by: _____
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Chief Engineer- Hearth Products

APPENDIX A
Laboratory Operating Procedure

Report Number: G102038216 Issued date: April 29, 2015
Client: Stove Builder International inc.

A. GAS ANALYSIS

1. Instruments should be turned on and allowed to warm up for one (1) hour minimum.

2. Calibrate analyzers as follows:

NOTE : Prior to proceeding with calibration, make sure to use NIST tracable calibration gas bottles. Adjust flow meter if necessary at each instrument to required flow value.

a) Using span gas, adjust span control to values specified on calibration gas label.
b) Using nitrogene, adjust zero controls to provide a 0.00 analyzer readout.

c) Repeat a) and b) until no further adjustment is required.
d) Check readout vs. calibration gases (2) labels.

The CO_2 and CO analyzers are "ZEROED" on nitrogen. The O_2 analyzer is spanned on air and set for 20.9%. It is zeroed on nitrogen as well.

3. Check for response time synchronization.

a) With no fire in unit, allow reading to stabilize (O_2 should be 20.93, CO and CO_2 should equal O).
b) Flow the calibration gas in the unit and start stop watch. Note the time required for each unit to reach .90 of the calibration gas bottle value. If all three analyzers reach this value within 15 seconds of each other, synchronization is adequate. If not, contact the laboratory manager. Synchronization is adjusted by internal instrument setting.

4. Set-up sample clean-up and water collection train as follows.

a) Load impingers as follows:
Impinger #1: 100 ml distilled water and 5 ml H_2SO_4
Impinger #2: 100 ml distilled water and 5 ml H_2SO_4
Impinger #3: Empty
Impinger #4: 200 – 300 grams silica gel (dry)

b) Place impingers in container and connect with “U TUBES”. Grease carefully on bottom half of ball joint so that grease will not get into tubes.
c) Connect filter to first impinger and sample line to last impinger.

e. Leak check system as follows.

1) Plug probe.
2) Turn on sample system.
3) Observe sample flow rotometer and vacuum gauge. If necessary, use vacuum; adjust valve to set vacuum to the maximum inches Hg.
4) If the float in rotometer does not stabilize below 10 on scale, system must be resealed.
5) Repeat leak check procedure until satisfactory results are obtained.

f) Just prior to starting test, fill impinger container with water and ice and record ambiant conditions on data form no. 192-t-9904.

B. Dilution tunnel sample train set-up

1. Filters and holders.

a) Clean probes and filter holder front housings carefully and desiccate for at least 24 hours prior to use.
b) Filters should be numbered and filter and probe combinations labeled prior to use.
c) Weigh desiccated filters and probe-filter units on analytical balance. Record weights data form no. 192-p-9904. Note that probe and front half of front filter are to be weighed as a unit.
d) Carefully assemble filter holder units and connect to sampling systems. Check “DRIERITE” columns for adequate dry absorbent (blue).

2. Leak checking.

a) Each sample system is to be checked for leakage prior to inserting probes in tunnel.

b) Plug probes and start samplers, adjust pump bypass valve to produce a vacuum reading of 5 inches Hg. (NOTE: During test, vacuum must not exceed 5 inches unless posttest leak check shows acceptable results.)

c) Allow vacuum indication to stabilize for two (2) minutes, then record time and dry gas (DGM_1) and (DGM_2) meter readings. Wait ten (10) minutes and record dry gas meter readings again (DGM_3, DGM_4). NOTE: If mark, system is leaking too much and all seals should be checked.

d) Calculate leakage rate as follows.

1) System 1: $\frac{(DGM_3 - DGM_1)}{10} = CFM_1$

2) System 2: $\frac{(DGM_4 - DGM_2)}{10} = CFM_2$

If CFM_1 or CFM_2 is greater than .02 CFM, leakage is unacceptable and system must be resealed.

If CFM_1 or CFM_2 is greater than 0.04 X sample rate, leakage is unacceptable. For most tests, the sample rate will be about 0.15 CFM, thus leakage rates in excess of 0.04 X 0.15 = 0.006 CFM are not acceptable.

e) Once leakage check is satisfactory, unplug probe and set flow to appropriate rate for test. This should be done in the minimum amount of time necessary and with the probes in ambient air. Do not insert probes in tunnel until the start of the test run. When flow is established, replug probes to prevent contamination.

Report Number: G102038216 Issued date: April 29, 2015
Client: Stove Builder International inc.

TEST CONDUCT

A. FUEL LOAD

1. Determine optimum load weight by multiplying firebox volume in cubic feet by 7. This is the load weight on an as-fired basis.
2. Determine piece size to obtain the requested load configuration and meet the test load weight criteria. The load should consist of the following: **TO BE DETERMINED**
3. Weigh out test load and adjust weight by shortening all pieces equally if necessary.

4. Measure and record moisture content of each fuel piece using Delmhorst moisture meter. Determine if fuel load moisture content is in required range. If not, construct new load using wood with required moisture content. All wood in the humidity chamber should be within range. Contact project manager if you cannot find suitable pieces.

B. Unit start-up

1. Before lighting a fire, turn on dilution tunnel and set flow rate to 140 SCFM if burn rate is to be less than 3 kg/hr or to an appropriate rate from table provided in laboratory for higher burn rates. Record readings on data form no. 192-r-9904.
2. Check draft imposed on cold stove with all inlets closed and a draft gauge in the chimney. If draft is greater than 0.005 inches water column, adjust tunnel to stack gap until draft is less than 0.005.
3. Check for ambient airflow around unit with hot wire anomometer. Must be less than 50 ft/min.
4. Check all equipment for proper operation. Analyzers should be on and in sample mode. Computer should be loaded with test program and awaiting test start command.
5. Zero scale and start fire with uncolored newspaper and kindling representing 10 % of test load with the same type of fuel.
6. Once kindling is burning well after 5 minutes, add splitted pieces having a bottom surface around 4 sq. inches and representing 25% of test load weight. Operate at high fire for 15 minutes. Then adjust settings to intended test run levels as per the manufacturer's.
7. Following addition of pretest fuel load (splitted pieces), start computer for data logging.

C. Test run

1. When the 15 minutes high fire pre-burn period is completed, the test is to be started as follows:

   a) Insert the sample probes into the tunnel being careful not to hit sides of tunnel with probe tip.
   b) Check tunnel pitot tube for proper position. (Pitot should be carefully cleaned prior to each test.)
   c) Turn on probe sample systems and stack sampler.
   d) Open stove door, rake coals and load stove as follows: **TO BE DETERMINED**
   e) Close door or follow manufacturer's start-up procedures. (Five (5) minutes maximum time before all
   doors and controls must be set to final positions for duration of test.)
   f) An alarm will sound an audible signal at the (10) minutes intervals. This signal a reading interval. You must record at each interval the following readings on data form no. 192-v-9904:

      1) Rotometer readings.
      2) Tunnel pitot tube reading.
      (Zero regularly between readings)
      3) Dry gas meter readings.
      4) Temperature readings.
      5) Draft reading
      6) Test laod weight
      7) CO, CO_2 and O_2 readings
      8) Observations of any unusual or non-routine events.

   g) During the test, any condition approaching unacceptable limits will be noted. The filter probes and housings are installed in small holders just outside the tunnel. If the filter temperature gets too high, you will have to increase the water flow through the cooling unit until acceptable temperatures are obtained. In between readings, check on other equipment. Be sure dryers and filters are working and monitor impinger train for proper water and ice levels etc.

h) When the fuel charge is consumed, it will signal end of test and shut down the sampling systems. When this occurs, remove filter holder and probes from tunnel and impingers from sample line.

III. POST TEST PROCEDURES

SAMPLE RECOVERY – FILTER TRAINS

1. Carefully clean outside of probes and filter housings with alcohol.
2. Disassemble filter holder and transfer filters to clean petri dish. Scrape gasket with scalpel and collect any loose material on filters.
3. Place probe and front half of first filter holders (still assembled) and filters in desiccator. Allow 24-hour desiccation before weighing.
4. Weigh probe filter holder units and filters at two (2) hour intervals until weight change between weighings is less than 0.5 mg. Record all weights taken on data form no. 192-p-9904.

Calculation of results

The computer program carries out all final calculations. When run, it will ask for data from forms used during the test. Enter data as called for.

Other tests

Fuel samples for each run should be tested for heating value and moisture content by ASTM D3286 and D4442 methods respectively.

GENERAL

This guide cannot cover every possible contingency, which may develop during a particular test program. Many questions, which may arise, can be answered by a complete understanding of the test standards and their intent. When in doubt on any detail, check with the laboratory manager and be sure you understand the procedures involved.

It is critical that all spaces on the data forms be properly filled in. Each test must be represented by a complete record of what was done and when.

Data and Calculation Forms
Appendix B

Time	Ambiant	Flue	Firebox Top	Dilution Tunnel	Firebox Right	Firebox Back	Firebox Bottom	Firebox Left
min	°F	°F	°F	°F	°F	°F	°F	°F
0	79.62	224.03	91.27	96.85	137.16	332.50	86.50	97.50
1	80.12	237.18	91.58	98.85	142.80	360.99	86.94	99.25
2	81.29	242.29	92.97	101.09	147.57	377.91	85.78	101.02
3	80.25	242.95	93.56	103.84	150.74	378.62	85.48	102.90
4	78.94	249.06	93.34	106.54	153.20	391.28	84.13	106.54
5	80.33	256.15	93.97	109.51	156.71	409.39	84.78	107.75
6	79.89	260.49	95.56	112.49	160.51	418.38	85.12	109.51
7	81.15	265.41	95.79	115.58	163.90	429.02	85.83	111.14
8	79.04	269.78	96.20	118.80	166.82	440.59	85.90	113.96
9	78.06	269.42	96.88	122.00	168.06	434.67	85.13	115.34
10	77.78	273.24	96.13	124.95	170.42	441.49	86.14	117.76
11	78.44	280.37	96.84	128.35	174.23	463.41	86.94	119.13
12	77.97	283.76	97.88	131.41	176.67	469.14	87.84	121.25
13	77.42	285.63	98.59	134.40	179.28	471.10	87.19	123.58
14	77.61	287.79	98.63	137.52	181.04	472.75	87.48	125.08
15	77.17	287.92	99.11	140.34	182.31	468.06	86.93	127.17
16	77.27	289.34	99.12	143.11	183.04	465.75	86.63	129.52
17	77.83	292.32	100.36	145.77	185.09	477.85	88.61	132.13
18	77.21	293.04	99.33	148.17	186.45	481.81	87.30	133.55
19	77.07	290.18	98.89	150.67	186.39	464.98	89.82	133.22
20	77.35	291.08	99.21	152.81	187.40	458.21	91.42	134.29
21	77.59	296.78	99.02	154.74	190.75	476.49	93.26	136.62
22	78.24	301.07	99.32	156.68	192.65	489.20	93.31	137.48
23	78.50	303.04	99.13	158.63	194.43	492.05	93.58	139.82
24	78.76	301.87	99.14	160.62	195.38	483.70	94.76	140.86
25	79.22	304.21	98.98	162.55	197.07	487.97	95.48	141.47
26	79.56	305.15	100.12	164.38	198.54	490.47	96.30	143.11
27	80.59	306.25	99.61	166.35	199.44	490.42	96.69	145.15
28	80.66	309.33	99.84	168.15	200.60	499.95	97.11	146.71
29	80.25	310.69	99.97	169.62	201.87	503.88	95.95	147.00
30	80.15	310.63	100.56	171.12	202.86	503.13	93.65	150.42
31	80.82	312.78	109.77	172.33	203.38	506.62	93.03	150.29

32	79.57	313.52	113.31	173.70	203.89	509.64	91.92	149.59
33	79.19	312.66	93.32	174.85	204.29	504.05	90.95	150.62
34	78.40	312.91	113.43	175.92	204.24	502.57	91.29	151.22
35	77.93	315.22	114.85	176.86	205.54	512.18	92.19	151.20
36	79.01	316.43	116.22	178.06	205.26	520.49	91.49	152.11
37	78.44	317.04	117.19	179.00	206.81	522.89	91.78	152.25
38	79.25	317.87	117.84	179.91	207.16	524.85	91.50	153.27
39	78.16	318.60	117.60	180.84	207.90	530.10	91.98	155.23
40	77.76	318.89	117.89	181.56	207.80	527.13	90.91	156.04
41	78.15	319.32	118.13	182.32	208.40	524.86	90.74	155.44
42	77.35	321.55	118.62	183.17	209.44	533.90	92.25	154.88
43	78.32	321.41	118.13	183.98	210.21	533.41	90.98	156.11
44	78.99	322.60	118.48	184.91	210.80	533.27	92.46	158.03
45	77.74	322.10	118.51	185.47	210.55	527.39	91.59	156.86
46	77.53	322.75	118.24	186.22	211.74	530.83	90.75	158.57
47	79.23	323.18	118.61	187.11	211.64	533.20	91.54	158.23
48	77.88	324.07	118.88	187.56	211.83	533.26	91.06	157.92
49	77.53	326.71	119.14	188.11	212.77	542.71	91.62	158.04
50	77.67	326.98	118.95	188.90	213.39	540.68	91.88	158.44
51	77.60	328.14	119.43	189.49	213.92	546.40	91.22	161.51
52	77.85	328.13	119.27	190.27	214.80	545.90	91.37	160.41
53	77.59	329.15	119.64	190.82	215.18	546.61	92.26	160.62
54	77.26	329.01	120.16	191.91	215.55	543.90	92.68	160.56
55	77.65	328.72	119.98	192.41	215.48	542.24	90.45	161.37
56	77.60	332.13	120.30	193.20	215.04	548.73	90.76	161.69
57	77.59	336.70	121.67	193.67	215.87	559.38	90.62	161.67
58	77.30	339.47	121.08	194.19	217.26	568.12	91.71	161.65
59	77.25	338.02	121.15	194.64	216.72	552.52	90.90	161.73

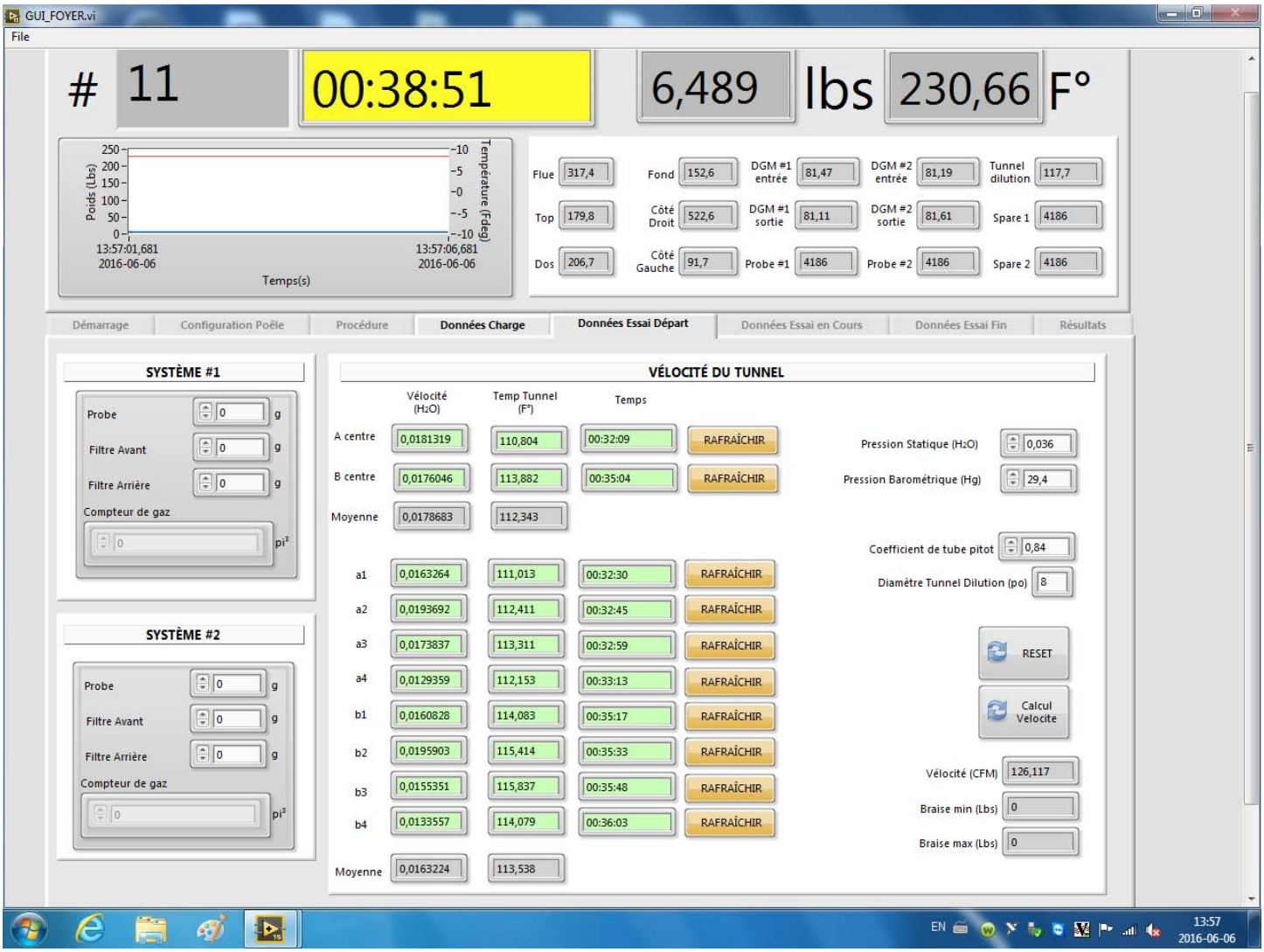
DGM Outlet 1	DGM Inlet 1	Probe 1	DGM Outlet 2	DGM Inlet 2	Probe 2	Probe 3	Draft	Dilution Tunnel	Scale
°F	°F	°F	°F	°F	°F	°F	"H_2O	"H_2O	lb
81.19	81.26	N/A	80.36	81.98	N/A	N/A	0.018	0.022	9.27
81.17	81.24	N/A	80.37	81.95	N/A	N/A	0.016	0.022	9.17
81.18	81.24	N/A	80.38	81.92	N/A	N/A	0.020	0.022	9.11
81.18	81.20	N/A	80.40	81.88	N/A	N/A	0.019	0.022	9.07
81.20	81.19	N/A	80.43	81.86	N/A	N/A	0.016	0.022	9.00
81.20	81.14	N/A	80.44	81.81	N/A	N/A	0.020	0.021	8.90
81.22	81.11	N/A	80.48	81.79	N/A	N/A	0.017	0.022	8.87
81.24	81.08	N/A	80.50	81.77	N/A	N/A	0.017	0.022	8.79
81.25	81.05	N/A	80.53	81.76	N/A	N/A	0.020	0.022	8.71
81.26	81.01	N/A	80.55	81.73	N/A	N/A	0.019	0.022	8.66
81.27	80.99	N/A	80.58	81.72	N/A	N/A	0.020	0.021	8.61
81.28	80.97	N/A	80.60	81.71	N/A	N/A	0.018	0.022	8.51
81.29	80.97	N/A	80.63	81.70	N/A	N/A	0.019	0.022	8.43
81.30	80.96	N/A	80.67	81.69	N/A	N/A	0.017	0.021	8.38
81.31	80.95	N/A	80.70	81.69	N/A	N/A	0.019	0.022	8.30
81.31	80.96	N/A	80.74	81.70	N/A	N/A	0.017	0.021	8.26
81.32	80.94	N/A	80.77	81.70	N/A	N/A	0.018	0.022	8.18
81.31	80.92	N/A	80.79	81.71	N/A	N/A	0.021	0.021	8.10
81.33	80.91	N/A	80.83	81.70	N/A	N/A	0.021	0.022	8.03
81.37	80.91	N/A	80.87	81.73	N/A	N/A	0.021	0.022	8.00
81.38	80.90	N/A	80.88	81.72	N/A	N/A	0.018	0.022	7.93
81.39	80.89	N/A	80.92	81.71	N/A	N/A	0.020	0.022	7.82
81.41	80.90	N/A	80.94	81.72	N/A	N/A	0.022	0.022	7.74
81.41	80.92	N/A	80.96	81.72	N/A	N/A	0.019	0.022	7.64
81.43	80.92	N/A	80.98	81.69	N/A	N/A	0.021	0.021	7.59
81.43	80.94	N/A	81.00	81.68	N/A	N/A	0.020	0.021	7.48
81.43	80.94	N/A	81.02	81.68	N/A	N/A	0.019	0.021	7.40
81.45	80.95	N/A	81.03	81.68	N/A	N/A	0.022	0.021	7.32
81.44	80.95	N/A	81.06	81.70	N/A	N/A	0.021	0.021	7.22
81.46	80.96	N/A	81.10	81.71	N/A	N/A	0.018	0.022	7.17
81.45	80.94	N/A	81.12	81.71	N/A	N/A	0.022	0.022	7.07
81.46	80.95	N/A	81.14	81.70	N/A	N/A	0.021	0.018	7.00

81.48	80.98	N/A	81.16	81.70	N/A	N/A	0.018	0.017	6.91
81.49	81.01	N/A	81.17	81.67	N/A	N/A	0.022	0.002	6.86
81.48	81.03	N/A	81.16	81.63	N/A	N/A	0.021	0.018	6.78
81.49	81.07	N/A	81.17	81.61	N/A	N/A	0.018	0.014	6.72
81.48	81.09	N/A	81.18	81.61	N/A	N/A	0.020	0.017	6.62
81.48	81.11	N/A	81.19	81.61	N/A	N/A	0.021	0.018	6.55
81.48	81.13	N/A	81.20	81.63	N/A	N/A	0.020	0.018	6.48
81.49	81.13	N/A	81.22	81.62	N/A	N/A	0.018	0.018	6.41
81.49	81.14	N/A	81.24	81.64	N/A	N/A	0.020	0.018	6.35
81.49	81.11	N/A	81.25	81.65	N/A	N/A	0.020	0.018	6.28
81.51	81.11	N/A	81.29	81.69	N/A	N/A	0.021	0.018	6.17
81.51	81.10	N/A	81.29	81.70	N/A	N/A	0.019	0.017	6.12
81.53	81.11	N/A	81.33	81.73	N/A	N/A	0.023	0.018	6.02
81.56	81.13	N/A	81.36	81.77	N/A	N/A	0.022	0.017	5.94
81.56	81.13	N/A	81.38	81.78	N/A	N/A	0.019	0.017	5.85
81.57	81.14	N/A	81.40	81.81	N/A	N/A	0.019	0.017	5.79
81.57	81.14	N/A	81.41	81.81	N/A	N/A	0.023	0.017	5.72
81.58	81.16	N/A	81.44	81.84	N/A	N/A	0.021	0.018	5.63
81.58	81.17	N/A	81.45	81.86	N/A	N/A	0.023	0.017	5.54
81.58	81.17	N/A	81.46	81.87	N/A	N/A	0.019	0.018	5.45
81.60	81.20	N/A	81.48	81.87	N/A	N/A	0.019	0.018	5.37
81.60	81.21	N/A	81.49	81.88	N/A	N/A	0.020	0.018	5.31
81.62	81.23	N/A	81.51	81.89	N/A	N/A	0.019	0.017	5.19
81.64	81.23	N/A	81.51	81.89	N/A	N/A	0.020	0.018	5.11
81.67	81.25	N/A	81.52	81.92	N/A	N/A	0.023	0.018	5.04
81.69	81.28	80.65	81.54	81.93	79.37	79.56	0.023	0.017	4.96
81.70	81.28	80.93	81.54	81.94	79.48	79.65	0.019	0.018	4.87
81.71	81.32	81.22	81.57	81.96	79.54	79.73	0.023	0.017	4.79

Time	Ambiant	Flue	Dilution Tunnel	Firebox Top	Firebox Back	Firebox Right	Firebox Left	Firebox Bottom
min	°F	°F	°F	°F	°F	°F	°F	°F
0	77.47	340.47	121.89	195.10	553.95	217.12	162.30	90.99
10	77.21	338.76	122.30	195.74	529.28	217.97	162.00	94.99
20	77.67	345.46	123.92	193.84	553.69	220.65	160.74	95.51
30	77.67	339.80	122.93	192.79	529.88	218.56	160.75	95.94
40	77.39	337.20	123.05	191.84	529.92	217.22	159.59	94.99
50	77.50	348.66	124.63	192.06	543.81	222.12	160.54	97.15
60	77.72	349.63	124.63	192.09	549.97	224.72	162.12	98.50
70	77.92	283.03	119.13	188.95	391.86	195.65	155.16	88.46
80	77.91	247.51	112.30	168.22	339.33	168.45	138.00	84.92
90	77.37	226.44	108.10	151.43	306.07	153.94	125.57	82.87
100	78.12	222.12	106.26	138.71	300.47	148.24	117.25	83.81
110	78.18	212.56	105.03	132.05	282.80	144.56	113.39	84.46
120	80.74	209.50	105.37	128.50	275.46	142.71	112.46	86.02
130	78.83	212.69	105.98	127.50	288.50	143.20	110.72	83.31
140	77.12	217.44	106.79	126.34	298.79	143.30	109.24	82.58
150	80.98	202.79	104.72	126.49	262.34	139.98	110.54	86.43
160	78.76	214.47	106.18	125.55	289.06	143.11	110.17	83.23
170	77.42	212.19	105.88	125.32	283.78	141.08	108.83	81.57
180	77.91	209.80	104.90	124.08	275.91	141.48	108.44	84.93
190	79.35	183.39	100.45	123.92	230.37	131.96	108.49	81.22
200	79.38	168.36	96.96	116.80	208.98	120.85	102.37	77.53
210	79.78	165.62	97.42	112.26	204.83	119.74	101.09	84.14
220	79.93	167.14	97.56	112.45	209.02	121.52	102.67	85.07
230	80.38	162.07	96.79	111.71	197.70	119.68	102.85	85.01
240	80.42	162.48	97.69	110.78	195.74	120.08	102.73	85.19

DGM Outlet 1	DGM Inlet 1	Probe 1	DGM Outlet 2	DGM Inlet 2	Probe 2	Probe 3	Draft	Dilution Tunnel	Scale
°F	°F	°F	°F	°F	°F	°F	"H_2O	"H_2O	lb
81.73	81.34	81.33	81.59	81.98	79.56	79.76	0.023	0.017	4.72
85.19	82.98	89.27	84.95	83.25	89.31	89.22	0.022	0.017	27.49
87.79	84.12	89.47	87.55	83.99	88.95	88.07	0.022	0.020	26.67
87.45	84.44	86.44	87.29	85.16	88.89	87.84	0.022	0.019	25.90
86.54	85.65	86.67	87.47	86.41	88.95	87.77	0.023	0.016	25.11
87.27	86.65	86.63	88.43	87.48	88.94	88.77	0.022	0.018	24.26
87.83	87.33	87.01	88.00	88.12	88.04	89.25	0.019	0.020	23.42
88.81	88.02	86.81	88.76	88.72	86.84	N/A	0.021	0.018	22.91
89.03	88.18	85.53	89.17	88.16	85.31	N/A	0.019	0.018	22.51
89.33	88.36	84.91	89.50	88.75	84.54	N/A	0.018	0.020	22.13
89.58	88.52	84.92	89.72	89.06	83.92	N/A	0.018	0.019	21.73
89.65	88.68	85.36	89.82	89.10	84.05	N/A	0.014	0.021	21.38
89.49	88.80	88.40	89.98	89.14	86.42	N/A	0.015	0.017	20.97
89.88	89.17	89.42	89.95	89.15	87.45	N/A	0.016	0.020	20.65
89.75	89.14	87.82	89.20	89.39	87.18	N/A	0.017	0.017	20.29
89.70	89.09	85.32	89.99	89.35	84.29	N/A	0.016	0.017	19.94
89.77	89.10	85.37	89.87	89.37	84.24	N/A	0.017	0.018	19.57
89.75	89.14	85.30	89.55	89.44	84.18	N/A	0.017	0.017	19.24
89.06	89.53	84.62	89.20	89.02	83.81	N/A	0.016	0.016	18.89
89.93	89.56	84.15	89.27	88.93	83.26	N/A	0.014	0.017	18.60
89.87	89.63	83.31	89.16	89.11	82.65	N/A	0.014	0.018	18.44
89.93	89.48	83.28	89.52	89.29	82.51	N/A	0.013	0.017	18.16
89.79	89.39	83.25	89.47	89.13	82.46	N/A	0.013	0.015	17.91
87.87	88.95	81.95	88.75	88.50	80.90	N/A	0.013	0.016	17.72
85.46	86.33	80.81	88.94	87.07	N/A	N/A	0.015	0.015	17.53

Date/heure	Time	O_2	CO	CO_2IR	CO
YYYY-MM-DD HH:MM:SS	min	%	ppm	%	%
2016-06-06 13:31:56	0	15.30	369	5.58	0.04
2016-06-06 13:41:56	10	15.22	590	5.51	0.06
2016-06-06 13:51:56	20	15.93	377	5.30	0.04
2016-06-06 14:01:56	30	14.89	334	5.43	0.03
2016-06-06 14:11:56	40	15.83	471	5.70	0.05
2016-06-06 14:21:56	50	14.96	418	5.96	0.04
2016-06-06 14:31:56	60	18.48	573	3.46	0.06
2016-06-06 14:41:56	70	18.29	522	2.67	0.05
2016-06-06 14:51:56	80	18.88	582	2.25	0.06
2016-06-06 15:01:56	90	19.06	632	2.32	0.06
2016-06-06 15:11:56	100	19.22	726	2.01	0.07
2016-06-06 15:21:56	110	18.11	599	1.97	0.06
2016-06-06 15:31:56	120	18.54	548	2.20	0.05
2016-06-06 15:41:56	130	18.84	713	2.22	0.07
2016-06-06 15:51:56	140	18.59	965	1.87	0.10
2016-06-06 16:01:56	150	18.60	1023	2.15	0.10
2016-06-06 16:11:56	160	19.19	992	1.85	0.10
2016-06-06 16:21:56	170	19.00	694	2.03	0.07
2016-06-06 16:31:56	180	19.85	667	1.63	0.07
2016-06-06 16:41:56	190	19.81	678	1.12	0.07
2016-06-06 16:51:56	200	19.22	663	1.23	0.07
2016-06-06 17:01:56	210	19.76	794	1.09	0.08
2016-06-06 17:11:56	220	19.71	739	1.07	0.07
2016-06-06 17:21:56	230	20.51	793	1.07	0.08


GUI_FOYER.vi
File
11
00:38:51
6,489 lbs
230,66 F°
Poids (Lbs)
Température (Fdeg)
13:57:01,681
2016-06-06
13:57:06,681
2016-06-06
Temps(s)
Flue 317,4
Fond 152,6
DGM #1 entrée 81,47
DGM #2 entrée 81,19
Tunnel dilution 117,7
Top 179,8
Côté Droit 522,6
DGM #1 sortie 81,11
DGM #2 sortie 81,61
Spare 1 4186
Dos 206,7
Côté Gauche 91,7
Probe #1 4186
Probe #2 4186
Spare 2 4186
Démarrage
Configuration Poêle
Procédure
Données Charge
Données Essai Départ
Données Essai en Cours
Données Essai Fin
Résultats
SYSTÈME #1
Probe 0 g
Filtre Avant 0 g
Filtre Arrière 0 g
Compteur de gaz 0 pi³
SYSTÈME #2
Probe 0 g
Filtre Avant 0 g
Filtre Arrière 0 g
Compteur de gaz 0 pi³
VÉLOCITÉ DU TUNNEL
Vélocité (H2O)
Temp Tunnel (F°)
Temps
A centre 0,0181319 110,804 00:32:09 RAFRAÎCHIR
B centre 0,0176046 113,882 00:35:04 RAFRAÎCHIR
Moyenne 0,0178683 112,343
a1 0,0163264 111,013 00:32:30 RAFRAÎCHIR
a2 0,0193692 112,411 00:32:45 RAFRAÎCHIR
a3 0,0173837 113,311 00:32:59 RAFRAÎCHIR
a4 0,0129359 112,153 00:33:13 RAFRAÎCHIR
b1 0,0160828 114,083 00:35:17 RAFRAÎCHIR
b2 0,0195903 115,414 00:35:33 RAFRAÎCHIR
b3 0,0155351 115,837 00:35:48 RAFRAÎCHIR
b4 0,0133557 114,079 00:36:03 RAFRAÎCHIR
Moyenne 0,0163224 113,538
Pression Statique (H2O) 0,036
Pression Barométrique (Hg) 29,4
Coefficient de tube pitot 0,84
Diamètre Tunnel Dilution (po) 8
RESET
Calcul Velocite
Vélocité (CFM) 126,117
Braise min (Lbs) 0
Braise max (Lbs) 0
EN
13:57
2016-06-06

Time	Ambiant	Flue	Firebox Top	Dilution Tunnel	Firebox Right	Firebox Back	Firebox Bottom	Firebox Left	DGM Outlet 1
min	°F	°F	°F	°F	°F	°F	°F	°F	°F
0	78.20	269.29	104.81	117.54	167.91	415.36	82.57	113.49	80.99
1	77.57	275.95	105.66	120.07	171.82	432.32	83.12	116.01	81.01
2	78.15	281.54	106.45	122.78	174.11	443.54	82.28	117.57	81.05
3	77.43	285.71	106.75	125.51	177.87	452.21	82.55	119.33	81.09
4	77.18	287.17	106.85	128.47	180.46	452.60	83.04	121.29	81.14
5	76.98	287.59	107.29	131.15	181.69	447.12	81.73	123.05	81.19
6	76.69	293.09	107.95	133.81	184.49	454.77	83.26	125.38	81.22
7	76.83	297.29	108.46	136.56	186.94	462.20	85.47	126.36	81.27
8	77.20	298.35	108.40	139.09	188.95	461.97	87.56	128.35	81.30
9	78.13	300.79	109.52	141.69	190.60	462.69	88.68	129.60	81.36
10	78.55	309.47	110.51	144.22	195.08	483.98	90.53	131.76	81.42
11	78.39	311.18	110.61	146.68	197.54	482.58	90.56	134.61	81.47
12	78.61	318.05	110.92	149.25	201.33	500.42	90.05	136.47	81.50
13	78.60	320.52	111.53	151.99	203.93	497.47	90.88	138.74	81.53
14	78.67	325.45	112.66	154.65	206.58	506.65	91.03	140.81	81.53
15	78.70	325.95	112.92	157.15	207.72	505.14	91.11	142.97	81.54
16	78.85	325.43	113.65	159.54	208.73	496.19	90.27	144.62	81.54
17	79.14	326.71	114.50	161.60	210.07	490.95	90.29	145.81	81.53
18	79.20	326.26	114.27	163.82	210.68	493.21	91.68	148.60	81.52
19	79.06	328.58	114.62	165.63	211.74	492.82	91.25	149.61	81.51
20	79.55	330.38	114.87	167.45	212.75	500.94	92.79	151.32	81.49
21	79.64	335.16	115.86	169.12	215.13	517.54	91.67	151.93	81.48
22	79.43	330.72	115.32	170.97	216.01	505.57	90.52	152.96	81.45
23	79.39	334.66	116.20	172.53	216.33	511.14	92.54	154.78	81.43
24	79.74	338.77	116.76	174.05	218.02	521.59	91.56	155.65	81.41
25	79.85	338.46	116.92	175.65	218.70	518.60	93.54	156.94	81.40
26	80.02	341.59	117.60	177.01	220.20	528.61	92.30	157.79	81.38
27	79.77	343.54	117.44	178.13	223.95	532.14	92.87	159.46	81.37
28	79.41	343.90	116.14	179.33	225.25	530.53	92.16	160.07	81.36
29	79.07	343.96	116.26	180.41	225.34	528.65	92.72	160.30	81.37
30	80.70	344.13	116.27	181.30	224.92	531.01	89.67	161.37	81.36
31	78.83	343.61	116.39	182.02	224.91	527.28	91.69	161.45	81.36

32	78.62	348.86	115.19	182.76	226.47	544.73	91.07	161.14	81.35
33	78.56	347.74	112.98	183.55	227.40	540.80	90.13	161.42	81.35
34	78.26	344.97	106.52	184.52	226.89	524.18	89.37	161.72	81.34
35	78.86	346.70	102.58	185.21	226.67	531.61	88.64	162.01	81.34
36	78.29	347.80	107.80	185.62	226.94	541.47	89.41	164.20	81.34
37	77.51	350.66	110.03	186.32	228.41	550.13	90.08	163.89	81.34
38	78.11	348.27	110.01	187.00	227.54	535.48	88.14	163.99	81.32
39	78.14	349.31	110.07	187.76	227.68	537.15	88.12	163.82	81.32
40	77.79	349.29	109.39	188.07	227.89	534.56	87.58	163.47	81.32
41	77.77	348.14	109.58	188.63	227.39	528.68	87.73	163.63	81.33
42	77.76	349.33	111.26	188.73	227.54	531.37	88.14	163.64	81.33
43	77.54	350.96	111.73	189.10	228.06	536.31	88.61	164.82	81.33
44	77.75	351.44	112.16	189.14	228.68	538.14	87.91	165.70	81.33
45	77.21	355.00	112.28	189.50	229.76	548.85	88.12	165.13	81.35
46	77.23	356.21	112.30	189.76	230.17	545.52	86.81	164.96	81.36
47	77.06	356.31	112.41	190.07	231.25	554.87	86.85	165.49	81.39
48	78.18	357.11	112.16	190.36	231.85	561.01	88.64	166.42	81.43
49	77.05	358.24	112.41	190.42	232.40	559.92	86.91	166.44	81.47
50	76.86	359.29	112.41	190.61	231.97	555.36	87.61	167.17	81.51
51	76.94	358.84	112.86	191.16	232.22	548.48	86.70	167.04	81.54
52	77.00	360.22	112.50	191.39	233.10	560.21	87.64	170.17	81.56
53	76.57	357.37	112.78	191.61	233.38	555.86	86.97	170.42	81.59
54	77.06	356.39	112.50	192.26	232.50	556.69	87.31	168.85	81.61
55	76.84	357.92	112.75	192.36	232.84	563.76	87.91	168.81	81.64
56	76.74	359.32	112.37	192.82	233.53	567.98	87.55	169.16	81.67
57	76.65	357.69	112.34	193.41	232.75	558.26	87.43	168.72	81.69
58	76.65	357.41	112.17	193.74	232.03	546.84	86.65	169.00	81.72
59	76.56	360.91	112.52	193.73	232.93	560.92	86.53	172.22	81.73

DGM Inlet 1	Probe 1	DGM Outlet 2	DGM Inlet 2	Probe 2	Draft	Dilution Tunnel	Scale
°F	°F	°F	°F	°F	"H_2O	"H_2O	lb
79.95	N/A	81.47	80.95	N/A	0.018	0.027	8.59
79.95	N/A	81.51	80.99	N/A	0.017	0.026	8.55
79.97	N/A	81.57	81.04	N/A	0.020	0.027	8.47
79.98	N/A	81.62	81.06	N/A	0.020	0.026	8.40
80.00	N/A	81.67	81.08	N/A	0.020	0.026	8.35
80.03	N/A	81.71	81.08	N/A	0.019	0.027	8.28
80.07	N/A	81.71	81.09	N/A	0.018	0.026	8.22
80.11	N/A	81.71	81.10	N/A	0.019	0.025	8.16
80.14	N/A	81.67	81.09	N/A	0.018	0.026	8.10
80.17	N/A	81.64	81.09	N/A	0.020	0.025	8.00
80.21	N/A	81.61	81.10	N/A	0.022	0.024	7.91
80.25	N/A	81.58	81.10	N/A	0.022	0.024	7.84
80.29	N/A	81.57	81.10	N/A	0.018	0.027	7.73
80.34	N/A	81.57	81.10	N/A	0.021	0.027	7.64
80.39	N/A	81.59	81.12	N/A	0.020	0.027	7.55
80.44	N/A	81.61	81.12	N/A	0.021	0.024	7.47
80.49	N/A	81.64	81.12	N/A	0.022	0.026	7.40
80.54	N/A	81.68	81.14	N/A	0.019	0.027	7.32
80.60	N/A	81.68	81.14	N/A	0.020	0.023	7.24
80.65	N/A	81.70	81.14	N/A	0.019	0.025	7.16
80.69	N/A	81.70	81.15	N/A	0.020	0.025	7.08
80.74	N/A	81.72	81.17	N/A	0.023	0.024	6.98
80.81	N/A	81.73	81.19	N/A	0.019	0.024	6.92
80.87	N/A	81.73	81.21	N/A	0.022	0.024	6.83
80.94	N/A	81.74	81.22	N/A	0.019	0.025	6.74
81.00	N/A	81.76	81.25	N/A	0.023	0.024	6.66
81.07	N/A	81.78	81.26	N/A	0.021	0.024	6.56
81.13	N/A	81.82	81.26	N/A	0.020	0.025	6.51
81.17	N/A	81.82	81.26	N/A	0.022	0.026	6.40
81.23	N/A	81.85	81.27	N/A	0.023	0.024	6.35
81.27	N/A	81.86	81.25	N/A	0.021	0.024	6.29
81.29	N/A	81.87	81.26	N/A	0.021	0.024	6.21

81.30	N/A	81.89	81.28	N/A	0.021	0.020	6.12
81.29	N/A	81.90	81.30	N/A	0.021	0.019	6.08
81.28	N/A	81.93	81.34	N/A	0.021	0.020	6.02
81.28	N/A	81.97	81.39	N/A	0.023	0.031	5.91
81.26	N/A	81.98	81.42	N/A	0.019	0.033	5.86
81.26	N/A	82.01	81.46	N/A	0.019	0.032	5.78
81.24	N/A	82.03	81.48	N/A	0.020	0.031	5.73
81.23	N/A	82.05	81.50	N/A	0.022	0.031	5.65
81.22	N/A	82.06	81.53	N/A	0.021	0.032	5.59
81.21	N/A	82.08	81.54	N/A	0.020	0.035	5.51
81.20	N/A	82.11	81.56	N/A	0.023	0.036	5.44
81.21	N/A	82.13	81.57	N/A	0.021	0.034	5.37
81.19	N/A	82.15	81.57	N/A	0.023	0.035	5.26
81.19	N/A	82.17	81.59	N/A	0.020	0.038	5.19
81.16	N/A	82.19	81.60	N/A	0.022	0.034	5.09
81.15	N/A	82.20	81.61	N/A	0.022	0.035	5.00
81.14	N/A	82.20	81.63	N/A	0.022	0.033	4.93
81.12	N/A	82.20	81.64	N/A	0.023	0.037	4.85
81.10	N/A	82.20	81.66	N/A	0.020	0.035	4.75
81.09	N/A	82.21	81.68	N/A	0.023	0.036	4.66
81.07	N/A	82.22	81.72	N/A	0.021	0.037	4.58
81.07	N/A	82.23	81.76	N/A	0.022	0.036	4.51
81.04	N/A	82.24	81.80	N/A	0.022	0.034	4.44
81.03	N/A	82.26	81.84	N/A	0.022	0.035	4.32
81.03	N/A	82.28	81.87	N/A	0.024	0.037	4.24
81.04	N/A	82.32	81.91	N/A	0.020	0.035	4.15
81.05	N/A	82.34	81.93	N/A	0.020	0.038	4.08
81.04	N/A	82.37	81.94	N/A	0.024	0.036	3.98

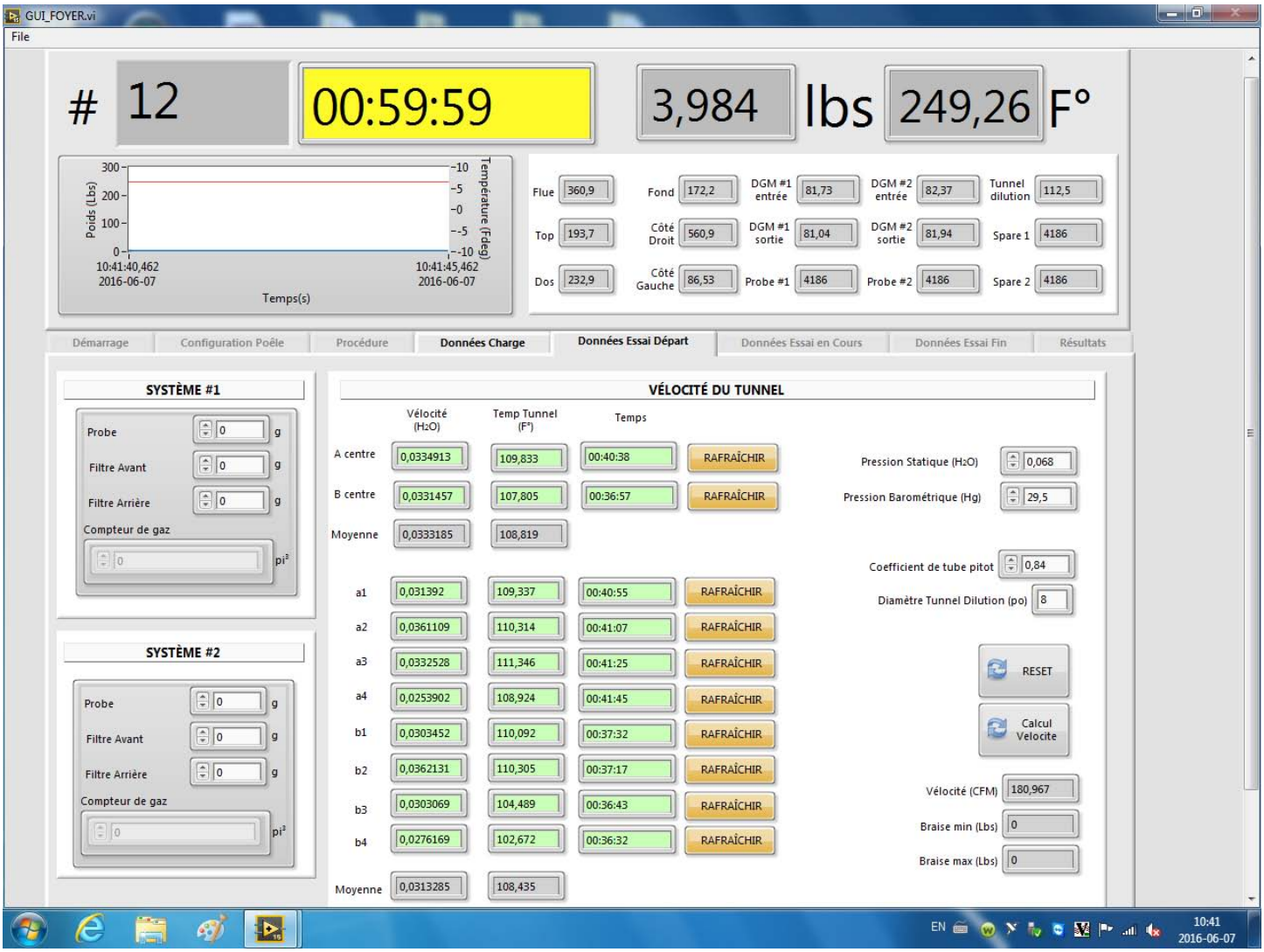
Time	Ambient	Flue	Dilution Tunnel	Firebox Top	Firebox Back	Firebox Right	Firebox Left	Firebox Bottom	DGM Inlet 1
min	°F	°F	°F	°F	°F	°F	°F	°F	°F
0	76.53	359.73	112.08	193.84	561.11	233.44	171.65	85.92	81.75
10	79.89	355.50	112.70	195.20	566.52	233.83	174.97	98.12	82.89
20	78.14	355.46	112.08	197.00	543.22	235.04	174.51	90.25	84.37
30	77.83	352.82	112.13	196.59	540.83	233.02	172.11	91.02	85.57
40	77.02	355.39	111.89	196.07	536.11	234.61	170.65	90.04	86.45
50	77.58	363.70	112.48	195.24	578.32	236.89	170.78	90.51	87.13
60	76.86	361.19	112.82	197.31	560.56	235.91	174.70	90.11	87.56
70	77.10	306.62	107.11	191.92	423.31	210.64	165.87	88.59	87.96
80	82.05	261.17	102.76	175.07	350.35	183.42	150.62	90.36	88.24
90	80.59	243.02	99.83	157.31	328.51	167.39	135.53	80.93	88.57
100	80.88	226.87	98.95	144.24	300.92	155.72	124.84	78.35	89.06
110	78.73	212.64	97.31	135.08	271.55	146.58	116.92	77.42	89.25
120	77.44	207.64	96.65	129.69	269.73	143.71	112.98	77.14	88.97
130	78.68	213.25	96.92	128.60	281.07	146.41	113.25	79.70	88.76
140	77.34	216.84	97.61	127.09	288.89	147.04	112.11	79.50	88.78
150	82.31	208.13	97.61	126.86	266.40	144.70	111.99	79.78	88.92
160	78.63	214.52	97.47	125.59	283.93	145.54	110.77	77.89	88.81
170	76.86	206.45	97.67	125.19	265.84	142.10	110.11	77.42	88.84
180	79.92	210.62	98.05	125.31	273.85	143.70	110.63	78.52	88.97
190	78.25	187.67	95.29	123.86	236.62	134.20	108.57	76.90	88.97
200	78.06	166.46	92.64	117.16	197.18	121.41	102.82	75.14	89.02
210	77.13	160.21	92.16	110.15	189.80	117.12	98.61	74.82	88.99
220	78.27	156.26	91.50	105.89	181.81	114.86	96.45	76.46	88.95
230	82.28	155.51	91.66	103.20	179.67	114.52	94.90	78.63	88.77
240	78.65	156.63	92.81	102.41	181.38	114.43	94.49	76.19	89.20
250	78.98	158.05	93.01	103.03	184.02	116.72	95.98	81.71	88.24
260	80.55	158.38	91.76	105.70	184.46	118.09	98.85	82.79	87.43
270	80.88	162.28	91.59	106.66	187.47	120.17	100.30	83.57	87.46
280	81.42	164.86	92.15	108.72	191.97	121.85	101.97	84.10	87.55
290	81.87	160.05	91.74	109.43	182.73	119.53	102.22	84.18	86.62
300	81.65	164.61	92.35	109.77	191.22	122.77	102.70	84.80	86.84
310	82.04	165.13	92.74	110.71	190.72	123.23	103.68	85.04	86.07

320	81.64	159.17	92.26	110.12	180.64	120.24	103.17	84.80	86.46
330	81.87	159.69	92.51	109.30	185.11	120.41	102.76	84.85	86.64
340	82.01	170.91	93.61	109.93	202.47	125.64	103.53	85.59	86.84
350	82.04	164.71	93.75	111.84	193.17	123.85	104.51	85.49	87.91
360	82.36	164.03	93.90	112.42	190.57	123.47	105.01	85.88	87.03

DGM Outlet 1	Probe 1	DGM Inlet 2	DGM Outlet 2	Probe 2	Probe 3	Draft	Tunnel	Scale	Scale zeroed
°F	°F	°F	°F	°F	°F	"H_2O	"H_2O	lb	lb
81.04	81.25	82.38	81.94	79.06	80.55	0.024	0.035	20.99	13.32
86.04	83.33	83.67	83.94	81.12	82.88	0.021	0.034	20.18	12.51
86.17	83.66	84.97	84.40	81.37	84.31	0.023	0.038	19.38	11.71
86.19	84.05	86.04	84.74	81.43	85.09	0.022	0.035	18.60	10.93
86.76	83.99	86.85	84.86	81.35	85.14	0.020	0.035	17.78	10.12
87.53	83.87	87.46	85.17	81.26	84.96	0.021	0.038	16.90	9.23
88.04	83.96	88.00	85.57	81.30	84.67	0.023	0.038	16.03	8.37
88.48	83.82	88.56	85.88	81.30	N/A	0.022	0.038	15.50	7.84
88.96	83.32	88.57	85.92	80.98	N/A	0.017	0.037	14.97	7.30
89.22	82.79	88.72	86.08	80.72	N/A	0.019	0.038	14.57	6.90
89.67	81.87	88.71	86.11	80.51	N/A	0.016	0.036	14.19	6.52
89.87	81.75	88.79	86.14	80.40	N/A	0.015	0.031	13.83	6.16
89.88	82.14	88.94	86.33	80.32	N/A	0.015	0.043	13.44	5.77
89.49	82.47	89.26	86.78	80.27	N/A	0.014	0.039	13.01	5.34
89.50	82.39	89.22	86.88	80.32	N/A	0.016	0.034	12.64	4.97
89.79	82.51	89.19	86.94	80.44	N/A	0.014	0.033	12.31	4.64
89.75	82.55	89.27	87.26	80.49	N/A	0.014	0.037	11.92	4.26
89.57	82.40	89.43	87.61	80.30	N/A	0.017	0.036	11.65	3.99
89.65	82.60	89.72	88.30	80.38	N/A	0.016	0.035	11.23	3.56
89.61	82.65	89.97	88.97	80.40	N/A	0.015	0.036	10.98	3.31
89.62	81.98	89.15	89.34	80.15	N/A	0.016	0.036	10.78	3.12
89.84	83.32	89.25	89.49	80.62	N/A	0.013	0.033	10.59	2.93
89.88	84.22	89.43	89.75	81.08	N/A	0.014	0.029	10.36	2.69
89.91	84.48	89.56	89.62	81.23	N/A	0.014	0.035	10.19	2.52
89.93	84.60	89.91	88.96	81.00	N/A	0.014	0.026	9.96	2.29
88.14	85.35	88.26	88.81	81.30	N/A	0.015	0.028	9.74	2.07
87.66	85.87	87.14	88.08	81.43	N/A	0.013	0.036	9.53	1.86
87.11	86.39	87.58	87.63	81.56	N/A	0.015	0.040	9.34	1.68
86.68	86.91	86.91	87.34	81.69	N/A	0.014	0.041	9.15	1.49
86.49	86.72	87.00	87.15	81.82	N/A	0.012	0.038	8.99	1.32
86.50	86.65	87.16	87.28	81.95	N/A	0.015	0.044	8.78	1.12
86.53	85.77	87.32	87.47	82.08	N/A	0.016	0.041	8.59	0.92

86.76	85.18	87.36	87.64	81.26	N/A	0.014	0.043	8.43	0.77
86.87	84.84	87.52	87.77	80.76	N/A	0.016	0.040	8.27	0.60
87.03	85.67	87.50	87.83	81.11	N/A	0.014	0.041	8.04	0.38
87.16	85.01	87.46	87.78	81.16	N/A	0.012	0.039	7.87	0.20
87.10	85.97	87.37	87.79	81.34	N/A	0.014	0.042	7.67	0.00

Date/time	Time	O_2	CO	CO_2IR	CO
YYYY-MM-DD HH:MM:SS	min	%	ppm	%	%
2016-06-07 09:55:36	0	15.37	559	5.90	0.06
2016-06-07 10:05:36	10	14.84	378	5.79	0.04
2016-06-07 10:15:36	20	14.96	454	5.81	0.05
2016-06-07 10:25:36	30	14.99	340	5.88	0.03
2016-06-07 10:35:36	40	14.31	453	6.20	0.05
2016-06-07 10:45:36	50	15.57	631	5.92	0.06
2016-06-07 10:55:36	60	17.26	604	3.72	0.06
2016-06-07 11:05:36	70	18.52	823	2.64	0.08
2016-06-07 11:15:36	80	18.99	867	2.47	0.09
2016-06-07 11:25:36	90	18.74	873	2.30	0.09
2016-06-07 11:35:36	100	18.54	940	1.89	0.09
2016-06-07 11:45:36	110	17.87	780	2.01	0.08
2016-06-07 11:55:36	120	19.00	882	2.15	0.09
2016-06-07 12:05:36	130	19.34	877	2.22	0.09
2016-06-07 12:15:36	140	18.91	919	2.02	0.09
2016-06-07 12:25:36	150	18.94	1013	2.12	0.10
2016-06-07 12:35:36	160	18.05	822	1.93	0.08
2016-06-07 12:45:36	170	18.86	947	1.94	0.09
2016-06-07 12:55:36	180	19.81	1015	1.65	0.10
2016-06-07 13:05:36	190	19.54	869	1.11	0.09
2016-06-07 13:15:36	200	20.19	667	1.09	0.07
2016-06-07 13:25:36	210	20.05	827	1.09	0.08
2016-06-07 13:35:36	220	19.64	879	1.04	0.09
2016-06-07 13:35:36	230	20.04	773	1.18	0.08
2016-06-07 13:45:36	240	19.97	932	1.19	0.09
2016-06-07 13:55:36	250	19.80	839	1.34	0.08
2016-06-07 14:05:36	260	19.96	946	0.91	0.09
2016-06-07 14:15:36	270	20.02	827	1.00	0.08
2016-06-07 14:25:36	280	19.80	1063	1.17	0.11
2016-06-07 14:35:36	290	20.00	837	1.15	0.08
2016-06-07 14:45:36	300	19.88	901	0.94	0.09
2016-06-07 14:55:36	310	20.01	767	0.99	0.08
2016-06-07 15:05:36	320	19.65	833	1.22	0.08
2016-06-07 15:15:36	330	19.99	767	1.23	0.08
2016-06-07 15:25:36	340	19.91	829	1.14	0.08
2016-06-07 15:35:36	350	19.83	1018	0.99	0.10
2016-06-07 15:45:36	360	19.85	789	1.31	0.08


GUI_FOYER.vi
File
12
00:59:59
3,984 lbs
249,26 F°
Poids (Lbs)
Température (Fdeg)
Temps(s)
10:41:40,462
2016-06-07
10:41:45,462
2016-06-07
Flue 360,9
Fond 172,2
DGM #1 entrée 81,73
DGM #2 entrée 82,37
Tunnel dilution 112,5
Top 193,7
Côté Droit 560,9
DGM #1 sortie 81,04
DGM #2 sortie 81,94
Spare 1 4186
Dos 232,9
Côté Gauche 86,53
Probe #1 4186
Probe #2 4186
Spare 2 4186
Démarrage
Configuration Poêle
Procédure
Données Charge
Données Essai Départ
Données Essai en Cours
Données Essai Fin
Résultats
SYSTÈME #1
Probe
Filtre Avant
Filtre Arrière
Compteur de gaz
SYSTÈME #2
Probe
Filtre Avant
Filtre Arrière
Compteur de gaz
VÉLOCITÉ DU TUNNEL
Vélocité (H2O)
Temp Tunnel (F°)
Temps
A centre 0,0334913 109,833 00:40:38 RAFRAÎCHIR
B centre 0,0331457 107,805 00:36:57 RAFRAÎCHIR
Moyenne 0,0333185 108,819
a1 0,031392 109,337 00:40:55 RAFRAÎCHIR
a2 0,0361109 110,314 00:41:07 RAFRAÎCHIR
a3 0,0332528 111,346 00:41:25 RAFRAÎCHIR
a4 0,0253902 108,924 00:41:45 RAFRAÎCHIR
b1 0,0303452 110,092 00:37:32 RAFRAÎCHIR
b2 0,0362131 110,305 00:37:17 RAFRAÎCHIR
b3 0,0303069 104,489 00:36:43 RAFRAÎCHIR
b4 0,0276169 102,672 00:36:32 RAFRAÎCHIR
Moyenne 0,0313285 108,435
Pression Statique (H2O) 0,068
Pression Barométrique (Hg) 29,5
Coefficient de tube pitot 0,84
Diamètre Tunnel Dilution (po) 8
RESET
Calcul Velocite
Vélocité (CFM) 180,967
Braise min (Lbs) 0
Braise max (Lbs) 0
EN
10:41
2016-06-07

ASTM E2779 Calculation Sheet

Manufacturer: SBI **Eng:** Claude Pelland

Model: Cambridge

Date: 2016-06-06

Run: 1 Dry kilograms: **4.78**

Control #: QC20160606

Test Duration: **230.0**

	Start	End
Barometer (in.Hg):	29.2	29.4
Dry Bulb (F):		
Humidity (%):	74	59

Pitot type: Type S

0.85

loisture content of wood (wet basis): 10.55

	Average	0.00	0.00	0.00	246.55	78.45	110.13		87.72	88.54	85.69		87.91	88.59	85.28	0.02	0.018	
	Elapsed	Weight	*	*	*	*1	*2	*3	*	*	*	*	*	*	*	*	*	*	*
Actual	Time	Remaining				Flue	Room	Tunnel	DGM 1	DGM 1	DGM 1	Filter 1	DGM 2	DGM 2	DGM 2	Filter 2	Tunnel		
Time	Minutes	Lbs.	CO	CO_2	O_2	Gas	Temp	Dry Bulb	Reading	Inlet T	Outlet T	Temp	Reading	Inlet T	Outlet T	Temp	Velocity	Draft	
0.0	10.55	0.00	0.00	0.00	340.47	77.47	121.89	828.575	81.34	81.73	81.33	998.538	81.98	81.59	79.56	0.017	0.023	
10.00	9.76	0.00	0.00	0.00	338.76	77.21	122.30	830.910	82.98	85.19	89.27	1000.650	83.25	84.95	89.31	0.017	0.022	
20.00	8.94	0.00	0.00	0.00	345.46	77.67	123.92	833.199	84.12	87.79	89.47	1002.737	83.99	87.55	88.95	0.020	0.022	
30.00	8.17	0.00	0.00	0.00	339.80	77.67	122.93	835.435	84.44	87.45	86.44	1004.762	85.16	87.29	88.89	0.019	0.022	
40.00	7.39	0.00	0.00	0.00	337.20	77.39	123.05	837.690	85.65	86.54	86.67	1006.825	86.41	87.47	88.95	0.016	0.023	
50.00	6.53	0.00	0.00	0.00	348.66	77.50	124.63	839.930	86.65	87.27	86.63	1008.869	87.48	88.43	88.94	0.018	0.022	
60.00	5.70	0.00	0.00	0.00	349.63	77.72	124.63	842.113	87.33	87.83	87.01	1010.888	88.12	88.00	88.04	0.020	0.019	
70.00	5.19	0.00	0.00	0.00	283.03	77.92	119.13	844.382	88.02	88.81	86.81	1012.955	88.72	88.76	86.84	0.018	0.021	
80.00	4.79	0.00	0.00	0.00	247.51	77.91	112.30	846.649	88.18	89.03	85.53	1015.018	88.16	89.17	85.31	0.018	0.019	
90.00	4.40	0.00	0.00	0.00	226.44	77.37	108.10	848.883	88.36	89.33	84.91	1017.062	88.75	89.50	84.54	0.020	0.018	
100.00	4.00	0.00	0.00	0.00	222.12	78.12	106.26	851.125	88.52	89.58	84.92	1019.113	89.06	89.72	83.92	0.019	0.018	
110.00	3.65	0.00	0.00	0.00	212.56	78.18	105.03	853.361	88.68	89.65	85.36	1021.162	89.10	89.82	84.05	0.021	0.014	
120.00	3.25	0.00	0.00	0.00	209.50	80.74	105.37	855.610	88.80	89.49	88.40	1023.194	89.14	89.98	86.42	0.017	0.015	
130.00	2.93	0.00	0.00	0.00	212.69	78.83	105.98	857.885	89.17	89.88	89.42	1025.219	89.15	89.95	87.45	0.020	0.016	
140.00	2.57	0.00	0.00	0.00	217.44	77.12	106.79	860.141	89.14	89.75	87.82	1027.230	89.39	89.20	87.18	0.017	0.017	
150.00	2.21	0.00	0.00	0.00	202.79	80.98	104.72	862.387	89.09	89.70	85.32	1029.238	89.35	89.99	84.29	0.017	0.016	
160.00	1.84	0.00	0.00	0.00	214.47	78.76	106.18	864.665	89.10	89.77	85.37	1031.309	89.37	89.87	84.24	0.018	0.017	
170.00	1.52	0.00	0.00	0.00	212.19	77.42	105.88	866.899	89.14	89.75	85.30	1033.375	89.44	89.55	84.18	0.017	0.017	
180.00	1.17	0.00	0.00	0.00	209.80	77.91	104.90	869.139	89.53	89.06	84.62	1035.430	89.02	89.20	83.81	0.016	0.016	
190.00	0.88	0.00	0.00	0.00	183.39	79.35	100.45	871.363	89.56	89.93	84.15	1037.482	88.93	89.27	83.26	0.017	0.014	
200.00	0.71	0.00	0.00	0.00	168.36	79.38	96.96	873.577	89.63	89.87	83.31	1039.522	89.11	89.16	82.65	0.018	0.014	
210.00	0.43	0.00	0.00	0.00	165.62	79.78	97.42	875.712	89.48	89.93	83.28	1041.615	89.29	89.52	82.51	0.017	0.013	
220.00	0.19	0.00	0.00	0.00	167.14	79.93	97.56	878.024	89.39	89.79	83.25	1043.682	89.13	89.47	82.46	0.015	0.013	
230.00	0.00	0.00	0.00	0.00	162.07	80.38	96.79	879.525	88.95	87.87	81.95	1045.435	88.50	88.75	80.90	0.016	0.013	

Sampling stopped. Proportionality could not be maintained.

									6" Tunnel	0.1963	ft^2						(ASTM E2515 Formula)				
			Manufacturer:		SBI				12" Tunnel	0.7854	ft^2										
			Model:		Cambridge							Tunnel area (ft2):		0.3491			Manufacturer:		SBI		
			Date:		6-6-16							Wood moisture (% wet):		4.75			Model:		Cambridge		
			Run:		1							Load Weight (lbs wet):		10.54726			Date:		6-6-16		
			Project #:		QC20160606							Burn Rate (Dry kg/hr):		1.189			Run:		1		
			Test Duration:		230																
			Total Gas Volume (DGM 1):		48.307							Final Temperature (DGM #1) Degrees Rankin:					548.129				
			Total Gas Volume (DGM 2):		44.322							Final Temperature (DGM #2) Degrees Rankin:					548.253				
			Average Barometric Pressure:		29.3							Final Tunnel Temperature Degrees Rankin:					570.132				
			Molecular Weight:		28.78							Final Tunnel Velocity (feet per second):					7.6999786				
			Pitot Correction:		0.963159							Standardized Tunnel Flow (dscfm):					143.287304				
			Calibration Factor (DGM #1):		1.0060																
			Calibration Factor (DGM #2):		1.0030																
				(1) VS:	0.016775										Average	Average					
				(2) VS:	0.018283				Filter	Filter					Inlet +	Inlet +					
									Face	Face	Delta-P	Tunnel			Outlet	Outlet	Average	Average	#1	#2	Average
															Temp.	Temp.	99.9	99.9	dDGM	dDGM	0.1
Elapsed	DGM 1	DGM 1	DGM 1	DGM 2	DGM 2	DGM 2	Tunnel		Velocity	Velocity	(in. H2O)	Velocity			Meter 1	Meter 2	Proportional Rates		Vol.Std.	Vol.Std.	SQRT
Time	Reading	Inlet T	Outlet T	Reading	Inlet T	Outlet T	Dry Bulb		DGM 1	DGM 2	Tunnel	Ft/Sec			Deg. R	Deg. R	PR1	PR2	(ft3)	(ft3)	Time	Delta-P
0.00	828.58	81.34	81.73	998.54	81.9761863	81.58987	121.8904				0.017	7.66480			541.5	541.8					0	0.13183989
10.00	830.91	82.98	85.19	1000.65	83.24645223	84.95225	122.2973		12.00	10.82	0.017	7.64772			544.1	544.1	109.97	108.10	2.231	2.012	10	0.13150003
20.00	833.20	84.12	87.79	1002.74	83.98584988	87.54637	123.9222		11.72	10.66	0.020	8.18855			546.0	545.8	100.27	99.44	2.180	1.982	20	0.14060343
30.00	835.44	84.44	87.45	1004.76	85.1575604	87.29003	122.9306		11.45	10.33	0.019	8.06724			545.9	546.2	99.26	97.60	2.130	1.922	30	0.13863818
40.00	837.69	85.65	86.54	1006.83	86.40525721	87.46559	123.0533		11.54	10.51	0.016	7.43162			546.1	546.9	108.62	107.68	2.147	1.955	40	0.12770135
50.00	839.93	86.65	87.27	1008.87	87.48396284	88.42679	124.632		11.45	10.40	0.018	7.81931			547.0	548.0	102.50	101.30	2.129	1.934	50	0.13418174
60.00	842.11	87.33	87.83	1010.89	88.11700773	88.00333	124.6303		11.14	10.27	0.020	8.32532			547.6	548.1	93.61	93.94	2.073	1.910	60	0.14286525
70.00	844.38	88.02	88.81	1012.96	88.71784387	88.76214	119.1341		11.57	10.50	0.018	7.72904			548.4	548.7	103.51	102.36	2.151	1.953	70	0.13326073
80.00	846.65	88.18	89.03	1015.02	88.15561416	89.17099	112.2998		11.55	10.48	0.018	7.64950			548.6	548.7	103.18	102.04	2.149	1.949	80	0.1326745
90.00	848.88	88.36	89.33	1017.06	88.74845646	89.50387	108.0978		11.38	10.37	0.020	8.12818			548.8	549.1	94.91	94.29	2.116	1.930	90	0.14149737
100.00	851.13	88.52	89.58	1019.11	89.06280499	89.72484	106.2604		11.41	10.40	0.019	7.97568			549.1	549.4	96.68	96.01	2.123	1.935	100	0.13906764
110.00	853.36	88.68	89.65	1021.16	89.09591173	89.8234	105.0277		11.38	10.39	0.021	8.36789			549.2	549.5	91.67	91.20	2.117	1.933	110	0.14606538
120.00	855.61	88.80	89.49	1023.19	89.13544419	89.98063	105.3691		11.45	10.31	0.017	7.52983			549.1	549.6	102.53	100.54	2.129	1.917	120	0.1313971
130.00	857.89	89.17	89.88	1025.22	89.14592475	89.95093	105.9832		11.57	10.27	0.020	8.17101			549.5	549.5	95.55	92.43	2.153	1.910	130	0.14250833
140.00	860.14	89.14	89.75	1027.23	89.3879556	89.19816	106.7868		11.48	10.20	0.017	7.49577			549.4	549.3	103.46	100.30	2.135	1.898	140	0.13063901
150.00	862.39	89.09	89.70	1029.24	89.34589288	89.9906	104.7161		11.43	10.18	0.017	7.37482			549.4	549.7	104.33	101.28	2.126	1.894	150	0.12876653
160.00	864.67	89.10	89.77	1031.31	89.37137326	89.87389	106.1769		11.59	10.50	0.018	7.76294			549.4	549.6	100.77	99.51	2.156	1.953	160	0.13536817
170.00	866.90	89.14	89.75	1033.38	89.44303402	89.5495	105.8762		11.37	10.48	0.017	7.41196			549.4	549.5	103.45	103.96	2.114	1.949	170	0.12928216
180.00	869.14	89.53	89.06	1035.43	89.02048127	89.19845	104.9034		11.40	10.43	0.016	7.34374			549.3	549.1	104.56	104.34	2.120	1.940	180	0.1282025
190.00	871.36	89.56	89.93	1037.48	88.92607206	89.27084	100.4526		11.31	10.42	0.017	7.42967			549.7	549.1	101.64	102.17	2.103	1.937	190	0.13021659
200.00	873.58	89.63	89.87	1039.52	89.10670673	89.16333	96.95655		11.26	10.35	0.018	7.64905			549.8	549.1	97.67	98.03	2.094	1.926	200	0.13448173
210.00	875.71	89.48	89.93	1041.62	89.29225543	89.51776	97.41587		10.86	10.62	0.017	7.47066			549.7	549.4	96.53	102.96	2.019	1.975	210	0.13129127
220.00	878.02	89.39	89.79	1043.68	89.13434232	89.47249	97.55783		11.76	10.49	0.015	6.93283			549.6	549.3	112.71	109.64	2.187	1.951	220	0.12182368
230.00	879.53	88.95	87.87	1045.44	88.49612365	88.74554	96.79009		7.65	8.91	0.016	7.23237			548.4	548.6	70.35	89.23	1.423	1.656	230	0.12717487

VERSION: 2.4 2010-04-15

Manufacturer: SBI
Model: Cambridge
Date: 2016-06-07
Run: 2
Control #: QC20160606
Test Duration: 360
Output Category: Integrated

Appliance Type: Pellet (Cat, Non-Cat, Pellet)

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

Wood Moisture (% wet): 4.50
Load Weight (lb wet): 13.32
Burn Rate (dry kg/h): 0.96
Total Particulate Emissions: 17.33 g

Fuel Data
Energex P.
HHV 20 119 kJ/kg
%C 48.73
%H 6.87
%O 43.785
%Ash 0.615

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

Note 1: For other fuels, use the heating value and fuel composition determined by analysis of fuel sample in accordance with Clause 9.2.

Note 2: In cases where the "Fuel Weight Remaining" is the same for three or more readings in a row, a "divide by zero error" will occur in the calculation sheet. In such cases, adjust the weight values by interpolation between the first occurence and the next reading showing a decrease in weight.

	Averages	0.08	2.29	18.68	220.71	79.58
					Temp. (ºF)	
Elapsed Time (min)	Fuel Weight Remaining (lb)	Flue Gas Composition (%) CO	CO_2	O_2	Flue Gas	Room Temp
0	13.32	0.06	5.90	15.37	359.7	76.5
10	12.51	0.04	5.79	14.84	355.5	79.9
20	11.71	0.05	5.81	14.96	355.5	78.1
30	10.93	0.03	5.88	14.99	352.8	77.8
40	10.12	0.05	6.20	14.31	355.4	77.0
50	9.23	0.06	5.92	15.57	363.7	77.6
60	8.37	0.06	3.72	17.26	361.2	76.9
70	7.84	0.08	2.64	18.52	306.6	77.1
80	7.30	0.09	2.47	18.99	261.2	82.0
90	6.90	0.09	2.30	18.74	243.0	80.6
100	6.52	0.09	1.89	18.54	226.9	80.9
110	6.16	0.08	2.01	17.87	212.6	78.7
120	5.77	0.09	2.15	19.00	207.6	77.4
130	5.34	0.09	2.22	19.34	213.3	78.7
140	4.97	0.09	2.02	18.91	216.8	77.3
150	4.64	0.10	2.12	18.94	208.1	82.3
160	4.26	0.08	1.93	18.05	214.5	78.6
170	3.99	0.09	1.94	18.86	206.4	76.9
180	3.56	0.10	1.65	19.81	210.6	79.9
190	3.31	0.09	1.11	19.54	187.7	78.3
200	3.12	0.07	1.09	20.19	166.5	78.1
210	2.93	0.08	1.09	20.05	160.2	77.1
220	2.69	0.09	1.04	19.64	156.3	78.3
230	2.52	0.08	1.18	20.04	155.5	82.3
240	2.29	0.09	1.19	19.97	156.6	78.7

250	2.07	0.08	1.34	19.80	158.1	79.0
260	1.86	0.09	0.91	19.96	158.4	80.5
270	1.68	0.08	1.00	20.02	162.3	80.9
280	1.49	0.11	1.17	19.80	164.9	81.4
290	1.32	0.08	1.15	20.00	160.1	81.9
300	1.12	0.09	0.94	19.88	164.6	81.7
310	0.92	0.08	0.99	20.01	165.1	82.0
320	0.77	0.08	1.22	19.65	159.2	81.6
330	0.60	0.08	1.23	19.99	159.7	81.9
340	0.38	0.08	1.14	19.91	170.9	82.0
350	0.20	0.10	0.99	19.83	164.7	82.0
360	0.00	0.08	1.31	19.85	164.0	82.4

Manufacturer: SBI
Model: Cambridge
Date: 06-07-16
Run: 2
Control #: QC20160606
Test Duration: 360 min

	HHV	LHV
Eff	69.65%	75.18%
Comb Eff	99.35%	99.35%
HT Eff	70.10%	75.67%
Output	13 481	kJ/h
Burn Rate	0.96	kg/h
Grams CO	247	g
Input	19 356	kJ/h
MC wet	4.50	

Note: In the "Input data", "Calc. % O_2", "Fuel Properties", and "Mass Balance" columns, [e], [d], [g], [a]. [b], [c], [h], [u], [w], [j], and [k] refer to their respective variables in Clauses 13.7.3 to 13.7.5.

Ultimate CO_2
$CO_{2\text{-ult}}$ 19.63
F_0
1.050

Overall Heating Efficiency:	69.65%	Air Fuel Ratio (A/F)	
Combustion Efficiency:	99.35%	Dry Molecular Weight (M_d)	29.10
Heat Transfer Efficiency:	70.10%	Dry Moles Exhaust Gas (N_t):	1341.68
		Air Fuel Ratio (A/F)	38.54

%HC 0.8

Heat Output: 12 788 Btu/h 13 481 kJ/h
Heat Input: 18 361 Btu/h 19 356 kJ/h

Burn Duration: 6.00 h

Burn Rate: 2.12 lb/h 0.962 kg/h

Stack Temp: 216.8 Deg. F 102.7 Deg. C

Combustior
Tota
Total
T

Averages	0.08	2.29	10.63	20.78	18.45	104.84	26.43	99.1%	69.2%	68.6%	70.84	2.12	64.96	2.02	64.96	117018	4.06	6.87	2.74
INPUT DATA			Oxygen Calculation			Input Data		Combust	Heat	Net	Air	Wet Wt	% Wet	Dry Wt.	% Dry		Fuel Properties		
Elapsed	Weight	%	%	Excess	Total	Calc. %	Flue	Room	Eff	Transfer	Eff	Fuel	Now	Consumed	Now	Comsumed	Total	Carbon	Hydrogen	Oxygen
Time	Remaining (kg)	CO [e]	CO_2 [d]	Air EA	O_2	O_2 [g]	Gas (°C)	Temp (°C)	%	%	%	Ratio	Wt	x	Wt_{dn}	y	Input	/12= [a]	/1= [b]	/16= [c]
0	6.04	0.06	5.90	229.6%	20.54	14.61	182.1	24.7	99.9%	74.8%	74.7%	19.9	6.04	0.00	5.77	0.00	0	4.06	6.87	2.74
10	5.68	0.04	5.79	236.8%	20.55	14.74	179.7	26.6	100.2%	74.9%	75.1%	20.4	5.68	6.07	5.42	6.07	10539	4.06	6.87	2.74
20	5.31	0.05	5.81	235.2%	20.55	14.72	179.7	25.6	100.1%	74.9%	74.9%	20.3	5.31	12.08	5.08	12.08	6885	4.06	6.87	2.74
30	4.96	0.03	5.88	231.9%	20.55	14.65	178.2	25.5	100.2%	75.2%	75.4%	20.1	4.96	17.93	4.74	17.93	6962	4.06	6.87	2.74
40	4.59	0.05	6.20	214.3%	20.52	14.30	179.7	25.0	100.1%	75.8%	75.8%	19.0	4.59	24.07	4.38	24.07	7410	4.06	6.87	2.74
50	4.19	0.06	5.92	228.1%	20.54	14.59	184.3	25.3	99.8%	74.6%	74.5%	19.8	4.19	30.69	4.00	30.69	7624	4.06	6.87	2.74
60	3.80	0.06	3.72	419.3%	20.69	16.94	182.9	24.9	100.0%	65.5%	65.5%	31.4	3.80	37.20	3.63	37.20	6090	4.06	6.87	2.74
70	3.56	0.08	2.64	621.1%	20.76	18.08	152.6	25.1	99.4%	62.6%	62.2%	43.6	3.56	41.18	3.40	41.18	4661	4.06	6.87	2.74
80	3.31	0.09	2.47	667.8%	20.77	18.26	127.3	27.8	99.2%	67.6%	67.0%	46.5	3.31	45.22	3.16	45.22	4068	4.06	6.87	2.74
90	3.13	0.09	2.30	722.3%	20.78	18.44	117.2	27.0	99.2%	68.3%	67.7%	49.8	3.13	48.18	2.99	48.18	3379	4.06	6.87	2.74
100	2.96	0.09	1.89	889.4%	20.81	18.87	108.3	27.2	98.8%	66.4%	65.6%	60.0	2.96	51.04	2.83	51.04	3252	4.06	6.87	2.74
110	2.79	0.08	2.01	840.1%	20.80	18.75	100.4	26.0	99.5%	69.8%	69.4%	57.0	2.79	53.78	2.67	53.78	3271	4.06	6.87	2.74
120	2.62	0.09	2.15	777.1%	20.79	18.60	97.6	25.2	99.1%	71.8%	71.1%	53.1	2.62	56.67	2.50	56.67	3542	4.06	6.87	2.74
130	2.42	0.09	2.22	750.6%	20.79	18.52	100.7	25.9	99.1%	71.7%	71.1%	51.5	2.42	59.88	2.32	59.88	3499	4.06	6.87	2.74
140	2.25	0.09	2.02	829.5%	20.80	18.73	102.7	25.2	98.9%	69.0%	68.3%	56.3	2.25	62.70	2.15	62.70	3080	4.06	6.87	2.74
150	2.10	0.10	2.12	783.7%	20.79	18.62	97.9	28.0	98.6%	72.2%	71.2%	53.5	2.10	65.19	2.01	65.19	3105	4.06	6.87	2.74
160	1.93	0.08	1.93	875.6%	20.81	18.83	101.4	25.9	99.3%	68.6%	68.1%	59.2	1.93	68.05	1.84	68.05	2841	4.06	6.87	2.74
170	1.81	0.09	1.94	864.8%	20.80	18.82	96.9	24.9	98.8%	69.8%	69.0%	58.5	1.81	70.08	1.73	70.08	3036	4.06	6.87	2.74
180	1.62	0.10	1.65	1020.8%	20.82	19.12	99.2	26.6	98.3%	65.9%	64.8%	68.0	1.62	73.28	1.54	73.28	2940	4.06	6.87	2.74
190	1.50	0.09	1.11	1540.1%	20.86	19.71	86.5	25.7	98.7%	60.3%	59.5%	100.1	1.50	75.14	1.44	75.14	1938	4.06	6.87	2.74
200	1.41	0.07	1.09	1597.1%	20.86	19.74	74.7	25.6	100.1%	65.8%	65.9%	103.9	1.41	76.61	1.35	76.61	1681	4.06	6.87	2.74
210	1.33	0.08	1.09	1573.9%	20.86	19.73	71.2	25.1	99.0%	67.4%	66.7%	102.3	1.33	78.04	1.27	78.04	1866	4.06	6.87	2.74
220	1.22	0.09	1.04	1640.4%	20.86	19.78	69.0	25.7	98.5%	67.9%	66.9%	106.3	1.22	79.83	1.16	79.83	1777	4.06	6.87	2.74
230	1.14	0.08	1.18	1461.3%	20.86	19.64	68.6	27.9	99.4%	71.8%	71.4%	95.3	1.14	81.10	1.09	81.10	1722	4.06	6.87	2.74
240	1.04	0.09	1.19	1429.8%	20.85	19.62	69.2	25.9	98.3%	70.7%	69.6%	93.2	1.04	82.79	0.99	82.79	1936	4.06	6.87	2.74
250	0.94	0.08	1.34	1278.6%	20.84	19.46	70.0	26.1	99.0%	72.7%	72.0%	84.0	0.94	84.43	0.90	84.43	1869	4.06	6.87	2.74
260	0.85	0.09	0.91	1854.0%	20.87	19.92	70.2	27.0	97.8%	64.7%	63.3%	119.5	0.85	86.01	0.81	86.01	1736	4.06	6.87	2.74
270	0.76	0.08	1.00	1713.1%	20.87	19.83	72.4	27.2	98.9%	65.9%	65.1%	110.9	0.76	87.42	0.73	87.42	1647	4.06	6.87	2.74
280	0.67	0.11	1.17	1438.1%	20.85	19.63	73.8	27.5	97.5%	68.9%	67.2%	93.6	0.67	88.85	0.64	88.85	1547	4.06	6.87	2.74
290	0.60	0.08	1.15	1491.2%	20.86	19.67	71.1	27.7	98.9%	70.0%	69.2%	97.1	0.60	90.08	0.57	90.08	1612	4.06	6.87	2.74
300	0.51	0.09	0.94	1805.7%	20.87	19.89	73.7	27.6	98.3%	63.8%	62.7%	116.6	0.51	91.63	0.48	91.63	1742	4.06	6.87	2.74
310	0.42	0.08	0.99	1740.3%	20.87	19.84	74.0	27.8	99.4%	65.1%	64.6%	112.7	0.42	93.08	0.40	93.08	1520	4.06	6.87	2.74
320	0.35	0.08	1.22	1406.2%	20.85	19.59	70.6	27.6	99.0%	71.3%	70.6%	91.9	0.35	94.24	0.33	94.24	1409	4.06	6.87	2.74
330	0.27	0.08	1.23	1402.3%	20.85	19.58	70.9	27.7	99.4%	71.4%	71.0%	91.7	0.27	95.51	0.26	95.51	1703	4.06	6.87	2.74
340	0.17	0.08	1.14	1505.2%	20.86	19.68	77.2	27.8	99.0%	66.8%	66.1%	98.0	0.17	97.18	0.16	97.18	1725	4.06	6.87	2.74
350	0.09	0.10	0.99	1698.0%	20.87	19.83	73.7	27.8	97.4%	65.3%	63.6%	109.7	0.09	98.48	0.09	98.48	2522	4.06	6.87	2.74
360	0.00	0.08	1.31	1313.4%	20.85	19.50	73.3	28.0	99.3%	71.6%	71.1%	86.2	0.00	100.00	0.00	100.00	882	4.06	6.87	2.74

Moisture Content M_{Cwb}: 4.5

ı Efficiency:	99.35%		Moisture of Wood (wet basis):	4.5	Dry kg : 5.77
ał Input (kJ):	116 136	110 149 (Btu)	Initial Dry Weight Wt_{do} (kg):	5.77	CA: 48.73
Output (kJ):	80 887	76 717 (Btu)	Moisture Content Dry	4.71	HY: 6.87
Efficiency:	69.65%				OX: 43.785
otal CO (g):	247.08				

Load Weight (kg):	**6.04**			
Fuel Heating	**HHV**	**LHV**		**HHV**	**LHV**
Value in kJ/kg - CV:	**20 119**	**18 638**	Btu/lb	**8655.4**	**8018.1**

20119.00	4.50	79.18	21.00	0.58	2.02	-0.02	0.06	39.24	470.74	2.08	-0.46	1941.50	35.47	2.62	377.99	3110.92	2346.53	2283.15	2257.56	2983.04	2732.57	299.58	4565.40
	Mw	Mass Balance (moles/100 mole dry flue gas)					kg Wood per 100 mole dfp	Moles per kg of Dry Wood						Moisture	Stack Temp	Heat Content Change - Ambient to Stack Temperature Flue Gas Constituent						Room Temp	
Calorific Value	Moisture Fuel Burnt	[h]	[u]	[w]	[j]	[k]	Nk	CO_2	O_2	CO	HC	N_2	H_2O	Present	K	CO_2	O_2	CO	N_2	CH_4	H_2O	K	CO_2
20119.00	4.50	79.43	21.07	1.46	5.06	-0.02	0.15	40.58	100.52	0.38	-0.11	546.33	34.77	2.62	455.22	6365.65	4746.85	4605.21	4556.42	6223.74	5507.45	297.89	258.32
20119.00	4.50	79.43	21.07	1.43	4.95	-0.02	0.14	40.72	103.68	0.27	-0.13	558.64	34.82	2.62	452.87	6193.98	4619.30	4481.58	4434.08	6054.86	5359.64	299.75	252.23
20119.00	4.50	79.43	21.07	1.44	4.97	-0.02	0.14	40.66	102.99	0.32	-0.12	555.88	34.80	2.62	452.85	6230.37	4647.40	4509.08	4461.24	6088.33	5392.61	298.78	253.34
20119.00	4.50	79.44	21.07	1.45	5.02	-0.02	0.14	40.75	101.52	0.24	-0.13	550.57	34.82	2.62	451.39	6174.46	4607.29	4470.55	4423.04	6030.23	5346.65	298.61	251.63
20119.00	4.50	79.45	21.08	1.53	5.30	-0.02	0.15	40.67	93.81	0.30	-0.11	521.20	34.78	2.62	452.81	6252.36	4664.46	4525.79	4477.74	6108.41	5412.64	298.16	254.28
20119.00	4.50	79.43	21.07	1.47	5.08	-0.01	0.15	40.53	99.87	0.43	-0.10	543.72	34.76	2.62	457.43	6437.69	4797.77	4653.91	4604.76	6300.31	5565.48	298.47	260.89
20119.00	4.50	79.28	21.03	0.93	3.22	-0.02	0.09	40.40	183.96	0.66	-0.20	861.11	34.96	2.62	456.03	6393.37	4766.53	4624.05	4575.12	6253.00	5529.91	298.07	258.32
20119.00	4.50	79.20	21.01	0.67	2.32	-0.02	0.07	39.87	273.04	1.24	-0.26	1196.25	35.08	2.62	425.72	5105.23	3830.45	3721.98	3681.33	4939.96	4453.04	298.20	203.57
20119.00	4.50	79.19	21.00	0.63	2.18	-0.02	0.06	39.73	293.68	1.39	-0.27	1273.87	35.10	2.62	400.47	3951.69	2979.24	2898.39	2865.99	3792.49	3468.81	300.95	157.02
20119.00	4.50	79.18	21.00	0.58	2.04	-0.02	0.06	39.65	317.81	1.50	-0.29	1364.82	35.15	2.62	390.39	3569.32	2697.28	2625.64	2595.97	3411.68	3142.87	300.14	141.51
20119.00	4.50	79.15	20.99	0.48	1.70	-0.02	0.05	39.25	391.93	1.95	-0.35	1643.78	35.26	2.62	381.41	3197.57	2420.98	2357.80	2330.92	3046.24	2822.62	300.30	125.52
20119.00	4.50	79.16	21.00	0.51	1.79	-0.02	0.05	39.69	370.28	1.54	-0.37	1563.16	35.31	2.62	373.51	2923.18	2217.61	2160.81	2135.95	2775.23	2587.14	299.11	116.02
20119.00	4.50	79.17	21.00	0.55	1.91	-0.02	0.05	39.55	342.10	1.62	-0.31	1456.32	35.19	2.62	370.73	2838.50	2155.02	2100.22	2075.97	2691.24	2514.72	298.39	112.27
20119.00	4.50	79.17	21.00	0.56	1.97	-0.02	0.06	39.60	330.39	1.56	-0.30	1412.19	35.17	2.62	373.85	2938.02	2228.72	2171.60	2146.62	2789.65	2600.04	299.08	116.34
20119.00	4.50	79.15	21.00	0.52	1.81	-0.02	0.05	39.39	365.34	1.79	-0.33	1543.69	35.22	2.62	375.84	3046.96	2310.73	2251.35	2225.49	2894.47	2695.48	298.34	120.03
20119.00	4.50	79.16	21.00	0.54	1.90	-0.02	0.05	39.27	344.89	1.88	-0.28	1466.10	35.13	2.62	371.00	2746.12	2083.52	2030.21	2006.84	2606.62	2430.79	301.10	107.83
20119.00	4.50	79.15	21.00	0.49	1.72	-0.02	0.05	39.55	385.97	1.68	-0.38	1622.06	35.31	2.62	374.55	2967.42	2250.68	2192.92	2167.71	2818.29	2625.54	299.06	117.36
20119.00	4.50	79.15	20.99	0.50	1.74	-0.02	0.05	39.28	380.96	1.92	-0.33	1602.39	35.23	2.62	370.06	2824.05	2144.50	2090.09	2065.93	2676.53	2502.63	298.07	110.92
20119.00	4.50	79.13	20.99	0.43	1.50	-0.02	0.04	38.85	450.20	2.39	-0.38	1862.88	35.32	2.62	372.38	2852.65	2164.33	2108.95	2084.67	2707.79	2525.06	299.77	110.82
20119.00	4.50	79.10	20.98	0.29	1.03	-0.02	0.03	38.51	683.63	3.01	-0.66	2743.87	35.88	2.62	359.63	2375.99	1808.09	1763.14	1742.57	2243.51	2111.44	298.85	91.49
20119.00	4.50	79.10	20.98	0.28	1.00	-0.02	0.03	39.25	710.84	2.40	-0.79	2848.61	36.15	2.62	347.85	1911.11	1458.14	1422.82	1406.02	1796.19	1704.18	298.74	75.02
20119.00	4.50	79.10	20.98	0.28	1.01	-0.02	0.03	38.63	699.20	2.93	-0.70	2803.03	35.96	2.62	344.38	1793.51	1369.62	1336.73	1320.89	1683.02	1601.17	298.22	69.28
20119.00	4.50	79.09	20.98	0.27	0.98	-0.02	0.03	38.32	728.88	3.24	-0.70	2914.36	35.96	2.62	342.18	1682.71	1285.45	1254.70	1239.80	1578.07	1502.94	298.85	64.48
20119.00	4.50	79.11	20.98	0.30	1.09	-0.02	0.03	38.98	648.67	2.55	-0.67	2613.04	35.91	2.62	341.77	1581.17	1207.39	1178.39	1164.43	1483.90	1411.49	301.08	61.63
20119.00	4.50	79.10	20.98	0.31	1.11	-0.02	0.03	38.43	633.55	3.01	-0.58	2554.49	35.72	2.62	342.39	1682.54	1285.20	1254.42	1239.54	1578.17	1502.59	299.07	64.66
20119.00	4.50	79.11	20.98	0.35	1.23	-0.02	0.03	38.97	566.10	2.44	-0.56	2301.06	35.67	2.62	343.18	1706.87	1303.50	1272.22	1257.14	1601.61	1523.89	299.25	66.53
20119.00	4.50	79.08	20.98	0.24	0.87	-0.02	0.02	37.70	825.02	3.92	-0.76	3275.95	36.08	2.62	343.36	1680.82	1283.31	1252.44	1237.61	1577.82	1500.18	300.12	63.36
20119.00	4.50	79.09	20.98	0.26	0.94	-0.02	0.03	38.44	762.20	3.18	-0.76	3040.56	36.09	2.62	345.53	1759.27	1342.51	1310.04	1294.57	1653.00	1569.12	300.31	67.63
20119.00	4.50	79.09	20.98	0.31	1.10	-0.02	0.03	37.94	636.52	3.45	-0.52	2564.42	35.61	2.62	346.96	1804.53	1376.52	1343.10	1327.26	1696.68	1608.68	300.61	68.46
20119.00	4.50	79.10	20.98	0.30	1.07	-0.02	0.03	38.70	661.76	2.82	-0.65	2661.75	35.87	2.62	344.29	1689.32	1289.33	1258.20	1243.32	1586.84	1507.04	300.86	65.37
20119.00	4.50	79.08	20.98	0.25	0.89	-0.02	0.02	37.98	803.53	3.64	-0.76	3195.47	36.09	2.62	346.82	1794.06	1368.53	1335.31	1319.56	1686.82	1599.35	300.74	68.14
20119.00	4.50	79.09	20.98	0.26	0.93	-0.02	0.03	38.67	775.07	3.00	-0.81	3089.76	36.18	2.62	347.11	1797.37	1370.91	1337.59	1321.82	1690.27	1602.07	300.95	69.51
20119.00	4.50	79.11	20.98	0.32	1.12	-0.02	0.03	38.83	623.49	2.65	-0.62	2517.49	35.80	2.62	343.80	1674.85	1278.45	1247.63	1232.87	1572.86	1494.39	300.73	65.03
20119.00	4.50	79.11	20.98	0.32	1.13	-0.02	0.03	39.07	622.08	2.44	-0.65	2512.81	35.86	2.62	344.09	1681.46	1283.38	1252.41	1237.60	1579.33	1500.11	300.85	65.69
20119.00	4.50	79.10	20.98	0.30	1.06	-0.02	0.03	38.71	668.15	2.81	-0.67	2685.93	35.89	2.62	350.32	1925.32	1467.47	1431.55	1414.73	1812.86	1714.53	300.93	74.53
20119.00	4.50	79.08	20.98	0.26	0.94	-0.02	0.03	37.64	753.77	3.87	-0.65	3006.59	35.86	2.62	346.88	1788.14	1363.93	1330.81	1315.11	1681.43	1593.95	300.95	67.30
20119.00	4.50	79.11	20.98	0.34	1.20	-0.02	0.03	39.10	581.93	2.35	-0.59	2361.22	35.75	2.62	346.50	1766.41	1347.42	1314.71	1299.20	1660.87	1574.67	301.13	69.06

SUMS						AVERAGE	SUMS						
30804.82	21861.04	125812.87	-15032.63	61273.95	4523.49	6319.16	35249.30	750.73	34498.6	81768.6	750.7	247.1	-31.4
Energy Losses (kJ/kg of Dry Fuel)						Total							
Flue Gas Constituent						Loss	Total	Chemical	Sensible and	Total	Chem	Grams Produced	
O_2	CO	N_2	CH_4	H_2O Comb	H_2O Fuel MC	Rate	Loss	Loss 1	Latent Loss	Output	Loss 2	CO	HC
477.16	110.56	2489.29	-94.82	1720.50	129.52	5090.53	0.00	0	0.00	0	0	0.00	0.00
478.95	76.43	2477.07	-114.88	1717.57	129.13	5016.50	2627.69	-20	2648.05	7911	-20	3.90	-1.07
478.66	91.35	2479.91	-107.11	1717.86	129.22	5043.23	1725.75	-6	1731.38	5159	-6	3.04	-0.65
467.75	67.74	2435.18	-115.71	1717.21	129.10	4952.90	1713.83	-17	1730.52	5248	-17	2.28	-0.71
437.56	85.44	2333.78	-96.54	1717.39	129.27	4861.19	1790.52	-4	1794.87	5620	-4	3.06	-0.63
479.16	124.25	2503.72	-87.68	1721.73	129.67	5131.74	1944.55	13	1931.22	5679	13	4.58	-0.59
876.87	188.68	3939.67	-179.77	1730.66	129.58	6944.02	2102.06	2	2099.90	3988	2	5.56	-0.97
1045.87	356.41	4403.80	-231.23	1698.61	126.76	7603.78	1761.42	28	1733.20	2899	28	8.06	-0.96
874.95	398.74	3650.90	-240.87	1665.14	124.18	6630.05	1340.66	31	1309.35	2728	31	7.90	-0.87
857.24	429.82	3543.02	-261.14	1655.84	123.33	6489.62	1089.91	28	1062.08	2289	28	7.08	-0.79
948.84	557.09	3831.51	-309.32	1649.65	122.49	6925.78	1119.33	39	1079.86	2132	39	8.83	-0.90
821.15	439.21	3338.83	-331.79	1643.70	121.88	6148.99	999.67	17	982.58	2271	17	7.01	-0.97
737.23	462.57	3023.28	-280.52	1635.81	121.69	5812.32	1023.41	32	991.80	2519	32	8.00	-0.89
736.34	446.10	3031.44	-271.29	1637.84	121.91	5818.68	1011.99	30	982.03	2487	30	7.62	-0.85
844.19	511.23	3435.46	-291.88	1643.35	122.16	6384.53	977.41	33	944.30	2103	33	7.68	-0.80
718.58	534.76	2942.22	-251.45	1629.83	121.47	5803.24	895.76	43	852.50	2210	43	8.11	-0.70
868.70	480.40	3516.16	-335.57	1645.45	121.98	6414.47	905.75	20	885.68	1935	20	6.66	-0.85
816.96	546.57	3310.44	-297.99	1637.20	121.65	6245.76	942.54	37	905.49	2094	37	8.10	-0.81
974.38	681.29	3883.50	-336.03	1641.95	121.71	7077.62	1034.10	50	984.25	1905	50	9.78	-0.88
1236.06	858.42	4781.37	-589.94	1653.58	120.63	8151.61	785.18	25	759.69	1153	25	8.13	-1.02
1036.50	683.15	4005.20	-708.46	1651.14	119.56	6862.10	573.34	-2	575.62	1108	-2	5.62	-1.06
957.64	833.29	3702.50	-622.86	1638.67	119.29	6697.82	621.20	19	601.94	1245	19	7.61	-1.04
936.94	920.66	3613.23	-625.30	1635.40	119.04	6664.45	588.71	26	562.88	1189	26	8.01	-0.99
783.20	725.61	3042.69	-599.25	1629.46	118.80	5762.15	493.28	11	482.64	1229	11	6.12	-0.92
814.24	855.55	3166.38	-518.20	1624.46	119.04	6126.13	589.46	32	557.27	1346	32	8.11	-0.89
737.91	693.69	2892.76	-495.46	1622.90	119.09	5637.42	523.80	18	505.58	1346	18	6.35	-0.83
1058.76	1113.93	4054.34	-674.90	1640.36	119.03	7374.88	636.30	38	598.74	1100	38	9.47	-1.04
1023.27	903.89	3936.21	-680.97	1643.46	119.21	7012.70	574.04	18	556.03	1073	18	7.29	-1.00
876.19	979.99	3403.66	-465.71	1622.88	119.31	6604.78	507.98	39	468.71	1039	39	7.42	-0.64
853.23	800.60	3309.42	-583.87	1631.32	119.05	6195.11	496.35	17	479.18	1116	17	6.32	-0.84
1099.65	1035.13	4216.63	-680.32	1644.48	119.29	7503.00	649.75	30	619.33	1093	30	8.83	-1.06
1062.55	851.94	4084.12	-723.29	1648.97	119.30	7113.09	537.49	10	527.97	983	10	6.34	-0.98
797.10	753.52	3103.74	-550.44	1627.46	119.02	5915.41	414.23	14	400.17	995	14	5.20	-0.69
798.37	692.51	3109.86	-576.36	1630.31	119.03	5839.40	494.29	10	484.63	1209	10	5.77	-0.88
980.49	800.64	3799.87	-593.41	1639.72	119.59	6821.44	584.96	18	567.43	1140	18	6.76	-0.91
1028.09	1100.42	3954.01	-578.96	1633.93	119.28	7324.07	918.01	65	853.15	1604	65	13.58	-1.30
784.11	669.50	3067.70	-529.35	1628.17	119.23	5808.43	254.59	6	248.54	627	6	2.89	-0.42

Intertek Testing Services

Manufacturer:	SBI	**Technicians:**	Claude Pelland
Model:	Cambridge		
Date:	06-07-16		
Run:	2		
Control #:	QC20160606		
Test Duration:	360		
Output Category:	Integrated		

Test Results in Accordance with CSA B415.1-10

	HHV Basis	LHV Basis
Overall Efficiency	69.6%	75.2%
Combustion Efficiency	99.4%	99.4%
Heat Transfer Efficiency	70%	75.7%

Output Rate (kJ/h)	13 481	12 788	**(Btu/h)**
Burn Rate (kg/h)	0.96	2.12	**(lb/h)**
Input (kJ/h)	19 356	18 361	**(Btu/h)**

Test Load Weight (dry kg)	5.77	12.72	**dry lb**
MC wet (%)	4.5		
MC dry (%)	4.71		
Particulate (g)	17.33		
CO (g)	247		
Test Duration (h)	6.00		

Emissions	**Particulate**	**CO**
g/MJ Output	0.21	3.05
g/kg Dry Fuel	3.00	42.80
g/h	2.89	41.18
lb/MM Btu Output	0.50	7.10

Air/Fuel Ratio (A/F)	38.54

VERSION: **2.4** **2010-04-15**

ASTM E2779 Calculation Sheet

Manufacturer: SBI **Eng:** Claude Pelland
Model: Cambridge
Date: 2016-06-07
Run: 2 Dry kilograms: 6.04
Control #: QC20160606
Test Duration: 360.0

	Start	End			
Barometer (in.Hg):	29.5	29.4	Pitot type	Type S	
				0.84	
Dry Bulb (F):					
Humidity (%):	74	59			

sture content of wood (wet basis): 13.32

		Average	0.00	0.00	0.00	220.71	79.58	98.42		87.56	88.07	83.95		87.94	87.01	80.95	0.04	0.016	
	Elapsed	Weight	*	*	*	*1	*2	*3	*	*	*	*	*	*	*	*	*	*	*
Actual	Time	Remaining				Flue	Room	Tunnel	DGM 1	DGM 1	DGM 1	Filter 1	DGM 2	DGM 2	DGM 2	Filter 2	Tunnel		
Time	Minutes	Lbs.	CO	CO_2	O_2	Gas	Temp	Dry Bulb	Reading	Inlet T	Outlet T	Temp	Reading	Inlet T	Outlet T	Temp	Velocity	Draft	
10:56:00	0.0	13.32	0.00	0.00	0.00	359.73	76.53	112.08	881.025	81.75	81.04	81.25	1046.966	82.38	81.94	79.06	0.035	0.024	
11:06:00	10.00	12.51	0.00	0.00	0.00	355.50	79.89	112.70	882.109	82.89	86.04	83.33	1047.946	83.67	83.94	81.12	0.034	0.021	
11:16:00	20.00	11.71	0.00	0.00	0.00	355.46	78.14	112.08	883.260	84.37	86.17	83.66	1048.970	84.97	84.40	81.37	0.038	0.023	
11:26:00	30.00	10.93	0.00	0.00	0.00	352.82	77.83	112.13	884.391	85.57	86.19	84.05	1049.998	86.04	84.74	81.43	0.035	0.022	
11:36:00	40.00	10.12	0.00	0.00	0.00	355.39	77.02	111.89	885.511	86.45	86.76	83.99	1051.010	86.85	84.86	81.35	0.035	0.020	
11:46:00	50.00	9.23	0.00	0.00	0.00	363.70	77.58	112.48	886.610	87.13	87.53	83.87	1052.040	87.46	85.17	81.26	0.038	0.021	
11:56:00	60.00	8.37	0.00	0.00	0.00	361.19	76.86	112.82	887.703	87.56	88.04	83.96	1053.046	88.00	85.57	81.30	0.038	0.023	
12:06:00	70.00	7.84	0.00	0.00	0.00	306.62	77.10	107.11	888.792	87.96	88.48	83.82	1054.048	88.56	85.88	81.30	0.038	0.022	
12:16:00	80.00	7.30	0.00	0.00	0.00	261.17	82.05	102.76	889.860	88.24	88.96	83.32	1055.052	88.57	85.92	80.98	0.037	0.017	
12:26:00	90.00	6.90	0.00	0.00	0.00	243.02	80.59	99.83	890.926	88.57	89.22	82.79	1056.056	88.72	86.08	80.72	0.038	0.019	
12:36:00	100.00	6.52	0.00	0.00	0.00	226.87	80.88	98.95	891.998	89.06	89.67	81.87	1057.058	88.71	86.11	80.51	0.036	0.016	
12:46:00	110.00	6.16	0.00	0.00	0.00	212.64	78.73	97.31	893.053	89.25	89.87	81.75	1058.061	88.79	86.14	80.40	0.031	0.015	
12:56:00	120.00	5.77	0.00	0.00	0.00	207.64	77.44	96.65	894.112	88.97	89.88	82.14	1059.061	88.94	86.33	80.32	0.036	0.015	
13:06:00	130.00	5.34	0.00	0.00	0.00	213.25	78.68	96.92	895.156	88.76	89.49	82.47	1060.059	89.26	86.78	80.27	0.039	0.014	
13:16:00	140.00	4.97	0.00	0.00	0.00	216.84	77.34	97.61	896.205	88.78	89.50	82.39	1061.055	89.22	86.88	80.32	0.034	0.016	
13:26:00	150.00	4.64	0.00	0.00	0.00	208.13	82.31	97.61	897.247	88.92	89.79	82.51	1062.049	89.19	86.94	80.44	0.033	0.014	
13:36:00	160.00	4.26	0.00	0.00	0.00	214.52	78.63	97.47	898.280	88.81	89.75	82.55	1063.039	89.27	87.26	80.49	0.037	0.014	
13:46:00	170.00	3.99	0.00	0.00	0.00	206.45	76.86	97.67	899.302	88.84	89.57	82.40	1064.016	89.43	87.61	80.30	0.036	0.017	
13:56:00	180.00	3.56	0.00	0.00	0.00	210.62	79.92	98.05	900.324	88.97	89.65	82.60	1064.992	89.72	88.30	80.38	0.035	0.016	
14:06:00	190.00	3.31	0.00	0.00	0.00	187.67	78.25	95.29	901.336	88.97	89.61	82.65	1065.965	89.97	88.97	80.40	0.036	0.015	
14:16:00	200.00	3.12	0.00	0.00	0.00	166.46	78.06	92.64	902.343	89.02	89.62	81.98	1066.930	89.15	89.34	80.15	0.034	0.016	
14:26:00	210.00	2.93	0.00	0.00	0.00	160.21	77.13	92.16	903.347	88.99	89.84	83.32	1067.891	89.25	89.49	80.62	0.033	0.013	
14:36:00	220.00	2.69	0.00	0.00	0.00	156.26	78.27	91.50	904.345	88.95	89.88	84.22	1068.850	89.43	89.75	81.08	0.029	0.014	
14:46:00	230.00	2.52	0.00	0.00	0.00	155.51	82.28	91.66	905.300	88.77	89.91	84.48	1069.794	89.56	89.62	81.23	0.035	0.014	
14:56:00	240.00	2.29	0.00	0.00	0.00	156.63	78.65	92.81	906.339	89.20	89.93	84.60	1070.720	89.91	88.96	81.00	0.026	0.014	
15:06:00	250.00	2.07	0.00	0.00	0.00	158.05	78.98	93.01	907.395	88.24	88.14	85.35	1071.845	88.26	88.81	81.30	0.035	0.015	
15:16:00	260.00	1.86	0.00	0.00	0.00	158.38	80.55	91.76	908.600	87.43	87.66	85.87	1072.912	87.14	88.08	81.43	0.036	0.013	
15:26:00	270.00	1.68	0.00	0.00	0.00	162.28	80.88	91.59	909.868	87.46	87.11	86.39	1073.968	87.58	87.63	81.56	0.040	0.015	
15:36:00	280.00	1.49	0.00	0.00	0.00	164.86	81.42	92.15	911.118	87.55	86.68	86.91	1075.054	86.91	87.34	81.69	0.041	0.014	
15:46:00	290.00	1.32	0.00	0.00	0.00	160.05	81.87	91.74	912.329	86.62	86.49	86.72	1076.129	87.00	87.15	81.82	0.038	0.012	
15:56:00	300.00	1.12	0.00	0.00	0.00	164.61	81.65	92.35	913.595	86.84	86.50	86.65	1077.187	87.16	87.28	81.95	0.044	0.015	
16:06:00	310.00	0.92	0.00	0.00	0.00	165.13	82.04	92.74	914.840	86.07	86.53	85.77	1078.255	87.32	87.47	82.08	0.041	0.016	
16:16:00	320.00	0.77	0.00	0.00	0.00	159.17	81.64	92.26	916.085	86.46	86.76	85.18	1079.323	87.36	87.64	81.26	0.043	0.014	
16:26:00	330.00	0.60	0.00	0.00	0.00	159.69	81.87	92.51	917.335	86.64	86.87	84.84	1080.395	87.52	87.77	80.76	0.040	0.016	
16:36:00	340.00	0.38	0.00	0.00	0.00	170.91	82.01	93.61	918.575	86.84	87.03	85.67	1081.460	87.50	87.83	81.11	0.041	0.014	
16:46:00	350.00	0.20	0.00	0.00	0.00	164.71	82.04	93.75	919.814	87.91	87.16	85.01	1082.531	87.46	87.78	81.16	0.039	0.012	
16:56:00	360.00	0.00	0.00	0.00	0.00	164.03	82.36	93.90	921.067	87.03	87.10	85.97	1083.608	87.37	87.79	81.34	0.042	0.014	

								6" Tunnel	0.1963	ft^2						(ASTM E2515 Formula)					
		Manufacturer:			SBI			12" Tunnel	0.7854	ft^2											
		Model:			Cambridge						Tunnel area (ft2):		0.3491			Manufacturer:		SBI			
		Date:			6-7-16						Wood moisture (% wet):		4.75			Model:		Cambridge			
		Run:			2						Load Weight (lbs wet):		13.32198			Date:		6-7-16			
		Project #:			QC20160606						Burn Rate (Dry kg/hr):		0.959			Run:		2			
		Test Duration:			360																
		Total Gas Volume (DGM 1):			38.194						Final Temperature (DGM #1) Degrees Rankin:					547.815					
		Total Gas Volume (DGM 2):			34.866						Final Temperature (DGM #2) Degrees Rankin:					547.475					
		Average Barometric Pressure:			29.45						Final Tunnel Temperature Degrees Rankin:					558.420					
		Molecular Weight:			28.78						Final Tunnel Velocity (feet per second):					10.86123703					
		Pitot Correction:			0.9744746						Standardized Tunnel Flow (dscfm):					207.4098178					
		Calibration Factor (DGM #1):			1.0060																
		Calibration Factor (DGM #2):			1.0030								Average	Average							
				(1) VS:	0.0305547								Inlet +	Inlet +							
				(2) VS:	0.033471			Filter	Filter				Outlet	Outlet	Average	Average	#1	#2		Average	
								Face	Face	Delta-P	Tunnel	Temp.	Temp.	99.7	99.9	dDGM	dDGM		0.2	
Elapsed	DGM 1	DGM 1	DGM 1	DGM 2	DGM 2	DGM 2	Tunnel	Velocity	Velocity	(in. H2O)	Velocity	Meter 1	Meter 2	Proportional Rates		Vol.Std.	Vol.Std.		SQRT		
Time	Reading	Inlet T	Outlet T	Reading	Inlet T	Outlet T	Dry Bulb	DGM 1	DGM 2	Tunnel	Ft/Sec	Deg. R	Deg. R	PR1	PR2	(ft3)	(ft3)	Time	Delta-P		
0.00	881.03	81.75	81.04	1046.97	82.3830116	81.93532	112.084			0.035	10.69991	541.4	542.2					0	0.1861		
10.00	882.11	82.89	86.04	1047.95	83.66875333	83.93709	112.7018	5.56	5.02	0.034	10.61496	544.5	543.8	103.49	102.36	1.040	0.939	10	0.1845		
20.00	883.26	84.37	86.17	1048.97	84.97470921	84.40215	112.0791	5.90	5.24	0.038	11.25024	545.3	544.7	103.26	100.48	1.103	0.980	20	0.1957		
30.00	884.39	85.57	86.19	1050.00	86.04121579	84.73647	112.1267	5.79	5.25	0.035	10.82889	545.9	545.4	105.19	104.54	1.083	0.982	30	0.1884		
40.00	885.51	86.45	86.76	1051.01	86.84974472	84.85641	111.8858	5.73	5.17	0.035	10.81086	546.6	545.9	104.02	102.87	1.071	0.966	40	0.1881		
50.00	886.61	87.13	87.53	1052.04	87.45981053	85.16973	112.4782	5.61	5.25	0.038	11.20127	547.3	546.3	98.35	100.98	1.049	0.982	50	0.1948		
60.00	887.70	87.56	88.04	1053.05	87.99633509	85.57059	112.8233	5.58	5.13	0.038	11.25294	547.8	546.8	97.26	98.07	1.043	0.959	60	0.1956		
70.00	888.79	87.96	88.48	1054.05	88.55535392	85.87684	107.107	5.55	5.10	0.038	11.21932	548.2	547.2	96.07	96.84	1.038	0.954	70	0.1960		
80.00	889.86	88.24	88.96	1055.05	88.56947556	85.9176	102.7637	5.44	5.11	0.037	10.90936	548.6	547.2	96.03	99.01	1.017	0.956	80	0.1913		
90.00	890.93	88.57	89.22	1056.06	88.71879104	86.07572	99.82907	5.43	5.11	0.038	11.01251	548.9	547.4	94.35	97.52	1.015	0.956	90	0.1937		
100.00	892.00	89.06	89.67	1057.06	88.71251215	86.10902	98.94767	5.45	5.10	0.036	10.75729	549.4	547.4	96.82	99.47	1.020	0.954	100	0.1893		
110.00	893.05	89.25	89.87	1058.06	88.79145444	86.14278	97.30683	5.37	5.10	0.031	10.04456	549.6	547.5	101.67	106.30	1.003	0.955	110	0.1770		
120.00	894.11	88.97	89.88	1059.06	88.93810079	86.3326	96.65486	5.39	5.09	0.036	10.69869	549.4	547.6	95.75	99.33	1.007	0.951	120	0.1887		
130.00	895.16	88.76	89.49	1060.06	89.26223931	86.77871	96.92059	5.31	5.07	0.039	11.19062	549.1	548.0	90.39	94.68	0.994	0.949	130	0.1973		
140.00	896.21	88.78	89.50	1061.06	89.22219389	86.8831	97.6076	5.34	5.06	0.034	10.46752	549.1	548.1	97.21	101.13	0.998	0.947	140	0.1844		
150.00	897.25	88.92	89.79	1062.05	89.18981644	86.93775	97.61439	5.30	5.05	0.033	10.25345	549.4	548.1	98.50	103.03	0.991	0.945	150	0.1807		
160.00	898.28	88.81	89.75	1063.04	89.26977185	87.26014	97.47203	5.26	5.03	0.037	10.94488	549.3	548.3	91.48	96.04	0.983	0.941	160	0.1929		
170.00	899.30	88.84	89.57	1064.02	89.42725971	87.61483	97.67017	5.20	4.96	0.036	10.75389	549.2	548.5	92.17	96.41	0.973	0.928	170	0.1895		
180.00	900.32	88.97	89.65	1064.99	89.72224126	88.3024	98.05399	5.20	4.95	0.035	10.61285	549.3	549.0	93.42	97.48	0.972	0.926	180	0.1869		
190.00	901.34	88.97	89.61	1065.97	89.97390185	88.96811	95.2925	5.15	4.93	0.036	10.75910	549.3	549.5	90.81	95.23	0.963	0.923	190	0.1900		
200.00	902.34	89.02	89.62	1066.93	89.14744844	89.3363	92.63507	5.12	4.90	0.034	10.44280	549.3	549.2	92.64	96.92	0.958	0.915	200	0.1848		
210.00	903.35	88.99	89.84	1067.89	89.24602785	89.49094	92.15728	5.11	4.87	0.033	10.22386	549.4	549.4	94.23	98.46	0.955	0.911	210	0.1810		
220.00	904.35	88.95	89.88	1068.85	89.4322859	89.75357	91.49878	5.08	4.86	0.029	9.68672	549.4	549.6	98.74	103.49	0.949	0.909	220	0.1716		
230.00	905.30	88.77	89.91	1069.79	89.5627733	89.61974	91.65968	4.86	4.79	0.035	10.60089	549.3	549.6	86.39	93.11	0.909	0.895	230	0.1878		
240.00	906.34	89.20	89.93	1070.72	89.90864702	88.96265	92.81053	5.28	4.70	0.026	9.19759	549.6	549.4	108.46	105.55	0.988	0.878	240	0.1628		

250.00	907.40	88.24	88.14	1071.85	88.2633739	88.81002	93.00547	5.38	5.71	0.035	10.54771	548.2	548.5	96.64	112.23	1.007	1.069	250	0.1866
260.00	908.60	87.43	87.66	1072.91	87.1439116	88.0813	91.76188	6.15	5.43	0.036	10.74379	547.5	547.6	108.28	104.62	1.150	1.015	260	0.1903
270.00	909.87	87.46	87.11	1073.97	87.5806936	87.63025	91.59321	6.48	5.37	0.040	11.33193	547.3	547.6	108.10	98.14	1.211	1.005	270	0.2007
280.00	911.12	87.55	86.68	1075.05	86.9076854	87.33769	92.14626	6.39	5.53	0.041	11.46356	547.1	547.1	105.51	100.04	1.194	1.034	280	0.2030
290.00	912.33	86.62	86.49	1076.13	87.0039814	87.14717	91.73936	6.19	5.48	0.038	11.05213	546.6	547.1	106.16	102.66	1.158	1.024	290	0.1958
300.00	913.60	86.84	86.50	1077.19	87.1635902	87.27828	92.34846	6.47	5.39	0.044	11.87369	546.7	547.2	103.37	94.10	1.210	1.007	300	0.2102
310.00	914.84	86.07	86.53	1078.26	87.315682	87.46999	92.74193	6.37	5.44	0.041	11.42890	546.3	547.4	105.83	98.69	1.191	1.017	310	0.2023
320.00	916.09	86.46	86.76	1079.32	87.3593117	87.63732	92.26013	6.37	5.44	0.043	11.67599	546.6	547.5	103.39	96.48	1.190	1.016	320	0.2067
330.00	917.34	86.64	86.87	1080.40	87.5173638	87.7743	92.50608	6.39	5.45	0.040	11.25974	546.8	547.6	107.63	100.42	1.195	1.020	330	0.1993
340.00	918.58	86.84	87.03	1081.46	87.4964159	87.83423	93.60671	6.34	5.42	0.041	11.40732	546.9	547.7	105.53	98.66	1.185	1.013	340	0.2017
350.00	919.81	87.91	87.16	1082.53	87.4592606	87.78239	93.74987	6.32	5.45	0.039	11.11270	547.5	547.6	108.03	101.89	1.183	1.019	350	0.1965
360.00	921.07	87.03	87.10	1083.61	87.3736967	87.78699	93.90344	6.40	5.48	0.042	11.53333	547.1	547.6	105.48	98.76	1.197	1.025	360	0.2039

Intertek Testing Services

Manufacturer:	**SBI**
Model:	**Cambridge**
Date:	**6-7-16**
Run:	**2**
Project #:	**QC20160606**
Test Duration: (minutes)	**360**

RESULTS

Average emission rate:(gr/hr) **2.888**

Burn Rate (Dry kg/hr): 0.959

PRESSURE FACTOR: 0.98429

BAROMETRIC PRESSURE

Average:	29.45
Start:	29.5
End:	29.4

TEMPERATURE FACTORS

DGM #1:	0.96383
DGM #2:	0.96443

DRY GAS METER VALUES

VOLUMES SAMPLED

	DGM #1:	38.21534	
	DGM #2:	34.88779	
TOTAL TUNNEL VOLUME (scf):		74668	

DGM #1	Final:	921.067
	Initial:	881.025
DGM #2	Final:	1083.608
	Initial:	1046.966

SAMPLE RATIOS

Sample Train 1:	1953.863
Sample Train 2:	2140.220

TEMPERATURES (DEG. RANKIN)

DGM #1:	547.815
DGM #2:	547.475

TOTAL EMISSIONS

Sample Train 1 (g):	**18.17**
Sample Train 2 (g):	**16.48**

CALIBRATION FACTORS

DGM #1:	1.0060
DGM #2:	1.0030

EMISSION RATES

Sample Train 1 (g/hr):	**3.03**
Sample Train 2 (g/hr):	**2.75**
MAX Allowed	7.50%
DEVIATION:	4.88%

TUNNEL FLOW RATE: 207.410

PARTICULATE CATCH (mg)

Total Sample Train 1:	9.30
Total Sample Train 2:	7.7
Filter and seal Sample Train 1:	8.1
Filter and seal Sample Train 2:	7.7
Probe Sample Train 1:	1.2
Probe Sample Train 2:	0

	Train 1	Train 2
Cs	0.000243358	0.000220708
Cr	0	0
Et	18.17	16.48
Et	AVERAGE	17.33

Grams Emissions

Deviation (g/kg)

Train #1	3.009
Train #2	2.729
Deviation	0.280

Room Particulate Correction

Mr	0	Milligram Catch (mg)
Vmr	46.5264	Total Volume Sampled (dscf)

Rotometer (glass) at 100

flow rate is 0.12924 cfm

ASTM E2779 Calculation Sheet

Manufacturer:	SBI	**Tech:**												
Model:	Cambridge													
Date:	2016-06-07													
Run:	2	Dry kilograms:	**2.25**											
Control #:	QC20160606													
Test Duration:	**60.0**													
		Start	End											
	Barometer (in.Hg):	29.5	29.4		Pitot type	Type S								
						0.84								
	Dry Bulb (F):													
	Humidity (%):	74	59											
oisture content of wood (wet basis):		4.96												
	Average	0.00	0.00	0.00	357.68	77.69	112.31		82.99	84.55	85.62	0.04	0.022	
	Elapsed	**Weight**	*	*	*	***1**	***2**	***3**	*	*	*	*	*	*
Actual	**Time**	**Remaining**				**Flue**	**Room**	**Tunnel**	**DGM 3**	**DGM 3**	**DGM 3**	**Filter 3**	**Tunnel**	
Time	**Minutes**	**Lbs.**	**CO**	**CO_2**	**O_2**	**Gas**	**Temp**	**Dry Bulb**	**Reading**	**Inlet T**	**Outlet T**	**Temp**	**Velocity**	**Draft**
10:56:00	0.0	4.96	0.00	0.00	0.00	359.73	76.53	112.08	532.900	81.23	81.03	82.38	0.035	0.024
11:06:00	10.00	4.15	0.00	0.00	0.00	355.50	79.89	112.70	534.150	84.52	83.84	83.67	0.034	0.021
11:16:00	20.00	3.35	0.00	0.00	0.00	355.46	78.14	112.08	535.400	83.60	84.21	84.97	0.038	0.023
11:26:00	30.00	2.57	0.00	0.00	0.00	352.82	77.83	112.13	536.645	83.19	85.89	86.04	0.035	0.022
11:36:00	40.00	1.75	0.00	0.00	0.00	355.39	77.02	111.89	537.801	83.03	85.80	86.85	0.035	0.020
11:46:00	50.00	0.87	0.00	0.00	0.00	363.70	77.58	112.48	538.975	82.77	85.30	87.46	0.038	0.021
11:56:00	60.00	0.00	0.00	0.00	0.00	361.19	76.86	112.82	540.103	82.56	85.82	88.00	0.038	0.023

6" Tunnel 0.1963 ft^2
12" Tunnel 0.7854 ft^2

(ASTM E2515 Formula)

Manufacturer:	SBI	Tunnel area (ft2):	0.3491
Model:	Cambridge	Wood moisture (% wet):	4.75
Date:	6-7-16	Load Weight (lbs wet):	4.955341
Run:	2	Burn Rate (Dry kg/hr):	2.141
Project #:	QC20160606		
Test Duration:	60		
Total Gas Volume (DGM 3):	6.787	Final Temperature (DGM #3) Degrees Rankin:	543.770
Average Barometric Pressure:	29.45	Final Tunnel Temperature Degrees Rankin:	572.311
Molecular Weight:	28.78	Final Tunnel Velocity (feet per second):	10.9512955
Pitot Correction:	0.974475	Standardized Tunnel Flow (dscfm):	204.053597
Calibration Factor (DGM #3):	0.9870		
(3) VS:	0.169175		

Manufacturer: SBI
Model: Cambridge
Date: 6-7-16
Run: 2

Elapsed Time	DGM 1 Reading	DGM 1 Inlet T	DGM 1 Outlet T	Tunnel Dry Bulb	Filter Face Velocity DGM 1	Delta-P (in. H2O) Tunnel	Tunnel Velocity Ft/Sec	Average Inlet + Outlet Temp. Meter 3 Deg. R	Average 99.5 Proportional Rates PR3	#3 dDGM Vol.Std. (ft3)	Time	Average 0.2 SQRT Delta-P
0.00	532.90	81.23	81.03	112.084		0.035	10.69991	541.1			0	0.1861
10.00	534.15	84.52	83.84	112.7018	6.30	0.034	10.61496	544.2	107.29	1.178	10	0.1845
20.00	535.40	83.60	84.21	112.0791	6.30	0.038	11.25024	543.9	101.22	1.178	20	0.1957
30.00	536.65	83.19	85.89	112.1267	6.27	0.035	10.82889	544.5	104.51	1.172	30	0.1884
40.00	537.80	83.03	85.80	111.8858	5.82	0.035	10.81086	544.4	97.20	1.089	40	0.1881
50.00	538.98	82.77	85.30	112.4782	5.92	0.038	11.20127	544.0	95.51	1.106	50	0.1948
60.00	540.10	82.56	85.82	112.8233	5.68	0.038	11.25294	544.2	91.35	1.063	60	0.1956

Intertek Testing Services

Manufacturer:	**SBI**	RESULTS	
Model:	**Cambridge**		
Date:	**6-7-16**	**Average emission rate:(gr/hr)**	**2.883**
Run:	**2**		
Project #:	**QC20160606**	Burn Rate (Dry kg/hr):	2.141
Test Duration: (minutes)	**60**		

PRESSURE FACTOR	0.98429	BAROMETRIC PRESSURE	
		Average:	29.45
TEMPERATURE FACTORS		Start:	29.5
DGM #3:	0.97100	End:	29.4
		DRY GAS METER VALUES	
VOLUMES SAMPLED		DGM #3 Final:	540.103
DGM #3:	6.79474	Initial:	532.900
TOTAL TUNNEL VOLUME (scf):	12243		
SAMPLE RATIOS		TEMPERATURES (DEG. RANKIN)	
Sample Train 3:	1801.866	DGM #3:	543.770
TOTAL EMISSIONS		CALIBRATION FACTORS	
Sample Train 3 (g):	**2.88**	DGM #3:	0.9870
EMISSION RATES		TUNNEL FLOW RATE:	204.054
Sample Train 3 (g/hr):	**2.88**		
		PARTICULATE CATCH (mg)	
		Total Sample Train 3:	1.60
		Filter and seal Sample Train 3:	1.2
MAX Allowed	7.50%		
		Probe Sample Train 3:	0.4
DEVIATION:	0.00%		

VERSION: 2.4 2010-04-15

Manufacturer: SBI
Model: Cambridge
Date: 2016-06-07
Run: 2
Control #: QC20160606
Test Duration: 60
Output Category: Integrated

Appliance Type: Pellet (Cat, Non-Cat, Pellet)

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

Wood Moisture (% wet): 4.50
Load Weight (lb wet): 4.96
Burn Rate (dry kg/h): 2.15
Total Particulate Emissions: 17.33 g

Fuel Data
Energex P.

HHV	20 119	kJ/kg
%C	48.73	
%H	6.87	
%O	43.785	
%Ash	0.615	

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

Note 1: For other fuels, use the heating value and fuel composition determined by analysis of fuel sample in accordance with Clause 9.2.

Note 2: In cases where the "Fuel Weight Remaining" is the same for three or more readings in a row, a "divide by zero error" will occur in the calculation sheet. In such cases, adjust the weight values by interpolation between the first occurence and the next reading showing a decrease in weight.

	Averages	0.05	5.60	15.33	357.68	77.69
					Temp. (ºF)	
Elapsed Time (min)	Fuel Weight Remaining (lb)	Flue Gas Composition (%) CO	CO_2	O_2	Flue Gas	Room Temp
0	4.96	0.06	5.90	15.37	359.7	76.5
10	4.15	0.04	5.79	14.84	355.5	79.9
20	3.35	0.05	5.81	14.96	355.5	78.1
30	2.57	0.03	5.88	14.99	352.8	77.8
40	1.75	0.05	6.20	14.31	355.4	77.0
50	0.87	0.06	5.92	15.57	363.7	77.6
60	0.00	0.06	3.72	17.26	361.2	76.9

Manufacturer: SBI
Model: Cambridge
Date: 06-07-16
Run: 2
Control #: QC20160606
Test Duration: 60 min

Note: In the "Input data", "Calc. % O_2", "Fuel Properties", and "Mass Balance" columns, [e], [d], [g], [a]. [b], [c], [h], [u], [w], [j], and [k] refer to their respective variables in Clauses 13.7.3 to 13.7.5.

	HHV	LHV
Eff	71.49%	77.17%
Comb Eff	99.50%	99.50%
HT Eff	71.85%	77.56%
Output	30 912	kJ/h
Burn Rate	2.15	kg/h
Grams CO	23	g
Input	43 239	kJ/h
MC wet	4.50	

Ultimate CO_2
$CO_{2\text{-ult}}$ 19.63
F_0
1.060

Overall Heating Efficiency: 71.49%
Combustion Efficiency: 99.50%
Heat Transfer Efficiency: 71.85%

Air Fuel Ratio (A/F)	
Dry Molecular Weight (M_d)	29.49
Dry Moles Exhaust Gas (N_d):	658.74
Air Fuel Ratio (A/F)	18.92

%HC 0.8

Heat Output: 29 323 Btu/h 30 912 kJ/h
Heat Input: 41 017 Btu/h 43 239 kJ/h
Burn Duration: 1.00 h
Burn Rate: 4.74 lb/h 2.149 kg/h
Stack Temp: 357.3 Deg. F 180.7 Deg. C

Combustion Efficiency:
Total Input (kJ):
Total Output (kJ):
Efficiency:
Total CO (g):

Averages	0.05	5.60	2.56	20.56	14.94	180.94	25.38	100.0%	73.7%	73.7%	21.57	1.14	49.16	1.09	49.16	47032	4.06	6.87	2.74	20119.00
INPUT DATA			Oxygen Calculation			Input Data		Combust	Heat	Net	Air	Wet Wt	% Wet	Dry Wt.	% Dry		Fuel Properties			
Elapsed Time	Weight Remaining (kg)	% CO [e]	% CO_2 [d]	Excess Air EA	Total O_2	Calc. % O_2 [g]	Flue Gas (°C)	Room Temp (°C)	Eff %	Transfer %	Eff %	Fuel Ratio	Now Wt	Consumed x	Now Wt_{dn}	Comsumed y	Total Input	Carbon /12= [a]	Hydrogen /1= [b]	Oxygen /16= [c]	Calorific Value
0	2.25	0.06	5.90	229.6%	20.54	14.61	182.1	24.7	99.9%	74.8%	74.7%	19.9	2.25	0.00	2.15	0.00	0	4.06	6.87	2.74	20119.00
10	1.88	0.04	5.79	236.8%	20.55	14.74	179.7	26.6	100.2%	74.9%	75.1%	20.4	1.88	16.33	1.80	16.33	10548	4.06	6.87	2.74	20119.00
20	1.52	0.05	5.81	235.2%	20.55	14.72	179.7	25.6	100.1%	74.9%	74.9%	20.3	1.52	32.46	1.45	32.46	6887	4.06	6.87	2.74	20119.00
30	1.17	0.03	5.88	231.9%	20.55	14.65	178.2	25.5	100.2%	75.2%	75.4%	20.1	1.17	48.19	1.11	48.19	6974	4.06	6.87	2.74	20119.00
40	0.79	0.05	6.20	214.3%	20.52	14.30	179.7	25.0	100.1%	75.8%	75.8%	19.0	0.79	64.72	0.76	64.72	7410	4.06	6.87	2.74	20119.00
50	0.39	0.06	5.92	228.1%	20.54	14.59	184.3	25.3	99.8%	74.6%	74.5%	19.8	0.39	82.46	0.38	82.46	11420	4.06	6.87	2.74	20119.00
60	0.00	0.06	3.72	419.3%	20.69	16.94	182.9	24.9	100.0%	65.5%	65.5%	31.4	0.00	100.00	0.00	100.00	3792	4.06	6.87	2.74	20119.00

Moisture Content M_{Cwb}: 4.5

99.50%		Moisture of Wood (wet basis):	4.5	Dry kg :	2.15
43 239	41 010 (Btu)	Initial Dry Weight Wt_{do} (kg):	2.15	CA:	48.73
30 912	29 318 (Btu)	Moisture Content Dry	4.71	HY:	6.87
71.49%				OX:	43.785
22.63					

Load Weight (kg):	**2.25**				
Fuel Heating	**HHV**	**LHV**		**HHV**	**LHV**
Value in kJ/kg - CV:	**20 119**	**18 638**	Btu/lb	**8655.4**	**8018.1**

4.50	**79.41**	**21.06**	**1.39**	**4.80**	**-0.02**	**0.14**	**40.62**	**112.34**	**0.37**	**-0.13**	**591.06**	**34.82**	**2.62**	**454.09**	**6292.56**	**4692.80**	**4552.88**	**4504.63**	**6151.27**	**5444.91**	**298.53**	**1789.01**	**3696.11**
Mw	**Mass Balance**					**kg Wood per**								**Stack**	**Heat Content Change - Ambient to Stack Temperature**						**Room**		
Moisture	**(moles/100 mole dry flue gas)**					**100 mole dfp**	**Moles per kg of Dry Wood**						**Moisture**	**Temp**	**Flue Gas Constituent**						**Temp**		
Fuel Burnt	**[h]**	**[u]**	**[w]**	**[j]**	**[k]**	**Nk**	**CO_2**	**O_2**	**CO**	**HC**	**N_2**	**H_2O**	**Present**	**K**	**CO_2**	**O_2**	**CO**	**N_2**	**CH_4**	**H_2O**	**K**	**CO_2**	**O_2**
4.50	79.43	21.07	1.46	5.06	-0.02	0.15	40.58	100.52	0.38	-0.11	546.33	34.77	2.62	455.22	6365.65	4746.85	4605.21	4556.42	6223.74	5507.45	297.89	258.32	477.16
4.50	79.43	21.07	1.43	4.95	-0.02	0.14	40.72	103.68	0.27	-0.13	558.64	34.82	2.62	452.87	6193.98	4619.30	4481.58	4434.08	6054.86	5359.64	299.75	252.23	478.95
4.50	79.43	21.07	1.44	4.97	-0.02	0.14	40.66	102.99	0.32	-0.12	555.88	34.80	2.62	452.85	6230.37	4647.40	4509.08	4461.24	6088.33	5392.61	298.78	253.34	478.66
4.50	79.44	21.07	1.45	5.02	-0.02	0.14	40.75	101.52	0.24	-0.13	550.57	34.82	2.62	451.39	6174.46	4607.29	4470.55	4423.04	6030.23	5346.65	298.61	251.63	467.75
4.50	79.45	21.08	1.53	5.30	-0.02	0.15	40.67	93.81	0.30	-0.11	521.20	34.78	2.62	452.81	6252.36	4664.46	4525.79	4477.74	6108.41	5412.64	298.16	254.28	437.56
4.50	79.43	21.07	1.47	5.08	-0.01	0.15	40.53	99.87	0.43	-0.10	543.72	34.76	2.62	457.43	6437.69	4797.77	4653.91	4604.76	6300.31	5565.48	298.47	260.89	479.16
4.50	79.28	21.03	0.93	3.22	-0.02	0.09	40.40	183.96	0.66	-0.20	861.11	34.96	2.62	456.03	6393.37	4766.53	4624.05	4575.12	6253.00	5529.91	298.07	258.32	876.87

SUMS					AVERAGE	SUMS						
744.44	18658.62	-796.50	12042.93	905.50	5291.44	12085.54	-25.77	12111.3	34946.0	-25.8	22.6	-4.6
Energy Losses (kJ/kg of Dry Fuel)					Total							
Flue Gas Constituent					Loss	Total	Chemical	Sensible and	Total	Chem	Grams Produced	
CO	N_2	CH_4	H_2O Comb	H_2O Fuel MC	Rate	Loss	Loss 1	Latent Loss	Output	Loss 2	CO	HC
110.56	2489.29	-94.82	1720.50	129.52	5090.53	0.00	0	0.00	0	0	0.00	0.00
76.43	2477.07	-114.88	1717.57	129.13	5016.50	2630.13	-20	2650.51	7918	-20	3.90	-1.08
91.35	2479.91	-107.11	1717.86	129.22	5043.23	1726.34	-6	1731.98	5161	-6	3.05	-0.65
67.74	2435.18	-115.71	1717.21	129.10	4952.90	1716.88	-17	1733.61	5257	-17	2.29	-0.72
85.44	2333.78	-96.54	1717.39	129.27	4861.19	1790.41	-4	1794.75	5620	-4	3.06	-0.63
124.25	2503.72	-87.68	1721.73	129.67	5131.74	2912.91	20	2892.95	8507	20	6.87	-0.89
188.68	3939.67	-179.77	1730.66	129.58	6944.02	1308.86	1	1307.51	2483	1	3.46	-0.60

Intertek Testing Services

Manufacturer:	SBI	**Technicians:**	Claude Pelland
Model:	Cambridge		
Date:	06-07-16		
Run:	2		
Control #:	QC20160606		
Test Duration:	60		
Output Category:	Integrated		

Test Results in Accordance with CSA B415.1-10

	HHV Basis	LHV Basis
Overall Efficiency	71.5%	77.2%
Combustion Efficiency	99.5%	99.5%
Heat Transfer Efficiency	72%	77.6%

Output Rate (kJ/h)	30 912	29 323	**(Btu/h)**
Burn Rate (kg/h)	2.15	4.74	**(lb/h)**
Input (kJ/h)	43 239	41 017	**(Btu/h)**

Test Load Weight (dry kg)	2.15	4.74	**dry lb**
MC wet (%)	4.5		
MC dry (%)	4.71		
Particulate (g)	17.33		
CO (g)	23		
Test Duration (h)	1.00		

Emissions	**Particulate**	**CO**
g/MJ Output	0.56	0.73
g/kg Dry Fuel	8.06	10.53
g/h	17.33	22.63
lb/MM Btu Output	1.30	1.70

Air/Fuel Ratio (A/F)	18.92

VERSION: **2.4** **2010-04-15**

VERSION: 2.4 2010-04-15

Manufacturer: SBI
Model: Cambridge
Date: 2016-06-07
Run: 2
Control #: QC20160606
Test Duration: 180
Output Category: Integrated

Appliance Type: Pellet (Cat, Non-Cat, Pellet)

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

Wood Moisture (% wet): 4.50
Load Weight (lb wet): 3.56
Burn Rate (dry kg/h): 0.51
Total Particulate Emissions: 17.33 g

Fuel Data
Energex P.

HHV	20 119	kJ/kg
%C	48.73	
%H	6.87	
%O	43.785	
%Ash	0.615	

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

Note 1: For other fuels, use the heating value and fuel composition determined by analysis of fuel sample in accordance with Clause 9.2.

Note 2: In cases where the "Fuel Weight Remaining" is the same for three or more readings in a row, a "divide by zero error" will occur in the calculation sheet. In such cases, adjust the weight values by interpolation between the first occurence and the next reading showing a decrease in weight.

Averages		**0.09**	**1.14**	**19.89**	**165.54**	**80.52**
					Temp. (ºF)	
Elapsed Time (min)	**Fuel Weight Remaining (lb)**	**Flue Gas Composition (%) CO**	**CO_2**	**O_2**	**Flue Gas**	**Room Temp**
0	3.56	0.10	1.65	19.81	210.6	79.9
10	3.31	0.09	1.11	19.54	187.7	78.3
20	3.12	0.07	1.09	20.19	166.5	78.1
30	2.93	0.08	1.09	20.05	160.2	77.1
40	2.69	0.09	1.04	19.64	156.3	78.3
50	2.52	0.08	1.18	20.04	155.5	82.3
60	2.29	0.09	1.19	19.97	156.6	78.7
70	2.07	0.08	1.34	19.80	158.1	79.0
80	1.86	0.09	0.91	19.96	158.4	80.5
90	1.68	0.08	1.00	20.02	162.3	80.9
100	1.49	0.11	1.17	19.80	164.9	81.4
110	1.32	0.08	1.15	20.00	160.1	81.9
120	1.12	0.09	0.94	19.88	164.6	81.7
130	0.92	0.08	0.99	20.01	165.1	82.0
140	0.77	0.08	1.22	19.65	159.2	81.6
150	0.60	0.08	1.23	19.99	159.7	81.9
160	0.38	0.08	1.14	19.91	170.9	82.0
170	0.20	0.10	0.99	19.83	164.7	82.0
180	0.00	0.08	1.31	19.85	164.0	82.4

Manufacturer: SBI
Model: Cambridge
Date: 06-07-16
Run: 2
Control #: QC20160606
Test Duration: 180 min

Note: In the "Input data", "Calc. % O_2", "Fuel Properties", and "Mass Balance" columns, [e], [d], [g], [a]. [b], [c], [h], [u], [w], [j], and [k] refer to their respective variables in Clauses 13.7.3 to 13.7.5.

	HHV	LHV
Eff	65.58%	70.80%
Comb Eff	98.69%	98.69%
HT Eff	66.46%	71.74%
Output	6 785	kJ/h
Burn Rate	0.51	kg/h
Grams CO	134	g
Input	10 345	kJ/h
MC wet	4.50	

Ultimate CO_2
$CO_{2\text{-ult}}$ 19.63
F_0
1.034

Overall Heating Efficiency: 65.58%
Combustion Efficiency: 98.69%
Heat Transfer Efficiency: 66.46%

Air Fuel Ratio (A/F)	
Dry Molecular Weight (M_d)	28.97
Dry Moles Exhaust Gas (N_t):	2093.17
Air Fuel Ratio (A/F)	60.13

%HC 0.8

Heat Output: 6 436 Btu/h 6 785 kJ/h
Heat Input: 9 813 Btu/h 10 345 kJ/h

Burn Duration: 3.00 h

Burn Rate: 1.13 lb/h 0.514 kg/h

Stack Temp: 163.0 Deg. F 72.8 Deg. C

	Averages	0.09	1.14	15.22	20.86	19.67	74.19	26.96	98.8%	67.7%	66.9%	99.00	0.78	51.49	0.75	51.49	31917	4.06
	INPUT DATA			Oxygen Calculation			Input Data		Combust	Heat	Net	Air	Wet Wt	% Wet	Dry Wt.	% Dry		
Elapsed Time	Weight Remaining (kg)	% CO [e]	% CO_2 [d]	Excess Air EA	Total O_2	Calc. % O_2 [g]	Flue Gas (°C)	Room Temp (°C)	Eff %	Transfer %	Eff %	Fuel Ratio	Now Wt	Consumed x	Now Wt_{dn}	Comsumed y	Total Input	Carbon /12= [a]
0	1.62	0.10	1.65	1020.8%	20.82	19.12	99.2	26.6	98.3%	65.9%	64.8%	68.0	1.62	0.00	1.54	0.00	0	4.06
10	1.50	0.09	1.11	1540.1%	20.86	19.71	86.5	25.7	98.7%	60.3%	59.5%	100.1	1.50	6.97	1.44	6.97	3020	4.06
20	1.41	0.07	1.09	1597.1%	20.86	19.74	74.7	25.6	100.1%	65.8%	65.9%	103.9	1.41	12.49	1.35	12.49	1681	4.06
30	1.33	0.08	1.09	1573.9%	20.86	19.73	71.2	25.1	99.0%	67.4%	66.7%	102.3	1.33	17.81	1.27	17.81	1866	4.06
40	1.22	0.09	1.04	1640.4%	20.86	19.78	69.0	25.7	98.5%	67.9%	66.9%	106.3	1.22	24.51	1.16	24.51	1777	4.06
50	1.14	0.08	1.18	1461.3%	20.86	19.64	68.6	27.9	99.4%	71.8%	71.4%	95.3	1.14	29.26	1.09	29.26	1722	4.06
60	1.04	0.09	1.19	1429.8%	20.85	19.62	69.2	25.9	98.3%	70.7%	69.6%	93.2	1.04	35.61	0.99	35.61	1936	4.06
70	0.94	0.08	1.34	1278.6%	20.84	19.46	70.0	26.1	99.0%	72.7%	72.0%	84.0	0.94	41.73	0.90	41.73	1869	4.06
80	0.85	0.09	0.91	1854.0%	20.87	19.92	70.2	27.0	97.8%	64.7%	63.3%	119.5	0.85	47.66	0.81	47.66	1736	4.06
90	0.76	0.08	1.00	1713.1%	20.87	19.83	72.4	27.2	98.9%	65.9%	65.1%	110.9	0.76	52.92	0.73	52.92	1647	4.06
100	0.67	0.11	1.17	1438.1%	20.85	19.63	73.8	27.5	97.5%	68.9%	67.2%	93.6	0.67	58.27	0.64	58.27	1547	4.06
110	0.60	0.08	1.15	1491.2%	20.86	19.67	71.1	27.7	98.9%	70.0%	69.2%	97.1	0.60	62.89	0.57	62.89	1612	4.06
120	0.51	0.09	0.94	1805.7%	20.87	19.89	73.7	27.6	98.3%	63.8%	62.7%	116.6	0.51	68.66	0.48	68.66	1742	4.06
130	0.42	0.08	0.99	1740.3%	20.87	19.84	74.0	27.8	99.4%	65.1%	64.6%	112.7	0.42	74.12	0.40	74.12	1520	4.06
140	0.35	0.08	1.22	1406.2%	20.85	19.59	70.6	27.6	99.0%	71.3%	70.6%	91.9	0.35	78.46	0.33	78.46	1409	4.06
150	0.27	0.08	1.23	1402.3%	20.85	19.58	70.9	27.7	99.4%	71.4%	71.0%	91.7	0.27	83.20	0.26	83.20	1703	4.06
160	0.17	0.08	1.14	1505.2%	20.86	19.68	77.2	27.8	99.0%	66.8%	66.1%	98.0	0.17	89.43	0.16	89.43	1725	4.06
170	0.09	0.10	0.99	1698.0%	20.87	19.83	73.7	27.8	97.4%	65.3%	63.6%	109.7	0.09	94.32	0.09	94.32	2522	4.06
180	0.00	0.08	1.31	1313.4%	20.85	19.50	73.3	28.0	99.3%	71.6%	71.1%	86.2	0.00	100.00	0.00	100.00	882	4.06

Moisture Content $M_{Ow\,b}$: 4.5

Combustion Efficiency:	98.69%		Moisture of Wood (wet basis):	4.5	Dry kg :	1.54
Total Input (kJ):	31 035	29 435 (Btu)	Initial Dry Weight Wt_{do} (kg):	1.54	CA:	48.73
Total Output (kJ):	20 354	19 305 (Btu)	Moisture Content Dry	4.71	HY:	6.87
Efficiency:	65.58%				OX:	43.785
Total CO (g):	134.36					

Load Weight (kg):	**1.62**				
Fuel Heating	**HHV**	**LHV**		**HHV**	**LHV**
Value in kJ/kg - CV:	**20 119**	**18 638**	Btu/lb	**8655.4**	**8018.1**

6.87	**2.74**	**20119.00**	**4.50**	**79.10**	**20.98**	**0.30**	**1.06**	**-0.02**	**0.03**	**38.56**	**675.51**	**2.95**	**-0.66**	**2713.33**	**35.88**	**2.62**	**347.34**	**1839.38**	**1402.81**	**1368.69**	**1352.56**
Fuel Properties			**Mw**	**Mass Balance**					**kg Wood per**								**Stack**	**Heat Content Change - Ambient to Stack**			
				(moles/100 mole dry flue gas)					**100 mole dfp**	**Moles per kg of Dry Wood**						**Moisture**	**Temp**	**Flue Gas Constituent**			
Hydrogen	**Oxygen**	**Calorific**	**Moisture**																		
/1= [b]	**/16= [c]**	**Value**	**Fuel Burnt**	**[h]**	**[u]**	**[w]**	**[j]**	**[k]**	**Nk**	**CO_2**	**O_2**	**CO**	**HC**	**N_2**	**H_2O**	**Present**	**K**	**CO_2**	**O_2**	**CO**	**N_2**
6.87	2.74	20119.00	4.50	79.13	20.99	0.43	1.50	-0.02	0.04	38.85	450.20	2.39	-0.38	1862.88	35.32	2.62	372.38	2852.65	2164.33	2108.95	2084.67
6.87	2.74	20119.00	4.50	79.10	20.98	0.29	1.03	-0.02	0.03	38.51	683.63	3.01	-0.66	2743.87	35.88	2.62	359.63	2375.99	1808.09	1763.14	1742.57
6.87	2.74	20119.00	4.50	79.10	20.98	0.28	1.00	-0.02	0.03	39.25	710.84	2.40	-0.79	2848.61	36.15	2.62	347.85	1911.11	1458.14	1422.82	1406.02
6.87	2.74	20119.00	4.50	79.10	20.98	0.28	1.01	-0.02	0.03	38.63	699.20	2.93	-0.70	2803.03	35.96	2.62	344.38	1793.51	1369.62	1336.73	1320.89
6.87	2.74	20119.00	4.50	79.09	20.98	0.27	0.98	-0.02	0.03	38.32	728.88	3.24	-0.70	2914.36	35.96	2.62	342.18	1682.71	1285.45	1254.70	1239.80
6.87	2.74	20119.00	4.50	79.11	20.98	0.30	1.09	-0.02	0.03	38.98	648.67	2.55	-0.67	2613.04	35.91	2.62	341.77	1581.17	1207.39	1178.39	1164.43
6.87	2.74	20119.00	4.50	79.10	20.98	0.31	1.11	-0.02	0.03	38.43	633.55	3.01	-0.58	2554.49	35.72	2.62	342.39	1682.54	1285.20	1254.42	1239.54
6.87	2.74	20119.00	4.50	79.11	20.98	0.35	1.23	-0.02	0.03	38.97	566.10	2.44	-0.56	2301.06	35.67	2.62	343.18	1706.87	1303.50	1272.22	1257.14
6.87	2.74	20119.00	4.50	79.08	20.98	0.24	0.87	-0.02	0.02	37.70	825.02	3.92	-0.76	3275.95	36.08	2.62	343.36	1680.82	1283.31	1252.44	1237.61
6.87	2.74	20119.00	4.50	79.09	20.98	0.26	0.94	-0.02	0.03	38.44	762.20	3.18	-0.76	3040.56	36.09	2.62	345.53	1759.27	1342.51	1310.04	1294.57
6.87	2.74	20119.00	4.50	79.09	20.98	0.31	1.10	-0.02	0.03	37.94	636.52	3.45	-0.52	2564.42	35.61	2.62	346.96	1804.53	1376.52	1343.10	1327.26
6.87	2.74	20119.00	4.50	79.10	20.98	0.30	1.07	-0.02	0.03	38.70	661.76	2.82	-0.65	2661.75	35.87	2.62	344.29	1689.32	1289.33	1258.20	1243.32
6.87	2.74	20119.00	4.50	79.08	20.98	0.25	0.89	-0.02	0.02	37.98	803.53	3.64	-0.76	3195.47	36.09	2.62	346.82	1794.06	1368.53	1335.31	1319.56
6.87	2.74	20119.00	4.50	79.09	20.98	0.26	0.93	-0.02	0.03	38.67	775.07	3.00	-0.81	3089.76	36.18	2.62	347.11	1797.37	1370.91	1337.59	1321.82
6.87	2.74	20119.00	4.50	79.11	20.98	0.32	1.12	-0.02	0.03	38.83	623.49	2.65	-0.62	2517.49	35.80	2.62	343.80	1674.85	1278.45	1247.63	1232.87
6.87	2.74	20119.00	4.50	79.11	20.98	0.32	1.13	-0.02	0.03	39.07	622.08	2.44	-0.65	2512.81	35.86	2.62	344.09	1681.46	1283.38	1252.41	1237.60
6.87	2.74	20119.00	4.50	79.10	20.98	0.30	1.06	-0.02	0.03	38.71	668.15	2.81	-0.67	2685.93	35.89	2.62	350.32	1925.32	1467.47	1431.55	1414.73
6.87	2.74	20119.00	4.50	79.08	20.98	0.26	0.94	-0.02	0.03	37.64	753.77	3.87	-0.65	3006.59	35.86	2.62	346.88	1788.14	1363.93	1330.81	1315.11
6.87	2.74	20119.00	4.50	79.11	20.98	0.34	1.20	-0.02	0.03	39.10	581.93	2.35	-0.59	2361.22	35.75	2.62	346.50	1766.41	1347.42	1314.71	1299.20

			SUMS							AVERAGE	SUMS						
1730.06	1639.31	300.11	1348.00	17838.67	15953.65	69127.20	-11133.06	31088.62	2268.49	6657.45	10681.38	407.67	10273.7	21235.6	407.7	134.4	-17.1
Temperature		Room Temp	Energy Losses (kJ/kg of Dry Fuel) Flue Gas Constituent							Total Loss	Total	Chemical	Sensible and	Total	Chem	Grams Produced	
CH_4	H_2O	K	CO_2	O_2	CO	N_2	CH_4	H_2O Comb	H_2O Fuel MC	Rate	Loss	Loss 1	Latent Loss	Output	Loss 2	CO	HC
2707.79	2525.06	299.77	110.82	974.38	681.23	3883.50	-336.03	1641.95	121.71	7077.57	0.00	0	0.00	0	0	0.00	0.00
2243.51	2111.44	298.85	91.49	1236.06	858.42	4781.37	-589.94	1653.58	120.63	8151.61	1223.59	40	1183.87	1796	40	12.67	-1.59
1796.19	1704.18	298.74	75.02	1036.50	683.15	4005.20	-708.46	1651.14	119.56	6862.10	573.34	-2	575.62	1108	-2	5.62	-1.06
1683.02	1601.17	298.22	69.28	957.64	833.29	3702.50	-622.86	1638.67	119.29	6697.82	621.20	19	601.94	1245	19	7.61	-1.04
1578.07	1502.94	298.85	64.48	936.94	920.66	3613.23	-625.30	1635.40	119.04	6664.45	588.71	26	562.88	1189	26	8.01	-0.99
1483.90	1411.49	301.08	61.63	783.20	725.61	3042.69	-599.25	1629.46	118.80	5762.15	493.28	11	482.64	1229	11	6.12	-0.92
1578.17	1502.59	299.07	64.66	814.24	855.55	3166.38	-518.20	1624.46	119.04	6126.13	589.46	32	557.27	1346	32	8.11	-0.89
1601.61	1523.89	299.25	66.53	737.91	693.69	2892.76	-495.46	1622.90	119.09	5637.42	523.80	18	505.58	1346	18	6.35	-0.83
1577.82	1500.18	300.12	63.36	1058.76	1113.93	4054.34	-674.90	1640.36	119.03	7374.88	636.30	38	598.74	1100	38	9.47	-1.04
1653.00	1569.12	300.31	67.63	1023.27	903.89	3936.21	-680.97	1643.46	119.21	7012.70	574.04	18	556.03	1073	18	7.29	-1.00
1696.68	1608.68	300.61	68.46	876.19	979.99	3403.66	-465.71	1622.88	119.31	6604.78	507.98	39	468.71	1039	39	7.42	-0.64
1586.84	1507.04	300.86	65.37	853.23	800.60	3309.42	-583.87	1631.32	119.05	6195.11	496.35	17	479.18	1116	17	6.32	-0.84
1686.82	1599.35	300.74	68.14	1099.65	1035.13	4216.63	-680.32	1644.48	119.29	7503.00	649.75	30	619.33	1093	30	8.83	-1.06
1690.27	1602.07	300.95	69.51	1062.55	851.94	4084.12	-723.29	1648.97	119.30	7113.09	537.49	10	527.97	983	10	6.34	-0.98
1572.86	1494.39	300.73	65.03	797.10	753.52	3103.74	-550.44	1627.46	119.02	5915.41	414.23	14	400.17	995	14	5.20	-0.69
1579.33	1500.11	300.85	65.69	798.37	692.51	3109.86	-576.36	1630.31	119.03	5839.40	494.29	10	484.63	1209	10	5.77	-0.88
1812.86	1714.53	300.93	74.53	980.49	800.64	3799.87	-593.41	1639.72	119.59	6821.44	584.96	18	567.43	1140	18	6.76	-0.91
1681.43	1593.95	300.95	67.30	1028.09	1100.42	3954.01	-578.96	1633.93	119.28	7324.07	918.01	65	853.15	1604	65	13.58	-1.30
1660.87	1574.67	301.13	69.06	784.11	669.50	3067.70	-529.35	1628.17	119.23	5808.43	254.59	6	248.54	627	6	2.89	-0.42

Intertek Testing Services

Manufacturer:	SBI	**Technicians:**	Claude Pelland
Model:	Cambridge		
Date:	06-07-16		
Run:	2		
Control #:	QC20160606		
Test Duration:	180		
Output Category:	Integrated		

Test Results in Accordance with CSA B415.1-10

	HHV Basis	LHV Basis
Overall Efficiency	65.6%	70.8%
Combustion Efficiency	98.7%	98.7%
Heat Transfer Efficiency	66%	71.7%

Output Rate (kJ/h)	6 785	6 436	**(Btu/h)**
Burn Rate (kg/h)	0.51	1.13	**(lb/h)**
Input (kJ/h)	10 345	9 813	**(Btu/h)**

Test Load Weight (dry kg)	1.54	3.40	**dry lb**
MC wet (%)	4.5		
MC dry (%)	4.71		
Particulate (g)	17.33		
CO (g)	134		
Test Duration (h)	3.00		

Emissions	**Particulate**	**CO**
g/MJ Output	0.85	6.60
g/kg Dry Fuel	11.23	87.10
g/h	5.78	44.79
lb/MM Btu Output	1.98	15.34

Air/Fuel Ratio (A/F)	60.13

VERSION: **2.4** **2010-04-15**

VERSION:	**2.4**	**2010-04-15**				
Manufacturer:	SBI		**Appliance Type:**	Pellet	(Cat, Non-Cat, Pellet)	
Model:	Cambridge					
Date:	2016-06-07		**Temp. Units**	F	(F or C)	
Run:	2		**Weight Units**	lb	(kg or lb)	
Control #:	QC20160606					
Test Duration:	120					
Output Category:	Integrated		**Fuel Data**			
				Energex P.		
Wood Moisture (% wet):	4.50		**HHV**	20 119	kJ/kg	
Load Weight (lb wet):	4.81		**%C**	48.73		
Burn Rate (dry kg/h):	1.04		**%H**	6.87		
Total Particulate Emissions:	17.33	g	**%O**	43.785		
			%Ash	0.615		

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

Note 1: For other fuels, use the heating value and fuel composition determined by analysis of fuel sample in accordance with Clause 9.2.

Note 2: In cases where the "Fuel Weight Remaining" is the same for three or more readings in a row, a "divide by zero error" will occur in the calculation sheet. In such cases, adjust the weight values by interpolation between the first occurence and the next reading showing a decrease in weight.

Averages		**0.09**	**2.24**	**18.68**	**237.61**	**79.03**
					Temp. (ºF)	
Elapsed Time (min)	**Fuel Weight Remaining (lb)**	**Flue Gas Composition (%) CO**	**CO_2**	**O_2**	**Flue Gas**	**Room Temp**
0	4.81	0.06	3.72	17.26	361.2	76.9
10	4.28	0.08	2.64	18.52	306.6	77.1
20	3.74	0.09	2.47	18.99	261.2	82.0
30	3.34	0.09	2.30	18.74	243.0	80.6
40	2.96	0.09	1.89	18.54	226.9	80.9
50	2.60	0.08	2.01	17.87	212.6	78.7
60	2.21	0.09	2.15	19.00	207.6	77.4
70	1.78	0.09	2.22	19.34	213.3	78.7
80	1.41	0.09	2.02	18.91	216.8	77.3
90	1.08	0.10	2.12	18.94	208.1	82.3
100	0.70	0.08	1.93	18.05	214.5	78.6
110	0.43	0.09	1.94	18.86	206.4	76.9
120	0.00	0.10	1.65	19.81	210.6	79.9

Manufacturer: SBI
Model: Cambridge
Date: 06-07-16
Run: 2
Control #: QC20160606
Test Duration: 120 min

Note: In the "Input data", "Calc. % O_2", "Fuel Properties", and "Mass Balance" columns, [e], [d], [g], [a]. [b], [c], [h], [u], [w], [j], and [k] refer to their respective variables in Clauses 13.7.3 to 13.7.5.

	HHV	LHV
Eff	66.17%	71.43%
Comb Eff	99.03%	99.03%
HT Eff	66.82%	72.13%
Output	13 873	kJ/h
Burn Rate	1.04	kg/h
Grams CO	100	g
Input	20 966	kJ/h
MC wet	4.50	

Ultimate CO_2
$CO_{2\text{-ult}}$ 19.63
F_0
1.050

Overall Heating Efficiency: 66.17%
Combustion Efficiency: 99.03%
Heat Transfer Efficiency: 66.82%

Heat Output: 13 160 Btu/h 13 873 kJ/h
Heat Input: 19 888 Btu/h 20 966 kJ/h

Burn Duration: 2.00 h

Burn Rate: 2.30 lb/h 1.042 kg/h

Stack Temp: 227.3 Deg. F 108.5 Deg. C

Air Fuel Ratio (A/F)	
Dry Molecular Weight (M_d)	29.10
Dry Moles Exhaust Gas (N_t):	1360.96
Air Fuel Ratio (A/F)	39.09

%HC 0.8

Combustion Efficiency:
Total Input (kJ):
Total Output (kJ):
Efficiency:
Total CO (g):

Averages	0.09	2.24	7.74	20.79	18.51	114.23	26.13	99.1%	68.4%	67.8%	52.96	1.02	53.08	0.98	53.08	43806	4.06	6.87	2.74	20119.00
INPUT DATA			Oxygen Calculation			Input Data		Combust	Heat	Net	Air	Wet Wt	% Wet	Dry Wt.	% Dry		Fuel Properties			
Elapsed Time	Weight Remaining (kg)	% CO [e]	% CO_2 [d]	Excess Air EA	Total O_2	Calc. % O_2 [g]	Flue Gas (°C)	Room Temp (°C)	Eff %	Transfer %	Eff %	Fuel Ratio	Now Wt	Consumed x	Now Wt_{dn}	Comsumed y	Total Input	Carbon /12= [a]	Hydrogen /1= [b]	Oxygen /16= [c]	Calorific Value
0	2.18	0.06	3.72	419.3%	20.69	16.94	182.9	24.9	100.0%	65.5%	65.5%	31.4	2.18	0.00	2.08	0.00	0	4.06	6.87	2.74	20119.00
10	1.94	0.08	2.64	621.1%	20.76	18.08	152.6	25.1	99.4%	62.6%	62.2%	43.6	1.94	11.02	1.85	11.02	6974	4.06	6.87	2.74	20119.00
20	1.70	0.09	2.47	667.8%	20.77	18.26	127.3	27.8	99.2%	67.6%	67.0%	46.5	1.70	22.25	1.62	22.25	4097	4.06	6.87	2.74	20119.00
30	1.52	0.09	2.30	722.3%	20.78	18.44	117.2	27.0	99.2%	68.3%	67.7%	49.8	1.52	30.56	1.45	30.56	3400	4.06	6.87	2.74	20119.00
40	1.34	0.09	1.89	889.4%	20.81	18.87	108.3	27.2	98.8%	66.4%	65.6%	60.0	1.34	38.46	1.28	38.46	3226	4.06	6.87	2.74	20119.00
50	1.18	0.08	2.01	840.1%	20.80	18.75	100.4	26.0	99.5%	69.8%	69.4%	57.0	1.18	45.95	1.13	45.95	3269	4.06	6.87	2.74	20119.00
60	1.00	0.09	2.15	777.1%	20.79	18.60	97.6	25.2	99.1%	71.8%	71.1%	53.1	1.00	54.05	0.96	54.05	3574	4.06	6.87	2.74	20119.00
70	0.81	0.09	2.22	750.6%	20.79	18.52	100.7	25.9	99.1%	71.7%	71.1%	51.5	0.81	62.99	0.77	62.99	3487	4.06	6.87	2.74	20119.00
80	0.64	0.09	2.02	829.5%	20.80	18.73	102.7	25.2	98.9%	69.0%	68.3%	56.3	0.64	70.69	0.61	70.69	3051	4.06	6.87	2.74	20119.00
90	0.49	0.10	2.12	783.7%	20.79	18.62	97.9	28.0	98.6%	72.2%	71.2%	53.5	0.49	77.55	0.47	77.55	3095	4.06	6.87	2.74	20119.00
100	0.32	0.08	1.93	875.6%	20.81	18.83	101.4	25.9	99.3%	68.6%	68.1%	59.2	0.32	85.45	0.30	85.45	2833	4.06	6.87	2.74	20119.00
110	0.20	0.09	1.94	864.8%	20.80	18.82	96.9	24.9	98.8%	69.8%	69.0%	58.5	0.20	91.06	0.19	91.06	4925	4.06	6.87	2.74	20119.00
120	0.00	0.10	1.65	1020.8%	20.82	19.12	99.2	26.6	98.3%	65.9%	64.8%	68.0	0.00	100.00	0.00	100.00	1874	4.06	6.87	2.74	20119.00

Moisture Content M_{Cwb}: 4.5

99.03%		Moisture of Wood (wet basis):	4.5	Dry kg :	2.08
41 932	39 770 (Btu)	Initial Dry Weight Wt_{do} (kg):	2.08	CA:	48.73
27 746	26 316 (Btu)	Moisture Content Dry	4.71	HY:	6.87
66.17%				OX:	43.785
100.28					

Load Weight (kg):	**2.18**				
Fuel Heating	**HHV**	**LHV**		**HHV**	**LHV**
Value in kJ/kg - CV:	**20 119**	**18 638**	Btu/lb	**8655.4**	**8018.1**

4.50	**79.17**	**21.00**	**0.57**	**1.98**	**-0.02**	**0.06**	**39.55**	**340.81**	**1.63**	**-0.31**	**1451.43**	**35.19**	**2.62**	**387.38**	**3488.78**	**2634.58**	**2564.16**	**2535.27**	**3338.71**	**3069.13**	**299.28**	**1797.53**	**11121.30**
Mw	**Mass Balance**					**kg Wood per**								**Stack**	**Heat Content Change - Ambient to Stack Temperature**						**Room**		
Moisture	**(moles/100 mole dry flue gas)**					**100 mole dfp**	**Moles per kg of Dry Wood**						**Moisture**	**Temp**	**Flue Gas Constituent**						**Temp**		
Fuel Burnt	**[h]**	**[u]**	**[w]**	**[j]**	**[k]**	**Nk**	**CO_2**	**O_2**	**CO**	**HC**	**N_2**	**H_2O**	**Present**	**K**	**CO_2**	**O_2**	**CO**	**N_2**	**CH_4**	**H_2O**	**K**	**CO_2**	**O_2**
4.50	79.28	21.03	0.93	3.22	-0.02	0.09	40.40	183.96	0.66	-0.20	861.11	34.96	2.62	456.03	6393.37	4766.53	4624.05	4575.12	6253.00	5529.91	298.07	258.32	876.87
4.50	79.20	21.01	0.67	2.32	-0.02	0.07	39.87	273.04	1.24	-0.26	1196.25	35.08	2.62	425.72	5105.23	3830.45	3721.98	3681.33	4939.96	4453.04	298.20	203.57	1045.87
4.50	79.19	21.00	0.63	2.18	-0.02	0.06	39.73	293.68	1.39	-0.27	1273.87	35.10	2.62	400.47	3951.69	2979.24	2898.39	2865.99	3792.49	3468.81	300.95	157.02	874.95
4.50	79.18	21.00	0.58	2.04	-0.02	0.06	39.65	317.81	1.50	-0.29	1364.82	35.15	2.62	390.39	3569.32	2697.28	2625.64	2595.97	3411.68	3142.87	300.14	141.51	857.24
4.50	79.15	20.99	0.48	1.70	-0.02	0.05	39.25	391.93	1.95	-0.35	1643.78	35.26	2.62	381.41	3197.57	2420.98	2357.80	2330.92	3046.24	2822.62	300.30	125.52	948.84
4.50	79.16	21.00	0.51	1.79	-0.02	0.05	39.69	370.28	1.54	-0.37	1563.16	35.31	2.62	373.51	2923.18	2217.61	2160.81	2135.95	2775.23	2587.14	299.11	116.02	821.15
4.50	79.17	21.00	0.55	1.91	-0.02	0.05	39.55	342.10	1.62	-0.31	1456.32	35.19	2.62	370.73	2838.50	2155.02	2100.22	2075.97	2691.24	2514.72	298.39	112.27	737.23
4.50	79.17	21.00	0.56	1.97	-0.02	0.06	39.60	330.39	1.56	-0.30	1412.19	35.17	2.62	373.85	2938.02	2228.72	2171.60	2146.62	2789.65	2600.04	299.08	116.34	736.34
4.50	79.15	21.00	0.52	1.81	-0.02	0.05	39.39	365.34	1.79	-0.33	1543.69	35.22	2.62	375.84	3046.96	2310.73	2251.35	2225.49	2894.47	2695.48	298.34	120.03	844.19
4.50	79.16	21.00	0.54	1.90	-0.02	0.05	39.27	344.89	1.88	-0.28	1466.10	35.13	2.62	371.00	2746.12	2083.52	2030.21	2006.84	2606.62	2430.79	301.10	107.83	718.58
4.50	79.15	21.00	0.49	1.72	-0.02	0.05	39.55	385.97	1.68	-0.38	1622.06	35.31	2.62	374.55	2967.42	2250.68	2192.92	2167.71	2818.29	2625.54	299.06	117.36	868.70
4.50	79.15	20.99	0.50	1.74	-0.02	0.05	39.28	380.96	1.92	-0.33	1602.39	35.23	2.62	370.06	2824.05	2144.50	2090.09	2065.93	2676.53	2502.63	298.07	110.92	816.96
4.50	79.13	20.99	0.43	1.50	-0.02	0.04	38.85	450.20	2.39	-0.38	1862.88	35.32	2.62	372.38	2852.65	2164.33	2108.95	2084.67	2707.79	2525.06	299.77	110.82	974.38

SUMS					AVERAGE	SUMS						
6032.82	45850.23	-3618.86	21515.02	1600.79	6484.52	14185.91	407.56	13778.4	29620.2	407.6	100.3	-10.9
Energy Losses (kJ/kg of Dry Fuel)					Total							
Flue Gas Constituent					Loss	Total	Chemical	Sensible and	Total	Chem	Grams Produced	
CO	N_2	CH_4	H_2O Comb	H_2O Fuel MC	Rate	Loss	Loss 1	Latent Loss	Output	Loss 2	CO	HC
188.65	3939.67	-179.77	1730.66	129.58	6943.99	0.00	0	0.00	0	0	0.00	0.00
356.41	4403.80	-231.23	1698.61	126.76	7603.78	2635.79	42	2593.56	4338	42	12.07	-1.43
398.74	3650.90	-240.87	1665.14	124.18	6630.05	1350.23	32	1318.69	2747	32	7.95	-0.88
429.82	3543.02	-261.14	1655.84	123.33	6489.62	1096.67	28	1068.66	2303	28	7.12	-0.79
557.09	3831.51	-309.32	1649.65	122.49	6925.78	1110.36	39	1071.20	2115	39	8.76	-0.89
439.21	3338.83	-331.79	1643.70	121.88	6148.99	999.14	17	982.06	2270	17	7.01	-0.97
462.57	3023.28	-280.52	1635.81	121.69	5812.32	1032.58	32	1000.70	2542	32	8.07	-0.89
446.10	3031.44	-271.29	1637.84	121.91	5818.68	1008.50	30	978.64	2479	30	7.59	-0.84
511.23	3435.46	-291.88	1643.35	122.16	6384.53	968.25	33	935.46	2083	33	7.61	-0.79
534.76	2942.22	-251.45	1629.83	121.47	5803.24	892.67	43	849.56	2202	43	8.08	-0.69
480.40	3516.16	-335.57	1645.45	121.98	6414.47	903.31	20	883.29	1930	20	6.64	-0.85
546.57	3310.44	-297.99	1637.20	121.65	6245.76	1529.06	60	1468.97	3396	60	13.14	-1.31
681.29	3883.50	-336.03	1641.95	121.71	7077.62	659.35	32	627.56	1215	32	6.23	-0.56

Intertek Testing Services

Manufacturer:	SBI	**Technicians:**	Claude Pelland
Model:	Cambridge		
Date:	06-07-16		
Run:	2		
Control #:	QC20160606		
Test Duration:	120		
Output Category:	Integrated		

Test Results in Accordance with CSA B415.1-10

	HHV Basis	LHV Basis
Overall Efficiency	66.2%	71.4%
Combustion Efficiency	99.0%	99.0%
Heat Transfer Efficiency	67%	72.1%

Output Rate (kJ/h)	13 873	13 160	**(Btu/h)**
Burn Rate (kg/h)	1.04	2.30	**(lb/h)**
Input (kJ/h)	20 966	19 888	**(Btu/h)**

Test Load Weight (dry kg)	2.08	4.59	**dry lb**
MC wet (%)	4.5		
MC dry (%)	4.71		
Particulate (g)	17.33		
CO (g)	100		
Test Duration (h)	2.00		

Emissions	**Particulate**	**CO**
g/MJ Output	0.62	3.61
g/kg Dry Fuel	8.31	48.12
g/h	8.67	50.14
lb/MM Btu Output	1.45	8.40

Air/Fuel Ratio (A/F)	39.09

VERSION: **2.4** **2010-04-15**

SAMPLE WEIGHT DETERMINATION

Client: SBI **Model:** Cambridge & Osburn 3000
Project #: G102163734 **Sample ID #:** QC20160608
Date: 2016-06-07 **Engineer:** Claude Pelland **Run #:** 2 **Sample Train #:** 2C
Balance Equipment #: SBI-206 **Thermo/Hygrometer Equipment #:** SBI-213

Front Filter #	11	**Tare:**	0.0850	**Preliminary Wt :**	0.0861
Rear Filter #	12	**Tare:**	0.0848	**Preliminary Wt :**	0.0847
Seal Set #	N/A	**Tare:**	N/A	**Preliminary Wt :**	N/A
Date/Time in dessicator :		May 27th, 2016 / 8:00		**Preliminary Wt :**	0.1708

Date	Time	R/H %	Temp. (F)	Weight (grams)	Audit	Initials
2016-06-09	18:07	12.9	72.8	0.0860 0.0848	100mg= 0.0999 10g= 10.0001	
2016-06-10	9:13	1.0	71.7	0.0862 0.0848	100mg= 0.1000 10g= 10.0001	

Probe #:	21	**Tare:**	139.5479	**Preliminary Wt :**	139.5484
Date/Time in dessicator :		May 27th, 2016 / 8:00			

Date	Time	R/H %	Temp. (F)	Weight (grams)	Audit	Initials
2016-06-10	9:05	1.0	71.7	139.5491	200 g = 200.0001	
2016-06-13	8:36	0.2	71.6	139.5482	200 g = 199.9998	
2016-06-14	8:34	0.9	72.3	139.5483	200 g = 199.9998	

Date: _____

Engineer Signature: _____

SAMPLE WEIGHT DETERMINATION

Client: SBI **Model:** Cambridge & Osburn 3000
Project #: G102163734 **Sample ID #:** QC20160608
Date: 2016-06-07 **Engineer:** Claude Pelland **Run #:** 2 **Sample Train #:** 2D
Balance Equipment #: SBI-206 **Thermo/Hygrometer Equipment #:** SBI-213

Front Filter #	13	**Tare:**	0.0851	**Preliminary Wt :**	0.0886
Rear Filter #	14	**Tare:**	0.0848	**Preliminary Wt :**	0.0850
Seal Set #	N/A	**Tare:**	N/A	**Preliminary Wt :**	N/A
Date/Time in dessicator :		May 27th, 2016 / 8:00		**Preliminary Wt :**	0.1736

Date	Time	R/H %	Temp. (F)	Weight (grams)	Audit	Initials
2016-06-09	18:09	12.9	72.8	0.0885 0.0849	100mg= 0.0999 10g= 10.0001	
2016-06-10	9:15	1.0	71.7	0.0883 0.0849	100mg= 0.1000 10g= 10.0001	

Probe #:	27	**Tare:**	136.8187	**Preliminary Wt :**	136.8193
Date/Time in dessicator :		May 27th, 2016 / 8:00			

Date	Time	R/H %	Temp. (F)	Weight (grams)	Audit	Initials
2016-06-09	18:01	12.9	72.8	136.8193	200 g = 200.0003	
2016-06-10	9:07	1.0	71.7	136.8199	200 g = 200.0001	
2016-06-13	8:37	0.2	71.6	136.8191	200 g = 199.9998	
2016-06-14	8:35	0.9	72.3	136.8191	200 g = 199.9998	

Date: _____

Engineer Signature: _____

SAMPLE WEIGHT DETERMINATION

Client: SBI **Model:** Cambridge & Osburn 3000
Project #: G102163734 **Sample ID #:** QC20160608
Date: 2016-06-07 **Engineer:** Claude Pelland **Run #:** 2 **Sample Train #:** 2E
Balance Equipment #: SBI-206 **Thermo/Hygrometer Equipment #:** SBI-213

Front Filter #	15	**Tare:**	0.0849	**Preliminary Wt :**	0.0880
Rear Filter #	16	**Tare:**	0.0855	**Preliminary Wt :**	0.0855
Seal Set #	N/A	**Tare:**	N/A	**Preliminary Wt :**	N/A
Date/Time in dessicator :		May 27th, 2016 / 8:00		**Preliminary Wt :**	0.1735

Date	Time	R/H %	Temp. (F)	Weight (grams)	Audit	Initials
2016-06-09	18:11	12.9	72.8	0.0878 0.0856	100mg= 0.0999 10g= 10.0001	
2016-06-10	9:17	1.0	71.7	0.0878 0.0856	100mg= 0.1000 10g= 10.0001	

Probe #:	38	**Tare:**	136.2318	**Preliminary Wt :**	136.2326
Date/Time in dessicator :		May 27th, 2016 / 8:00			

Date	Time	R/H %	Temp. (F)	Weight (grams)	Audit	Initials
2016-06-09	18:02	12.9	72.8	136.2315	200 g = 200.0003	
2016-06-10	9:08	1.0	71.7	136.2317	200 g = 200.0001	

Date: _____

Engineer Signature: _____

Calibration records

General information

Project:	Cambridge (G102163734)
Project Engineer:	Claude Pelland
Project Engineer Signature:	
Scale ID:	SBI-206

Calibration

Date (YYYY-MM-DD)	Time (HH:MM)	Calibration weight ID	Calibration weight true mass	Reading (g)	Relative Humidity (%)	Ambiant temperature (°F)
2016-05-31	15:20	SBI-237	0.100003244	0.0999	6.4	72.1
2016-05-31	15:21	SBI-238	10.0000725	10.0000	6.4	72.1
2016-05-31	15:21	SBI-238	200.001163	199.9997	6.4	72.1
2016-06-01	14:54	SBI-237	0.100003244	0.1000	5.9	72.7
2016-06-01	14:55	SBI-238	10.0000725	10.0000	5.9	72.7
2016-06-01	14:56	SBI-238	200.001163	199.9993	5.9	72.7
2016-06-02	14:49	SBI-237	0.100003244	0.1000	6.8	72.4
2016-06-02	14:50	SBI-238	10.0000725	10.0001	6.8	72.4
2016-06-02	14:51	SBI-238	200.001163	199.9995	6.8	72.4
2016-06-03	9:32	SBI-237	0.100003244	0.1000	8.5	74.0
2016-06-03	9:33	SBI-238	10.0000725	10.0000	8.5	74.0
2016-06-03	9:34	SBI-238	200.001163	199.9996	8.5	74.0

Filters weights

General information

Project:	Cambridge (G102163734)
Project Engineer:	Claude Pelland
Project Engineer Signature:	
Scale ID:	SBI-206

Date (YYYY-MM-DD)	Time (HH:MM)		Reading (g)	Relative Humidity (%)	Ambiant temperature (°F)	Run number
2016-05-31	15:42	1	0.0852	6.4	72.1	N/A
2016-05-31	15:43	2	0.0857	6.4	72.1	N/A
2016-05-31	15:44	3	0.0856	6.4	72.1	N/A
2016-05-31	15:44	4	0.0860	6.4	72.1	N/A
2016-05-31	15:45	5	0.0853	6.4	72.1	N/A
2016-05-31	15:46	6	0.0859	6.4	72.1	N/A
2016-05-31	15:46	7	0.0851	6.4	72.1	N/A
2016-05-31	15:47	8	0.0846	6.4	72.1	N/A
2016-05-31	15:48	9	0.0858	6.4	72.1	N/A
2016-05-31	15:49	10	0.0835	6.4	72.1	N/A
2016-05-31	15:49	11	0.0850	6.4	72.1	N/A
2016-05-31	15:50	12	0.0848	6.4	72.1	N/A
2016-05-31	15:50	13	0.0851	6.4	72.1	N/A
2016-05-31	15:51	14	0.0848	6.4	72.1	N/A
2016-05-31	15:52	15	0.0850	6.4	72.1	N/A
2016-05-31	15:52	16	0.0856	6.4	72.1	N/A
2016-05-31	15:53	17	0.0862	6.4	72.1	N/A
2016-05-31	15:53	18	0.0864	6.4	72.1	N/A
2016-05-31	15:54	19	0.0855	6.4	72.1	N/A
2016-05-31	15:54	20	0.0858	6.4	72.1	N/A
2016-05-31	15:55	21	0.0857	6.4	72.1	N/A
2016-05-31	15:56	22	0.0857	6.4	72.1	N/A
2016-05-31	15:56	23	0.0840	6.4	72.1	N/A
2016-05-31	15:57	24	0.0841	6.4	72.1	N/A

Filters weights

General information

Project:	Cambridge (G102163734)
Project Engineer:	Claude Pelland
Project Engineer Signature:	
Scale ID:	SBI-206

Date (YYYY-MM-DD)	Time (HH:MM)		Reading (g)	Relative Humidity (%)	Ambiant temperature (°F)	Run number
2016-06-01	15:23	1	0.0851	5.9	72.7	1A
2016-06-01	15:24	2	0.0857	5.9	72.7	1A
2016-06-01	15:25	3	0.0856	5.9	72.7	1B
2016-06-01	15:26	4	0.0861	5.9	72.7	1B
2016-06-01	15:26	5	0.0853	5.9	72.7	1C
2016-06-01	15:27	6	0.0858	5.9	72.7	1C
2016-06-01	15:28	7	0.0850	5.9	72.7	2A
2016-06-01	15:28	8	0.0845	5.9	72.7	2A
2016-06-01	15:29	9	0.0858	5.9	72.7	2B
2016-06-01	15:29	10	0.0835	5.9	72.7	2B
2016-06-01	15:30	11	0.0850	5.9	72.7	2C
2016-06-01	15:31	12	0.0848	5.9	72.7	2C
2016-06-01	15:31	13	0.0851	5.9	72.7	2D
2016-06-01	15:32	14	0.0848	5.9	72.7	2D
2016-06-01	15:32	15	0.0849	5.9	72.7	2E
2016-06-01	15:33	16	0.0855	5.9	72.7	2E
2016-06-01	15:33	17	0.0862	5.9	72.7	N/A
2016-06-01	15:34	18	0.0863	5.9	72.7	N/A
2016-06-01	15:34	19	0.0856	5.9	72.7	N/A
2016-06-01	15:35	20	0.0858	5.9	72.7	N/A
2016-06-01	15:36	21	0.0857	5.9	72.7	N/A
2016-06-01	15:36	22	0.0857	5.9	72.7	N/A
2016-06-01	01:37	23	0.0839	5.9	72.7	N/A
2016-06-01	15:38	24	0.0843	5.9	72.7	N/A

Probe weights

General information

Project:	Cambridge (G102163734)
Project Engineer:	Claude Pelland
Project Engineer Signature:	
Scale ID:	SBI-206

Date (YYYY-MM-DD)	Time (HH:MM)		Reading (g)	Relative Humidity (%)	Ambiant temperature (°F)	Run number
2016-05-31	15:26	17	139.7113	6.4	72.1	N/A
2016-05-31	15:29	18	147.1246	6.4	72.1	N/A
2016-05-31	15:30	19	140.1275	6.4	72.1	N/A
2016-05-31	15:31	20	139.1366	6.4	72.1	N/A
2016-05-31	15:32	31	137.0215	6.4	72.1	N/A
2016-05-31	15:33	21	139.5482	6.4	72.1	N/A
2016-05-31	15:34	27	136.8190	6.4	72.1	N/A
2016-05-31	15:35	38	136.2319	6.4	72.1	N/A
2016-05-31	15:36	32	135.9698	6.4	72.1	N/A
2016-05-31	15:37	-	136.6445	6.4	72.1	N/A
2016-05-31	15:38	28	136.1844	6.4	72.1	N/A
2016-05-31	15:39	34	108.4486	6.4	72.1	N/A
2016-05-31	15:39	35	107.8573	6.4	72.1	N/A
2016-05-31	15:40	37	108.3886	6.4	72.1	N/A
2016-05-31	15:41	36	108.5195	6.4	72.1	N/A
2016-06-02	14:52	17	139.7113	6.8	72.4	1A
2016-06-02	14:53	18	147.7246	6.8	72.4	1B
2016-06-02	14:54	19	147.1273	6.8	72.4	1C
2016-06-02	14:55	20	139.1364	6.8	72.4	2A
2016-06-02	14:56	31	137.0211	6.8	72.4	2B
2016-06-02	14:57	21	139.5479	6.8	72.4	2C
2016-06-02	14:58	27	136.8187	6.8	72.4	2D
2016-06-02	14:59	38	136.2318	6.8	72.4	2E
2016-06-02	15:00	32	135.9696	6.8	72.4	N/A

SAMPLE WEIGHT DETERMINATION

Client: SBI **Model:** Cambridge & Osburn 3000
Project #: G102163734 **Sample ID #:** QC20160608
Date: 2016-06-07 **Engineer:** Claude Pelland **Run #:** 2 **Sample Train #:** 2A
Balance Equipment #: SBI-206 **Thermo/Hygrometer Equipment #:** SBI-213

Front Filter #	7	**Tare:**	0.0850	**Preliminary Wt :**	0.0902
Rear Filter #	8	**Tare:**	0.0845	**Preliminary Wt :**	0.0846
Seal Set #	N/A	**Tare:**	N/A	**Preliminary Wt :**	N/A
Date/Time in dessicator :		May 27th, 2016 / 8:00		**Preliminary Wt :**	0.1748

Date	Time	R/H %	Temp. (F)	Weight (grams)	Audit	Initials
2016-06-09	18:03	12.9	72.8	0.0899 0.0845	100mg= 0.0999 10g= 10.0001	
2016-06-10	9:10	1.0	71.7	0.0897 0.0846	100mg= 0.1000 10g= 10.0001	

Probe #:	20	**Tare:**	139.1364	**Preliminary Wt :**	139.1381
Date/Time in dessicator :		May 27th, 2016 / 8:00			

Date	Time	R/H %	Temp. (F)	Weight (grams)	Audit	Initials
2016-06-10	9:02	1.0	71.7	139.1379	200 g = 200.0001	
2016-06-13	8:34	0.2	71.6	139.1370	200 g = 199.9998	
2016-06-14	8:32	0.9	72.3	139.1372	200 g = 199.9998	

Date: _____

Engineer Signature: _____

SAMPLE WEIGHT DETERMINATION

Client: SBI **Model:** Cambridge & Osburn 3000
Project #: G102163734 **Sample ID #:** QC20160608
Date: 2016-06-07 **Engineer:** Claude Pelland **Run #:** 2 **Sample Train #:** 2B
Balance Equipment #: SBI-206 **Thermo/Hygrometer Equipment #:** SBI-213

Front Filter #	9	**Tare:**	0.0858	**Preliminary Wt :**	0.0906
Rear Filter #	10	**Tare:**	0.0835	**Preliminary Wt :**	0.0936
Seal Set #	N/A	**Tare:**	N/A	**Preliminary Wt :**	N/A
Date/Time in dessicator :		May 27th, 2016 / 8:00		**Preliminary Wt :**	0.1842

Date	Time	R/H %	Temp. (F)	Weight (grams)	Audit	Initials
2016-06-09	18:05	12.9	72.8	0.0905 0.0835	100mg= 0.0999 10g= 10.0001	
2016-06-10	9:12	1.0	71.7	0.0905 0.0835	100mg= 0.1000 10g= 10.0001	

Probe #:	31	**Tare:**	137.0211	**Preliminary Wt :**	137.0218
Date/Time in dessicator :		May 27th, 2016 / 8:00			

Date	Time	R/H %	Temp. (F)	Weight (grams)	Audit	Initials
2016-06-10	9:03	1.0	71.7	137.0216	200 g = 200.0001	
2016-06-13	8:35	0.2	71.6	137.0212	200 g = 199.9998	
2016-06-14	8:33	0.9	72.3	137.0211	200 g = 199.9998	

Date: _____

Engineer Signature: _____

Gouvernement du Canada Government of Canada

Avis

Rapport de données horaires pour le 07 juin 2016

Toutes les heures sont exprimées en heure normale locale (HNL). Pour convertir l'heure locale en heure avancée, ajoutez 1 heure s'il y a lieu.

QUEBEC INTL A
QUEBEC

Latitude :	46°47'28,000" N	**Longitude :**	71°23'36,000" O
Altitude :	74,40 m	**Identification Climat :**	7016293
Identification OMM :		**Identification TC :**	YQB

	Temp. °C	Point de rosée °C	Hum. rel. %	Dir. du vent 10's deg	Vit. du vent km/h	Visibilité km	Pression à la station kPa	Hmdx	Refr. éolien	Météo
HEURE										
00:00 ‡	15,4	13,1	86	30	4	24,1	98,96			ND
01:00 ‡	14,8	12,9	88	30	4	24,1	98,93			Généralement nuageux
02:00 ‡	14,6	12,1	85	29	3	24,1	98,88			ND
03:00 ‡	12,6	11,2	91	25	6	24,1	98,89			ND
04:00 ‡	14,0	11,9	87	25	5	48,3	98,92			Généralement nuageux
05:00 ‡	14,2	12,1	87	5	3	48,3	98,93			ND
06:00 ‡	15,9	12,7	81	1	5	48,3	98,92			ND
07:00 ‡	17,1	12,3	73	36	1	48,3	98,91			Nuageux

	Temp. °C	Point de rosée °C	Hum. rel. %	Dir. du vent 10's deg	Vit. du vent km/h	Visibilité km	Pression à la station kPa	Hmdx	Refr. éolien	Météo
08:00 ‡	18,1	12,2	68	22	21	48,3	98,87			ND
09:00 ‡	17,7	13,1	74	22	18	48,3	98,89			ND
10:00 ‡	17,3	12,7	74	22	19	48,3	98,90			Nuageux
11:00 ‡	17,4	12,8	74	20	15	48,3	98,87			ND
12:00 ‡	18,9	14,0	73	20	14	48,3	98,81			ND
13:00 ‡	20,5	13,3	63	23	16	48,3	98,71			Généralement dégagé
14:00 ‡	22,1	13,6	58	21	22	48,3	98,66	25		ND
15:00 ‡	21,2	13,0	59	20	23	48,3	98,64			Orages
16:00 ‡	16,6	12,2	75	26	20	32,2	98,68			Averses de pluie
17:00 ‡	17,1	11,7	70	24	14	48,3	98,67			ND
18:00 ‡	16,3	12,9	80	26	11	48,3	98,65			ND
19:00 ‡	15,1	12,5	84	18	4	48,3	98,64			Généralement nuageux
20:00 ‡	14,2	12,3	88	16	5	24,1	98,67			ND
21:00 ‡	13,9	12,1	89	31	6	24,1	98,66			ND
22:00 ‡	12,6	11,0	90	36	2	24,1	98,62			Généralement dégagé
23:00 ‡	12,3	11,2	93	9	3	24,1	98,60			ND

Légende

- E = Valeur estimatif
- M = Données manquantes
- ND = Non disponible
- ‡ = Ces données journalières n'ont subi qu'un contrôle de qualité préliminaire

Gouvernement du Canada | Government of Canada

Avis

Rapport de données horaires pour le 06 juin 2016

Toutes les heures sont exprimées en heure normale locale (HNL). Pour convertir l'heure locale en heure avancée, ajoutez 1 heure s'il y a lieu.

QUEBEC INTL A
QUEBEC

Latitude :	46°47'28,000" N	**Longitude :**	71°23'36,000" O
Altitude :	74,40 m	**Identification Climat :**	7016293
Identification OMM :		**Identification TC :**	YQB

HEURE	Temp. °C	Point de rosée °C	Hum. rel. %	Dir. du vent 10's deg	Vit. du vent km/h	Visibilité km	Pression à la station kPa	Hmdx	Refr. éolien	Météo
00:00 ‡	14,3	13,0	92	11	18	11,3	99,10			Pluie
01:00 ‡	13,9	13,0	94	12	16	11,3	99,04			Pluie
02:00 ‡	13,8	12,7	93	10	13	24,1	98,98			Pluie
03:00 ‡	13,7	12,4	92	10	9	24,1	98,91			ND
04:00 ‡	13,3	12,7	96	8	7	19,3	98,90			Pluie
05:00 ‡	13,7	12,8	94	8	9	32,2	98,88			ND
06:00 ‡	14,0	12,9	93	6	12	32,2	98,86			ND
07:00 ‡	13,9	13,3	96	4	5	16,1	98,85			Pluie
08:00 ‡	14,6	13,8	95	9	4	32,2	98,83			ND

	Temp. °C	Point de rosée °C	Hum. rel. %	Dir. du vent 10's deg	Vit. du vent km/h	Visibilité km	Pression à la station kPa	Hmdx	Refr. éolien	Météo
09:00 ‡	15,4	14,6	95	32	3	16,1	98,81			ND
10:00 ‡	18,0	16,4	90	8	8	32,2	98,76			Généralement nuageux
11:00 ‡	20,7	17,0	79	22	22	24,1	98,74	26		ND
12:00 ‡	20,7	14,7	68	23	41	24,1	98,74			ND
13:00 ‡	20,3	14,5	69	23	28	32,2	98,75			Généralement nuageux
14:00 ‡	22,5	14,2	59	23	33	32,2	98,74	26		ND
15:00 ‡	22,3	13,8	58	23	39	48,3	98,74	26		ND
16:00 ‡	21,9	12,9	56	23	41	48,3	98,75	25		Généralement dégagé
17:00 ‡	21,6	13,1	58	23	35	48,3	98,79			ND
18:00 ‡	20,4	13,7	65	24	21	48,3	98,82			ND
19:00 ‡	19,5	13,3	67	22	21	48,3	98,85			Généralement dégagé
20:00 ‡	18,9	13,2	69	22	20	24,1	98,92			ND
21:00 ‡	17,3	13,5	78	23	10	24,1	98,96			ND
22:00 ‡	17,2	13,4	78	24	16	24,1	98,98			Généralement dégagé
23:00 ‡	16,2	13,0	81	22	9	24,1	98,97			ND

Légende

- E = Valeur estimatif
- M = Données manquantes
- ND = Non disponible
- ‡ = Ces données journalières n'ont subi qu'un contrôle de qualité préliminaire

Calibration Documents
Appendix C

AIR LIQUIDE

CERTIFICAT D'ANALYSE

MONTREAL SPECIALTY GAS PLANT
11201 RAY LAWSON
MONTREAL QC
H1J 1M6

Client: QUEBEC
2230 BOUL. CHAREST O. STE-FOY
QUEBEC QUEBEC
G1N 2G3 CANADA

Date d'analyse:	03/05/2016	**No de série:**	SG-140107-A
Code de produit:	SPG-4MX0024334	**No d`ordre de fabrication:**	16-SGM-1725
Qualité:	CERTIFIE	**Pression:**	6750 kPa (15°C)
Taille:	7AL		1000 psi (21°C)
Raccord de sortie du robinet:	CGA 590	**Volume:**	0,485 m3
		Date d'expiration:	03/05/2019

COMPOSANTS	CONCENTRATION NOMINALE	RÉSULTAT D'ANALYSE
MONOXYDE DE CARBONE	0,8 % molaire	0,798 % molaire
OXYGÈNE	20 % molaire	19,8 % molaire
AZOTE	BALANCE	BALANCE
DIOXYDE DE CARBONE	40 % molaire	39,5 % molaire

Analyse réalisée par:

FREDERIC GAGNON B.Sc.

MÉTHODE D'ANALYSE:

La méthode d'analyse est basée sur le principe de la chromatographie en phase gazeuse comme décrit dans les Instructions d'Opérations de Air Liquide Canada. Selon les besoins,on choisi préférentiellement un détecteur FID ou TCD avec une colonne capillaire ou une colonne remplie.

La teneur en oxygène est mesurée à l'aide d'un analyseur d'oxygène Servomex.

PRÉCISION ANALYTIQUE:

Les spécifications pour les concentrations rapportées sont: +/- 2% pour les constituants en concentration supérieure à 0.5% et +/- 5% pour les constituants en concentration inférieure 0.5%. Sauf indication contraire, la précision d'analyse est indiquée en pourcentage du constituant. Dans certains cas, les valeurs peuvent changer en fonction de la nature, du nombre et de la concentration des constituants du mélange.

AIR LIQUIDE

CERTIFICAT D'ANALYSE

MONTREAL SPECIALTY GAS PLANT
11201 RAY LAWSON
MONTREAL QC
H1J 1M6

Client: QUEBEC
2230 BOUL. CHAREST O. STE-FOY
QUEBEC QUEBEC
G1N 2G3 CANADA

Date d'analyse:	03/05/2016	**No de série:**	SG-130251-A
Code de produit:	SPG-2MX0014570	**No d`ordre de fabrication:**	16-SGM-1718
Qualité:	CERTIFIE	**Pression:**	13500 kPa (15°C)
Taille:	7AL		2000 psi (21°C)
Raccord de sortie du robinet:	CGA 350	**Volume:**	807,0 L
		Date d'expiration:	03/05/2019

COMPOSANTS	CONCENTRATION NOMINALE	RÉSULTAT D'ANALYSE
MONOXYDE DE CARBONE	0,8 % molaire	0,770 % molaire
AZOTE	BALANCE	BALANCE

Analyse réalisée par:

FREDERIC GAGNON B.Sc.

MÉTHODE D'ANALYSE:

La méthode d'analyse est basée sur le principe de la chromatographie en phase gazeuse comme décrit dans les Instructions d'Opérations de Air Liquide Canada. Selon les besoins,on choisi préférentiellement un détecteur FID ou TCD avec une colonne capillaire ou une colonne remplie.

PRÉCISION ANALYTIQUE:

Les spécifications pour les concentrations rapportées sont: +/- 2% pour les constituants en concentration supérieure à 0.5% et +/- 5% pour les constituants en concentration inférieure 0.5%. Sauf indication contraire, la précision d'analyse est indiquée en pourcentage du constituant. Dans certains cas, les valeurs peuvent changer en fonction de la nature, du nombre et de la concentration des constituants du mélange.

AIR LIQUIDE

CERTIFICAT D'ANALYSE

MONTREAL SPECIALTY GAS PLANT
11201 RAY LAWSON
MONTREAL QC
H1J 1M6

Client: QUEBEC
2230 BOUL. CHAREST O. STE-FOY
QUEBEC QUEBEC
G1N 2G3 CANADA

Date d'analyse:	03/05/2016	**No de série:**	SG-130201-A
Code de produit:	SPG-2MX0024331	**No d`ordre de fabrication:**	16-SGM-1727
Qualité:	CERTIFIE	**Pression:**	13500 kPa (15°C)
Taille:	7AL		2000 psi (21°C)
Raccord de sortie du robinet:	CGA 350	**Volume:**	812,0 L
		Date d'expiration:	03/05/2019

COMPOSANTS	CONCENTRATION NOMINALE	RÉSULTAT D'ANALYSE
MONOXYDE DE CARBONE	8 % molaire	7,97 % molaire
AZOTE	BALANCE	BALANCE

Analyse réalisée par:

FREDERIC GAGNON-B.Sc.

MÉTHODE D'ANALYSE:

La méthode d'analyse est basée sur le principe de la chromatographie en phase gazeuse comme décrit dans les Instructions d'Opérations de Air Liquide Canada. Selon les besoins,on choisi préférentiellement un détecteur FID ou TCD avec une colonne capillaire ou une colonne remplie.

PRÉCISION ANALYTIQUE:

Les spécifications pour les concentrations rapportées sont: +/- 2% pour les constituants en concentration supérieure à 0,5% et +/- 5% pour les constituants en concentration inférieure 0.5%. Sauf indication contraire, la précision d'analyse est indiquée en pourcentage du constituant. Dans certains cas, les valeurs peuvent changer en fonction de la nature, du nombre et de la concentration des constituants du mélange.

AIR LIQUIDE

CERTIFICAT D'ANALYSE

MONTREAL SPECIALTY GAS PLANT
11201 RAY LAWSON
MONTREAL QC
H1J 1M6

Client: QUEBEC
2230 BOUL. CHAREST O. STE-FOY
QUEBEC QUEBEC
G1N 2G3 CANADA

Date d'analyse:	03/05/2016	**No de série:**	SG090157A
Code de produit:	SPG-2MX0024332	**No d`ordre de fabrication:**	16-SGM-1726
Qualité:	CERTIFIE	**Pression:**	7571,5 kPa (15°C)
Taille:	7AL		1121 psi (21°C)
Raccord de sortie du robinet:	CGA 580	**Volume:**	886,0 L
		Date d'expiration:	03/05/2019

COMPOSANTS	CONCENTRATION NOMINALE	RÉSULTAT D'ANALYSE
DIOXYDE DE CARBONE	40 % molaire	39,4 % molaire
AZOTE	BALANCE	BALANCE

Analyse réalisée par:

SAMIA AMRANI B.Sc.

MÉTHODE D'ANALYSE:

La méthode d'analyse est basée sur le principe de la chromatographie en phase gazeuse comme décrit dans les Instructions d'Opérations de Air Liquide Canada. Selon les besoins,on choisi préférentiellement un détecteur FID ou TCD avec une colonne capillaire ou une colonne remplie.

PRÉCISION ANALYTIQUE:

Les spécifications pour les concentrations rapportées sont: +/- 2% pour les constituants en concentration supérieure à 0,5% et +/- 5% pour les constituants en concentration inférieure 0,5%. Sauf indication contraire, la précision d'analyse est indiquée en pourcentage du constituant. Dans certains cas, les valeurs peuvent changer en fonction de la nature, du nombre et de la concentration des constituants du mélange.

AIR LIQUIDE

CERTIFICAT D'ANALYSE

MONTREAL SPECIALTY GAS PLANT
11201 RAY LAWSON
MONTREAL QC
H1J 1M6

Client: QUEBEC
2230 BOUL. CHAREST O. STE-FOY
QUEBEC QUEBEC
G1N 2G3 CANADA

Date d'analyse:	02/05/2016	**No de série:**	S980151E
Code de produit:	SPG-2MX0007686	**No d`ordre de fabrication:**	16-SGM-1717
Qualité:	CERTIFIE	**Pression:**	13500 kPa (15°C)
Taille:	7AL		2000 psi (21°C)
Raccord de sortie du robinet:	CGA 580	**Volume:**	860,337 L
		Date d'expiration:	02/05/2019

COMPOSANTS	CONCENTRATION NOMINALE	RÉSULTAT D'ANALYSE
DIOXYDE DE CARBONE	8 % molaire	8,08 % molaire
AZOTE	BALANCE	BALANCE

Analyse réalisée par:

SAMIA AMRANI B.Sc.

MÉTHODE D'ANALYSE:

La méthode d'analyse est basée sur le principe de la chromatographie en phase gazeuse comme décrit dans les Instructions d'Opérations de Air Liquide Canada. Selon les besoins,on choisi préférentiellement un détecteur FID ou TCD avec une colonne capillaire ou une colonne remplie.

PRÉCISION ANALYTIQUE:

Les spécifications pour les concentrations rapportées sont: +/- 2% pour les constituants en concentration supérieure à 0.5% et +/- 5% pour les constituants en concentration inférieure 0.5%. Sauf indication contraire, la précision d'analyse est indiquée en pourcentage du constituant. Dans certains cas, les valeurs peuvent changer en fonction de la nature, du nombre et de la concentration des constituants du mélange.

Date: 2016-06-02

Equipment: Test bench #5
T1 (Flue) Temperature: 75 F
Accuracy: 0.01 R.H.: 48%
Reference: SBI-096

S.D.	0.00	%	
R.M.U.	0.01	%	
O.M.U	**0.38**	**%**	
	Ave A.D.	0.19	%
Standard	Reading	A.D.	
70.0	69.82	0.26	
70.0	69.91	0.12	
70.0	69.93	0.10	

S.D.	0.00	%	
R.M.U.	0.01	%	
O.M.U	**0.23**	**%**	
	Ave A.D.	0.12	%
Standard	Reading	A.D.	
200.0	199.74	0.13	
200.0	199.80	0.10	
200.0	199.78	0.11	

S.D.	0.00	%	
R.M.U.	0.00	%	
O.M.U	**0.04**	**%**	
	Ave A.D.	0.02	%
Standard	Reading	A.D.	
600.0	599.87	0.02	
600.0	599.91	0.01	
600.0	599.92	0.01	

S.D.	0.00	%	
R.M.U.	0.00	%	
O.M.U	**0.00**	**%**	
	Ave A.D.	0.00	%
Standard	Reading	A.D.	
1000.0	1000.00	0.00	
1000.0	1000.03	0.00	
1000.0	1000.02	0.00	

S.D.	0.00	%	
R.M.U.	0.00	%	
O.M.U	**0.00**	**%**	
	Ave A.D.	0.00	%
Standard	Reading	A.D.	
1400.0	1399.99	0.00	
1400.0	1399.99	0.00	
1400.0	1399.99	0.00	

Vincent Pelletier

Date: 2016-06-02

Equipment: Test bench #5
T2 (Ambiant) Temperature: 75 F
Accuracy: 0.01 R.H.: 48%
Reference: SBI-096

S.D.	0.00	%	
R.M.U.	0.01	%	
O.M.U	**0.79**	**%**	
	Ave A.D.	0.40	%
Standard	Reading	A.D.	
70.0	69.70	0.43	
70.0	69.75	0.36	
70.0	69.74	0.37	

S.D.	0.00	%	
R.M.U.	0.01	%	
O.M.U	**0.39**	**%**	
	Ave A.D.	0.19	%
Standard	Reading	A.D.	
200.0	199.60	0.20	
200.0	199.62	0.19	
200.0	199.61	0.20	

S.D.	0.00	%	
R.M.U.	0.00	%	
O.M.U	**0.10**	**%**	
	Ave A.D.	0.05	%
Standard	Reading	A.D.	
600.0	599.69	0.05	
600.0	599.72	0.05	
600.0	599.70	0.05	

S.D.	0.00	%	
R.M.U.	0.00	%	
O.M.U	**0.03**	**%**	
	Ave A.D.	0.02	%
Standard	Reading	A.D.	
1000.0	999.82	0.02	
1000.0	999.84	0.02	
1000.0	999.81	0.02	

S.D.	0.00	%	
R.M.U.	0.00	%	
O.M.U	**0.03**	**%**	
	Ave A.D.	0.02	%
Standard	Reading	A.D.	
1400.0	1399.80	0.01	
1400.0	1399.76	0.02	
1400.0	1399.75	0.02	

Vincent Pelletier

Date: 2016-06-02

Equipment: Test bench #5
T3 (Dilution tunnel) Temperature: 75 F
Accuracy: 0.01 R.H.: 48%
Reference: SBI-096

S.D.	0.01	%	
R.M.U.	0.01	%	
O.M.U	**1.08**	**%**	
	Ave A.D.	0.54	%
Standard	Reading	A.D.	
70.0	69.60	0.57	
70.0	69.64	0.52	
70.0	69.64	0.52	

S.D.	0.00	%	
R.M.U.	0.01	%	
O.M.U	**0.49**	**%**	
	Ave A.D.	0.25	%
Standard	Reading	A.D.	
200.0	199.50	0.25	
200.0	199.52	0.24	
200.0	199.51	0.25	

S.D.	0.00	%	
R.M.U.	0.00	%	
O.M.U	**0.13**	**%**	
	Ave A.D.	0.06	%
Standard	Reading	A.D.	
600.0	599.62	0.06	
600.0	599.62	0.06	
600.0	593.62	1.06	

S.D.	0.00	%	
R.M.U.	0.00	%	
O.M.U	**0.06**	**%**	
	Ave A.D.	0.03	%
Standard	Reading	A.D.	
1000.0	999.71	0.03	
1000.0	999.70	0.03	
1000.0	999.67	0.03	

S.D.	0.00	%	
R.M.U.	0.00	%	
O.M.U	**0.05**	**%**	
	Ave A.D.	0.03	%
Standard	Reading	A.D.	
1400.0	1399.64	0.03	
1400.0	1399.63	0.03	
1400.0	1399.58	0.03	

Vincent Pelletier

Date: 2016-06-02

Equipment: Test bench #5
T4 (Firebox top) Temperature: 75 F
Accuracy: 0.01 R.H.: 48%
Reference: SBI-096

S.D.	0.01	%	
R.M.U.	0.01	%	
O.M.U	**1.35**	**%**	
	Ave A.D.	0.67	%
Standard	Reading	A.D.	
70.0	69.56	0.63	
70.0	69.50	0.72	
70.0	69.54	0.66	

S.D.	0.00	%	
R.M.U.	0.01	%	
O.M.U	**0.61**	**%**	
	Ave A.D.	0.31	%
Standard	Reading	A.D.	
200.0	199.39	0.31	
200.0	199.39	0.31	
200.0	199.40	0.30	

S.D.	0.00	%	
R.M.U.	0.00	%	
O.M.U	**0.18**	**%**	
	Ave A.D.	0.09	%
Standard	Reading	A.D.	
600.0	599.46	0.09	
600.0	599.47	0.09	
600.0	599.48	0.09	

S.D.	0.00	%	
R.M.U.	0.00	%	
O.M.U	**0.09**	**%**	
	Ave A.D.	0.05	%
Standard	Reading	A.D.	
1000.0	999.53	0.05	
1000.0	999.53	0.05	
1000.0	999.56	0.04	

S.D.	0.00	%	
R.M.U.	0.00	%	
O.M.U	**0.08**	**%**	
	Ave A.D.	0.04	%
Standard	Reading	A.D.	
1400.0	1399.46	0.04	
1400.0	1399.46	0.04	
1400.0	1399.45	0.04	

Vincent Pelletier

Date: 2016-06-02

Equipment: Test bench #5
T5 (Firebox back) Temperature: 75 F
Accuracy: 0.01 R.H.: 48%
Reference: SBI-096

S.D.	0.01	%	
R.M.U.	0.01	%	
O.M.U	**1.79**	**%**	
	Ave A.D.	0.89	%
Standard	Reading	A.D.	
70.0	69.33	0.95	
70.0	69.41	0.84	
70.0	69.41	0.85	

S.D.	0.00	%	
R.M.U.	0.01	%	
O.M.U	**0.74**	**%**	
	Ave A.D.	0.37	%
Standard	Reading	A.D.	
200.0	199.25	0.38	
200.0	199.28	0.36	
200.0	199.27	0.37	

S.D.	0.00	%	
R.M.U.	0.00	%	
O.M.U	**0.22**	**%**	
	Ave A.D.	0.11	%
Standard	Reading	A.D.	
600.0	599.34	0.11	
600.0	599.34	0.11	
600.0	599.33	0.11	

S.D.	0.00	%	
R.M.U.	0.00	%	
O.M.U	**0.12**	**%**	
	Ave A.D.	0.06	%
Standard	Reading	A.D.	
1000.0	999.41	0.06	
1000.0	999.41	0.06	
1000.0	999.40	0.06	

S.D.	0.00	%	
R.M.U.	0.00	%	
O.M.U	**0.10**	**%**	
	Ave A.D.	0.05	%
Standard	Reading	A.D.	
1400.0	1399.30	0.05	
1400.0	1399.30	0.05	
1400.0	1399.28	0.05	

Vincent Pelletier

Date: 2016-06-02

Equipment: Test bench #5
T6 (Firebox right) Temperature: 75 F
Accuracy: 0.01 R.H.: 48%
Reference: SBI-096

S.D.	0.01	%	
R.M.U.	0.01	%	
O.M.U	**1.88**	**%**	
	Ave A.D.	0.94	%
Standard	Reading	A.D.	
70.0	69.36	0.92	
70.0	69.33	0.96	
70.0	69.34	0.94	

S.D.	0.00	%	
R.M.U.	0.01	%	
O.M.U	**0.80**	**%**	
	Ave A.D.	0.40	%
Standard	Reading	A.D.	
200.0	199.19	0.40	
200.0	199.22	0.39	
200.0	199.20	0.40	

S.D.	0.00	%	
R.M.U.	0.00	%	
O.M.U	**0.24**	**%**	
	Ave A.D.	0.12	%
Standard	Reading	A.D.	
600.0	599.29	0.12	
600.0	599.26	0.12	
600.0	599.26	0.12	

S.D.	0.00	%	
R.M.U.	0.00	%	
O.M.U	**0.13**	**%**	
	Ave A.D.	0.07	%
Standard	Reading	A.D.	
1000.0	999.34	0.07	
1000.0	999.33	0.07	
1000.0	999.33	0.07	

S.D.	0.00	%	
R.M.U.	0.00	%	
O.M.U	**0.11**	**%**	
	Ave A.D.	0.06	%
Standard	Reading	A.D.	
1400.0	1399.22	0.06	
1400.0	1399.21	0.06	
1400.0	1399.26	0.05	

Vincent Pelletier

Date: 2016-06-02

Equipment: Test bench #5
T7 (Firebox left) Temperature: 75 F
Accuracy: 0.01 R.H.: 48%
Reference: SBI-096

S.D.	0.01	%	
R.M.U.	0.01	%	
O.M.U	**2.00**	**%**	
	Ave A.D.	1.00	%
Standard	Reading	A.D.	
70.0	69.28	1.03	
70.0	69.32	0.97	
70.0	69.30	1.00	

S.D.	0.01	%	
R.M.U.	0.01	%	
O.M.U	**0.83**	**%**	
	Ave A.D.	0.42	%
Standard	Reading	A.D.	
200.0	199.16	0.42	
200.0	199.18	0.41	
200.0	199.15	0.42	

S.D.	0.00	%	
R.M.U.	0.00	%	
O.M.U	**0.26**	**%**	
	Ave A.D.	0.13	%
Standard	Reading	A.D.	
600.0	599.19	0.13	
600.0	599.22	0.13	
600.0	599.22	0.13	

S.D.	0.00	%	
R.M.U.	0.00	%	
O.M.U	**0.15**	**%**	
	Ave A.D.	0.07	%
Standard	Reading	A.D.	
1000.0	999.26	0.07	
1000.0	999.27	0.07	
1000.0	999.25	0.07	

S.D.	0.00	%	
R.M.U.	0.00	%	
O.M.U	**0.12**	**%**	
	Ave A.D.	0.06	%
Standard	Reading	A.D.	
1400.0	1399.14	0.06	
1400.0	1399.14	0.06	
1400.0	1399.11	0.06	

Vincent Pelletier

Date: 2016-06-02

Equipment: Test bench #5
T8 (Firebox bottom) Temperature: 75 F
Accuracy: 0.01 R.H.: 48%
Reference: SBI-096

S.D.	0.01	%	
R.M.U.	0.01	%	
O.M.U	**2.23**	**%**	
	Ave A.D.	1.11	%
Standard	Reading	A.D.	
70.0	69.22	1.11	
70.0	69.22	1.11	
70.0	69.22	1.11	

S.D.	0.01	%	
R.M.U.	0.01	%	
O.M.U	**0.92**	**%**	
	Ave A.D.	0.46	%
Standard	Reading	A.D.	
200.0	199.09	0.46	
200.0	199.07	0.46	
200.0	199.08	0.46	

S.D.	0.00	%	
R.M.U.	0.00	%	
O.M.U	**0.30**	**%**	
	Ave A.D.	0.15	%
Standard	Reading	A.D.	
600.0	599.11	0.15	
600.0	599.12	0.15	
600.0	599.13	0.14	

S.D.	0.00	%	
R.M.U.	0.00	%	
O.M.U	**0.17**	**%**	
	Ave A.D.	0.08	%
Standard	Reading	A.D.	
1000.0	999.17	0.08	
1000.0	999.17	0.08	
1000.0	999.16	0.08	

S.D.	0.00	%	
R.M.U.	0.00	%	
O.M.U	**0.14**	**%**	
	Ave A.D.	0.07	%
Standard	Reading	A.D.	
1400.0	1399.03	0.07	
1400.0	1399.02	0.07	
1400.0	1399.03	0.07	

Vincent Pelletier

Date: 2016-06-02

Equipment: Test bench #5
T11 (Probe temp 1) Temperature: 75 F
Accuracy: 0.01 R.H.: 48%
Reference: SBI-096

S.D.	0.02	%	
R.M.U.	0.01	%	
O.M.U	**2.85**	**%**	
	Ave A.D.	1.43	%
Standard	Reading	A.D.	
70.0	68.94	1.51	
70.0	69.06	1.34	
70.0	69.03	1.39	

S.D.	0.01	%	
R.M.U.	0.01	%	
O.M.U	**1.13**	**%**	
	Ave A.D.	0.56	%
Standard	Reading	A.D.	
200.0	198.86	0.57	
200.0	198.89	0.56	
200.0	198.90	0.55	

S.D.	0.00	%	
R.M.U.	0.00	%	
O.M.U	**0.40**	**%**	
	Ave A.D.	0.20	%
Standard	Reading	A.D.	
600.0	598.67	0.22	
600.0	598.94	0.18	
600.0	598.93	0.18	

S.D.	0.00	%	
R.M.U.	0.00	%	
O.M.U	**0.21**	**%**	
	Ave A.D.	0.10	%
Standard	Reading	A.D.	
1000.0	998.96	0.10	
1000.0	998.97	0.10	
1000.0	998.98	0.10	

S.D.	0.00	%	
R.M.U.	0.00	%	
O.M.U	**0.18**	**%**	
	Ave A.D.	0.09	%
Standard	Reading	A.D.	
1400.0	1398.72	0.09	
1400.0	1398.82	0.08	
1400.0	1398.81	0.09	

Vincent Pelletier

Date: 2016-06-02

Equipment: Test bench #5
T14 (Probe temp 2) Temperature: 75 F
Accuracy: 0.01 R.H.: 48%
Reference: SBI-096

S.D.	0.02	%	
R.M.U.	0.01	%	
O.M.U	**3.11**	**%**	
	Ave A.D.	1.55	%
Standard	Reading	A.D.	
70.0	68.90	1.57	
70.0	68.92	1.54	
70.0	68.84	1.65	

S.D.	0.01	%	
R.M.U.	0.01	%	
O.M.U	**1.24**	**%**	
	Ave A.D.	0.62	%
Standard	Reading	A.D.	
200.0	198.75	0.62	
200.0	198.77	0.61	
200.0	198.78	0.61	

S.D.	0.00	%	
R.M.U.	0.00	%	
O.M.U	**0.40**	**%**	
	Ave A.D.	0.20	%
Standard	Reading	A.D.	
600.0	598.80	0.20	
600.0	598.81	0.20	
600.0	598.80	0.20	

S.D.	0.00	%	
R.M.U.	0.00	%	
O.M.U	**0.23**	**%**	
	Ave A.D.	0.12	%
Standard	Reading	A.D.	
1000.0	998.84	0.12	
1000.0	998.84	0.12	
1000.0	998.81	0.12	

S.D.	0.00	%	
R.M.U.	0.00	%	
O.M.U	**0.17**	**%**	
	Ave A.D.	0.09	%
Standard	Reading	A.D.	
1400.0	1398.70	0.09	
1400.0	1398.89	0.08	
1400.0	1398.78	0.09	

Vincent Pelletier

Date: 2016-06-02

Equipment: Test bench #5
T15 (Spare 1) Temperature: 75 F
Accuracy: 0.01 R.H.: 48%
Reference: SBI-096

S.D.	0.02	%	
R.M.U.	0.01	%	
O.M.U	**3.01**	**%**	
	Ave A.D.	1.51	%
Standard	Reading	A.D.	
70.0	68.83	1.67	
70.0	69.06	1.35	
70.0	68.71	1.84	

S.D.	0.01	%	
R.M.U.	0.01	%	
O.M.U	**1.25**	**%**	
	Ave A.D.	0.63	%
Standard	Reading	A.D.	
200.0	198.78	0.61	
200.0	198.72	0.64	
200.0	198.79	0.60	

S.D.	0.00	%	
R.M.U.	0.00	%	
O.M.U	**0.38**	**%**	
	Ave A.D.	0.19	%
Standard	Reading	A.D.	
600.0	598.89	0.18	
600.0	598.83	0.20	
600.0	598.83	0.19	

S.D.	0.00	%	
R.M.U.	0.00	%	
O.M.U	**0.23**	**%**	
	Ave A.D.	0.12	%
Standard	Reading	A.D.	
1000.0	998.81	0.12	
1000.0	998.86	0.11	
1000.0	998.87	0.11	

S.D.	0.00	%	
R.M.U.	0.00	%	
O.M.U	**0.17**	**%**	
	Ave A.D.	0.09	%
Standard	Reading	A.D.	
1400.0	1398.76	0.09	
1400.0	1398.81	0.09	
1400.0	1398.71	0.09	

Vincent Pelletier

Date: 2016-06-02

Equipment: Test bench #5
T16 (Spare 2) Temperature: 75 F
Accuracy: 0.01 R.H.: 48%
Reference: SBI-096

S.D.	0.02	%	
R.M.U.	0.01	%	
O.M.U	**2.83**	**%**	
	Ave A.D.	1.42	%
Standard	Reading	A.D.	
70.0	69.03	1.39	
70.0	68.99	1.44	
70.0	68.99	1.44	

S.D.	0.01	%	
R.M.U.	0.01	%	
O.M.U	**1.15**	**%**	
	Ave A.D.	0.57	%
Standard	Reading	A.D.	
200.0	198.85	0.58	
200.0	198.86	0.57	
200.0	198.90	0.55	

S.D.	0.00	%	
R.M.U.	0.00	%	
O.M.U	**0.37**	**%**	
	Ave A.D.	0.18	%
Standard	Reading	A.D.	
600.0	598.89	0.18	
600.0	598.90	0.18	
600.0	598.85	0.19	

S.D.	0.00	%	
R.M.U.	0.00	%	
O.M.U	**0.21**	**%**	
	Ave A.D.	0.11	%
Standard	Reading	A.D.	
1000.0	998.92	0.11	
1000.0	998.94	0.11	
1000.0	998.83	0.12	

S.D.	0.00	%	
R.M.U.	0.00	%	
O.M.U	**0.18**	**%**	
	Ave A.D.	0.09	%
Standard	Reading	A.D.	
1400.0	1398.75	0.09	
1400.0	1398.76	0.09	
1400.0	1398.83	0.08	

Vincent Pelletier

Thermal Metering System Calibration
Y factor for Method 5G sampling

Manufacturer:	American Meter Company
Model:	DTM-200A
Serial Number:	90R054300

Previous Calibration Comparision

Date	2015-09-08	Acceptable	
		Deviation (5%)	Deviation
y Factor	0.994	0.0497	0.009
Acceptance			

Average Gas Meter y Factor
1.003

Calibration Date:	03-30-16
Calibrated by:	Vincent Pelletier
Calibration Frequency:	6-months
Next Calibration Due:	03-08-16
Instrument Range:	1.000 cfm
Standard Temp.:	73 oF
Standard Press.:	29.92 "Hg
Barometric Press.:	30.09 "Hg
Signature/Date:	Vincent Pelletier 2016-03-30

Current Calibration

Acceptable y Deviation	0.050
Maximum y Deviation	0.023
Acceptance	Acceptable

Reference Standard *		
Standard Calibrator	Model	Standard Test Meter
	S/N	07J264834
	Calib. Date	Sept. 02, 2015
	Calib. Value	0.9931 y factor (ref)

Calibration Parameters	Run 1	Run 2	Run 3
Vacuum ("Hg)	0.00	0.00	0.00
dH ("H2O)	0.00	0.00	0.00
Initial Reference Meter	579.840	584.385	589.425
Final Reference Meter	584.385	589.425	614.643
Initial DGM	467.453	471.857	476.954
Final DGM	471.857	476.954	501.989
Temp. Ref. Meter (°F), Tr	66.6	70.9	71.9
Temperature DGM (°F), Td	67.0	69.5	73.4
Time (Minutes)	102.0	40.0	91.0
Net Volume Ref. Meter, Vr	4.545	5.040	25.218
Net Volume DGM, Vd	4.404	5.097	25.035
Gas Meter y Factor =	**1.026**	**0.979**	**1.003**
Gas Meter y Factor Deviation (from avg.)	0.023	0.023	0.000
Orifice dH@	**0.00**	**0.00**	**0.00**
Orifice dH@ Deviation (from avg.)	0.000	0.000	0.000

where: 0.043176471

1. Deviation = |Average value for all runs - current run value|
2. y = [Vr x (y factor (ref)) x (Pb) x (Td + 460) / [Vd x (Pb + (dH / 13.6)) x (Tr + 460]
3. dH@ = 0.0317 x dH / (Pb (Td + 460)) x [(Tr + 460) x time) / Vr]^2

* Reference calibration is traceable to NIST through NIST Test # 40674, Kimble ASTM E1272

Dry Gas Metering System Calibration
Y factor for Method 5G sampling

Manufacturer:	American Meter Company
Model:	DTM-200A
Serial Number:	98Z332226

Previous Calibration Comparision

Date	2015-09-08	Acceptable	
		Deviation (5%)	Deviation
y Factor	1.000	0.05	0.006
Acceptance			

Average Gas Meter y Factor

1.006

Calibration Date:	03-30-16
Calibrated by:	Vincent Pelletier
Calibration Frequency:	6-months
Next Calibration Due:	09-26-16
Instrument Range:	1.000 cfm
Standard Temp.:	73 oF
Standard Press.:	29.92 "Hg
Barometric Press.:	30.09 "Hg
Signature/Date:	Vincent Pelletier 2016-03-30

Current Calibration

Acceptable y Deviation	0.050
Maximum y Deviation	0.014
Acceptance	Acceptable

Reference Standard *		
Standard Calibrator	Model	Standard Test Meter
	S/N	07J264834
	Calib. Date	Sept. 02, 2015
	Calib. Value	0.9931 y factor (ref)

Calibration Parameters	Run 1	Run 2	Run 3
Vacuum ("Hg)	0.00	0.00	0.00
dH ("H2O)	0.00	0.00	0.00
Initial Reference Meter	614.643	667.231	672.581
Final Reference Meter	667.231	672.581	692.897
Initial DGM	956.596	1008.026	1013.254
Final DGM	1008.026	1013.254	1033.598
Temp. Ref. Meter (°F), Tr	73.3	72.2	69.0
Temperature DGM (°F), Td	73.8	69.4	69.2
Time (Minutes)	1028.0	35.0	67.0
Net Volume Ref. Meter, Vr	52.588	5.350	20.316
Net Volume DGM, Vd	51.43	5.228	20.344
Gas Meter y Factor =	**1.016**	**1.011**	**0.992**
Gas Meter y Factor Deviation (from avg.)	0.010	0.004	0.014
Orifice dH@	**0.00**	**0.00**	**0.00**
Orifice dH@ Deviation (from avg.)	0.000	0.000	0.000

where: 0.050029183

1. Deviation = |Average value for all runs - current run value|
2. y = [Vr x (y factor (ref)) x (Pb) x (Td + 460) / [Vd x (Pb + (dH / 13.6)) x (Tr + 460]
3. dH@ = 0.0317 x dH / (Pb (Td + 460)) x [(Tr + 460) x time) / Vr]^2

* Reference calibration is traceable to NIST through NIST Test # 40674, Kimble ASTM E1272

Ulrich Métrologie inc.
Ulrich Metrology Inc.
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Montréal (Québec) H8T 1A1

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Fax (514) 631-6122
info@ulrich.ca
www.ulrich.ca

ACCREDITATION ISO 17025
SCC Scope Number 220

CALIBRATION CERTIFICATE

Certificate no.:	525294	**Calibration date:**	April 07, 2016
Identification:	SBI-096	**Certificate issued:**	April 07, 2016
Description:	CALIBRATOR, OMEGA CL23A	**Interval:**	12 months
Size:	TC K/J/T	**Due date:**	April 07, 2017
Manufacturer:	OMEGA	**Procedure no.:**	MET/CAL
Model no.:	CL23A	**Environment:**	CLAS Type 2 Laboratory
Serial no.:	T-256137	**Temperature:**	23 ± 2°C
		Humidity:	35 - 55% RH
		Metrologist:	YUK

Property of: SBI
250 RUE DE COPENHAGUE
ST-AUGUSTIN-DE-DESMAURES, QC G3A 2H3

Approved by: David Llorens, Quality Manager

This calibration certificate is issued in accordance with the applicable requirements of ISO/IEC 17025 and Ulrich Metrology's quality manual QM-09 Revision 9. Measurement results provided are traceable to either the National Research Council Canada (NRC), the National Institute of Standards and Technology (NIST), a national laboratory of another country signatory to the CIPM Mutual Recognition Arrangement (MRA), or a calibration laboratory accredited by an accrediting body with which Canada has an equivalence agreement.

CALIBRATION STANDARDS

See notes below.

MEASUREMENT UNCERTAINTY

The above listed instrument meets or exceeds all specifications as stated in the reference procedure, unless noted otherwise. For measurement results associated with the conformance to a tolerance, the uncertainty in the measurement system did not exceed 25% (4:1 test uncertainty ratio) of the acceptable tolerance for each characteristic calibrated, unless otherwise noted in the report.

CALIBRATION DATA

See next page for measurement results.

Notes:

9V battery replaced.

166727 P

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www.ulrich.ca

CALIBRATION DATA

Certificate no.: 525294
Identification: SBI-096
Description: CALIBRATOR THERMOMETER
Serial no.: T-256137
Procedure: Omega CL23A: 5520A-M

Result: PASS
Condition: FOUND-LEFT

CALIBRATION STANDARDS

Identification	Description	Manufacturer	Model no.	Cal. Date	Due Date
7870009	CALIBRATOR	FLUKE	5520A	2016/01/06	2017/01/31

MEASUREMENT RESULTS (Per MET/CAL)

PARAMETER	TRUE VALUE	TEST RESULT	ACCEPTANCE LIMITS LOW	HIGH	PASS/ FAIL	TUR
Temperature measurements are performed by electrical simulation.						
DISPLAY CALIBRATION						
Did all segments of the display illuminate?						
Result of Operator Evaluation					PASS	
THERMOMETER CALIBRATION						
K Type Thermocouple						
-200.0degF		-200.1	-201.0	-199.0	PASS	1.7
-60.0degF		-59.9	-61.0	-59.0	PASS	3.1
-40.0degF		-40.0	-40.5	-39.5	PASS	1.5
32.0degF		31.9	31.5	32.5	PASS	1.7
1240.0degF		1240.0	1239.5	1240.5	PASS	1.1
1260.0degF		1260.0	1259.5	1260.5	PASS	1.1
2500.0degF		2500.0	2499.0	2501.0	PASS	1.4
J Type Thermocouple						
-200.0degF		-200.3	-201.0	-199.0	PASS	2.1
-60.0degF		-60.0	-61.0	-59.0	PASS	3.5
-40.0degF		-40.1	-40.5	-39.5	PASS	1.7
32.0degF		31.9	31.5	32.5	PASS	2.0
1240.0degF		1239.9	1239.5	1240.5	PASS	1.6
1260.0degF		1259.9	1259.5	1260.5	PASS	1.6
1400.0degF		1399.8	1399.4	1400.6	PASS	1.8
T Type Thermocouple						
-200.0degF		-199.9	-201.0	-199.0	PASS	2.3
-60.0degF		-59.8	-61.0	-59.0	PASS	2.3
-40.0degF		-40.0	-40.5	-39.5	PASS	1.2
32.0degF		32.0	31.5	32.5	PASS	1.7
750.0degF		749.9	749.5	750.5	PASS	2.0
CALIBRATOR CALIBRATION						
K Type Thermocouple						
-200.0degF		-199.7	-201.0	-199.0	PASS	1.7
-60.0degF		-59.9	-61.0	-59.0	PASS	3.1
-40.0degF		-39.9	-40.5	-39.5	PASS	1.5
32.0degF		32.0	31.5	32.5	PASS	1.7

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PARAMETER	TRUE VALUE	TEST RESULT	ACCEPTANCE LIMITS LOW	HIGH	PASS/ FAIL	TUR
1240.0degF		1240.2	1239.5	1240.5	PASS	1.1
1260.0degF		1260.2	1259.5	1260.5	PASS	1.1
2500.0degF		2500.5	2499.0	2501.0	PASS	1.4
J Type Thermocouple						
-200.0degF		-200.2	-201.0	-199.0	PASS	2.1
-60.0degF		-60.2	-61.0	-59.0	PASS	3.5
-40.0degF		-40.1	-40.5	-39.5	PASS	1.7
32.0degF		31.8	31.5	32.5	PASS	2.0
1240.0degF		1240.1	1239.5	1240.5	PASS	1.6
1260.0degF		1260.1	1259.5	1260.5	PASS	1.6
1400.0degF		1399.9	1399.4	1400.6	PASS	1.8
T Type Thermocouple						
-200.0degF		-200.3	-201.0	-199.0	PASS	2.3
-60.0degF		-60.3	-61.0	-59.0	PASS	2.3
-40.0degF		-40.1	-40.5	-39.5	PASS	1.2
32.0degF		31.7	31.5	32.5	PASS	1.7
750.0degF		749.8	749.5	750.5	PASS	2.0

End of Test Data

MICRO PRECISION CALIBRATION INC.

MICRO PRECISION CALIBRATION
22835 INDUSTRIAL PLACE
GRASS VALLEY CA 95949
530-268-1860

ACCREDITED
Calibration Laboratory
CERT # 935.01

Certificate of Calibration

Date: Apr 22, 2016 **Cert No. 222200812318776**

Customer:

STOVE BUILDERS INTERNATIONAL INC.

PORTES 11-12
250 DE COPENHAGUE
SAINT-AUGUSTIN-DE-DESMAURES QC G3A 2H3

MPC Control #:	DA5991
Asset ID:	SBI-097
Gage Type:	ANEMOMETER
Manufacturer:	EUROTRON INSTRUMENTS
Model Number:	VT 50
Size:	N/A
Temp/RH:	68.0°F / 43.0%

Work Order #:	SAC-70078354
Purchase Order #:	REWORK
Serial Number:	79977
Department:	N/A
Performed By:	ERICK CONKLIN
Received Condition:	IN TOLERANCE
Returned Condition:	IN TOLERANCE
Cal. Date:	April 22, 2016
Cal. Interval:	12 MONTHS
Cal. Due Date:	April 22, 2017

Calibration Notes:

Test Points

Seq.	Description	Standard	Tolerance -	Tolerance +	As Found	As Left	UOM	Result	Uncertainty
1	Temperature Tested at:(Deg F)	-4.0	-4.7	-3.3	-3.7	-3.7	Deg F	Passed	0.05
2	Tested at: (Deg F)	45.0	43.5	46.5	45.9	45.9	Deg F	Passed	0.05
3	Tested at: (Deg F)	90.0	87.6	92.4	91.2	91.2	Deg F	Passed	0.05
4	Tested at: (Deg F)	135.0	131.7	138.3	133.2	133.2	Deg F	Passed	0.05
5	Tested at: (Deg F)	176.0	171.8	180.1	173.4	173.4	Deg F	Passed	0.05
6	Air Velocity Tested At:	500	473	527	489	489	Fpm	Passed	14.5
7	Air Velocity Tested At:	1,000	930	1070	982	982	Fpm	Passed	29
8	Air Velocity Tested At:	2,000	1900	2100	1,984	1,984	Fpm	Passed	58
9	Air Velocity Tested At:	3,000	2870	3130	2,952	2,952	Fpm	Passed	87
10	Air Velocity Tested At:	4,000	3840	4160	4,020	4,020	Fpm	Passed	80
11	Air Velocity Tested At:	5,000	4810	5190	4,879	4,879	Fpm	Passed	100
12	Air Velocity Tested At:	6,000	5780	6220	5,963	5,963	Fpm	Passed	120

Calibrating Technician: Erick Conklin

ERICK CONKLIN

QC Approval: Robert S Means

Robert Means

The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k=2, which for normal distribution corresponds to a coverage probability of approximately 95%. The standard uncertainty of measurement has been determined in accordance with EA's Publication and NIST Technical Note 1297, 1994 Edition. Services rendered comply with ISO 17025:2005, ANSI/NCSL Z540-1, MPC Quality Manual, MPC CSD and with customer purchase order instructions.

Calibration cycles and resulting due dates were submitted/approved by the customer. Any number of factors may cause an instrument to drift out of tolerance before the next scheduled calibration. Recalibration cycles should be based on frequency of use, environmental conditions and customer's established systematic accuracy. The information on this report, pertains only to the instrument identified.

MICRO PRECISION CALIBRATION INC.

MICRO PRECISION CALIBRATION
22835 INDUSTRIAL PLACE
GRASS VALLEY CA 95949
530-268-1860

ACCREDITED
Calibration Laboratory
CERT # 935.01

Certificate of Calibration

Date: Apr 22, 2016 **Cert No. 222200812318776**

Standards Used to Calibrate Equipment

I.D.	Description.	Model	Serial	Manufacturer	Cal. Due Date	Traceability #
CR6800	HUMIDITY GENERATOR/ ENVIRONMENTAL CHAMBER	2500	0012263	THUNDER SCIENTIFIC CORPORATION	Aug 7, 2016	222008122801952
CL7456	STANDARD PLATINUM RESISTANCE THERMOMETER PROBE	5681	1595	FLUKE	Dec 4, 2016	A7B16006
CL7223	BLACK STACK	1560/2560	A07486/A07485/A07728	HART SCIENTIFIC, INC.	Nov 2, 2016	222008122718022
CJ5100	WIND TUNNEL WITH CONTROLLER	JS-500	375/305	INTERACTIVE INSTRUMENTS	Oct 29, 2016	222008122715516
AE2821	ANEMOMETER	AM-4822	N272316	LANDTEK	Oct 29, 2016	222008122715506

Procedures Used in this Event

Procedure Name	Description
CUSTOMER SPECIFICATIONS	Customer Specifications

Calibrating Technician: Erick Conklin

ERICK CONKLIN

QC Approval: Robert S Means

Robert Means

The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k=2, which for normal distribution corresponds to a coverage probability of approximately 95%. The standard uncertainty of measurement has been determined in accordance with EA's Publication and NIST Technical Note 1297, 1994 Edition. Services rendered comply with ISO 17025:2005, ANSI/NCSL Z540-1, MPC Quality Manual, MPC CSD and with customer purchase order instructions.

Calibration cycles and resulting due dates were submitted/approved by the customer. Any number of factors may cause an instrument to drift out of tolerance before the next scheduled calibration. Recalibration cycles should be based on frequency of use, environmental conditions and customer's established systematic accuracy. The information on this report, pertains only to the instrument identified.

All standards are traceable to SI through the National Institute of Standards and Technology (NIST) and/or recognized national or international standards laboratories. Services rendered include proper manufacturer's service instruction and are warranted for no less than thirty (30) days. This report may not be reproduced in part or in a whole without the prior written approval of the issuing MPC lab.

(CERT, Rev 3)

CERTIFICATE OF NIST TRACEABLE CALIBRATION

Calibration Certificate No: 51068

LABORATORY ACCREDITATION BUREAU a division of A-S-B
ACCREDITED ISO/IEC 17025
Certificate # L2115-1 Calibration

Customer Information

Customer: SBI St-Augustin

Address : 250, De Copenhague
Doors 11-12
St-Augustin-de-Desmaures

Customer PO #: 45864

Calibration Procedure Information

Procedure ID: GTP FLOW_INDI Revision #: 7 Revision Date: 1/6/2013

Calibration Standards Information

Graftel ID	Manufacturer	Model #	Description	CAL Due
10126	Graftel	N/A	LFE-D System	7/6/2016
10126-T	Graftel	9202	Temperature Sensor	8/17/2018
51202	Paroscientific	760-100A	Pressure, 100 Psia	8/17/2016
10127	Furness	352	Delta P	7/6/2016
60030	Paroscientific	760-100A	Pressure, 100 psia	5/7/2016
10159	HOBO	U12-011	Environment Monitor System	11/18/2015

Sensor Information

Manufacturer: American Meter Description: Gas Meter Method Used: Laminar

Model #: DTM-200A Rated Accuracy: ± 1 % of Reading Accuracy Specified By: AmericanMeter

Instrument ID#: SBI-103 Range: 0 to 250 scfh Condition: Functional

Serial #: 07J264834

Comments: Calibration Date: 09/02/2015

The instruments(s) listed on this certificate have been calibrated against standards traceable to the National Institue of Standards & Technology (NIST) or compared to nationally or internationally recognized consensus standards. The reported calibration uncertainty has a confidence level of 95% (k=2). A calibration uncertainty ratio of 4:1 was maintained unless required uncertainty is supported by analysis. Graftel, LLC. Quality Assurance System complies with applicable requirements of ISO/IEC-17025-2005, ANSI/NCSL Z540-I-1994 and ISO 9001: 2008. All results contained within this certificate relate only to item(s) calibrated. This certificate shall not be reproduced except in full and with the written consent of Graftel, LLC. Acceptance Criteria per Simple Acceptance Rule: Measurement Uncertainty is not applied to the measured value when in/out of tolerance statement is made.

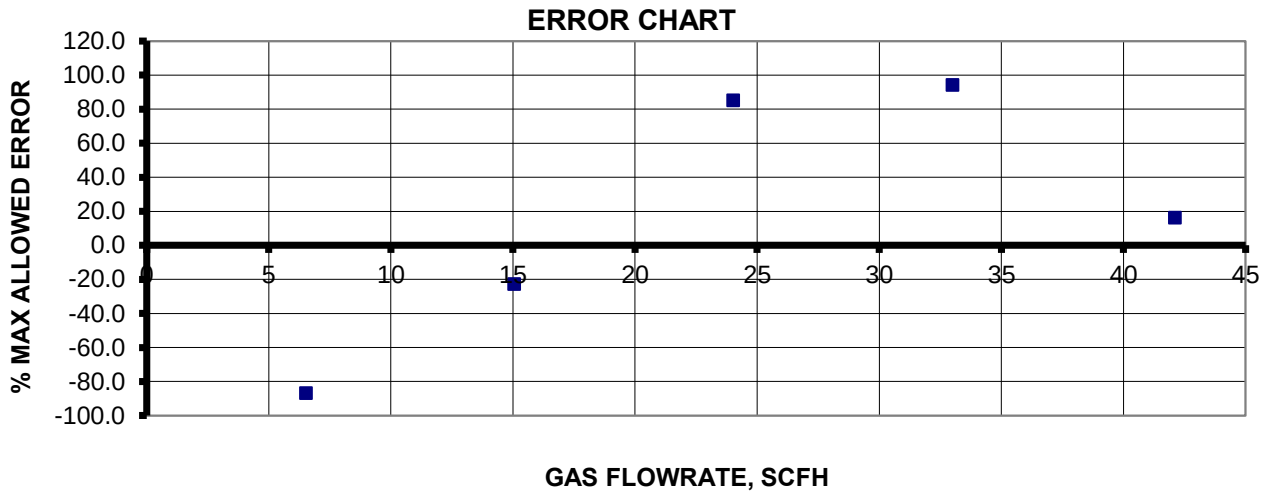
Performed By: _____ Date: 9/2/2015

I.B. Caoili
Calibration Technician

GRAFTEL, LLC. 870 Cambridge Drive, Elk Grove Village, IL 60007 847.364.2600
www.graftel.com

ATTACHMENT TO CALIBRATION CERTIFICATE 51068
AS FOUND / AS LEFT DATA

Air Flow Rate From Standard, scfh	Air Vol From Standard, scf	Air Vol From Meter, cf	Air vol From Meter, scf	Diff Air Vol STD - METER scf	% Proof	Measurement Uncertainty, scf	STATUS
6.527	0.287	0.3	0.289	-0.002	99.138	0.002	Pass
15.052	0.967	1.0	0.969	-0.002	99.773	0.005	Pass
24.025	0.984	1.0	0.976	0.008	100.859	0.005	Pass
33.003	1.982	2.0	1.963	0.019	100.951	0.010	Pass
42.116	1.982	2.0	1.979	0.003	100.163	0.010	Pass



INSTRUMENT SPECIFICATIONS		
Test Gas	Air	
Standard Pressure,Meter	14.73	psia
Standard Temperature,Meter	60	F
Rated Accuracy	1	% Rding
Full Scale Flow Rate	250	scfh Natural Gas @ 1/2 inch WC
LABORATORY AMBIENT CONDITIONS		
Pressure	14.39	psia
Humidity	52.04	% RH
Temperature	71.40	F

Flow - Humidity - Temperature - Pressure - Design - Consulting - Engineering
NIST Traceable Calibration Data Sheet
Graftel, LLC. 870 Cambridge Drive, Elk Grove Village, IL.60007
P. 847-364-2600 F. 847-364-2899
www.graftel.com

Rapport d'étalonnage No. CA0003-513-040116

Mettler Toledo
Service Business Unit Industrial
1900 Polaris Parkway
Columbus, Ohio 43240
1-800-METTLER

METTLER TOLEDO

ISO 9001 Registered

ANSI/NCSL Z540-1 Accrédité

Accrédité par l'American Association for Laboratory Accreditation (A2LA)

CERT.CALIBRATION #1902.02

Certificat d'étalonnage

Client

Société :	SBI Fabricant De Poeles		
Adresse :	250 Rue de Copenhague		
Ville :	Saint-Augustin-De-Desmaures	*État/Province :*	Quebec
Code postal :	G3A 2H3	Astea Customer ID:	300276257

Instrument

Constructeur :	Mettler Toledo	*Modèle de terminal :*	N/A
Modèle :	2256	*# série du terminal:*	N/A
No de série :	11682461LL	*# série de l'imprimant*	N/A
Capacité :	625 kg		N/A
Résolution :	0,02 kg	*Nbre de Divisions:*	31250
Classe :	III	*Procédure utilisée :*	NIST Handbook 44
No./ID d'inventaire:	SBI-186		
Procédure:	Le présent certificat est émis conformément aux conditions de certification accordées par l'A2LA, en vertu de la norme ISO/IEC 17025. A2LA a évalué la capacité de mesure du laboratoire et la traçabilité des normes nationales reconnues.		

Date de calibrage :	1-avr-2016	*Date, prochaine Cal.*	31-mars-2017
Signataire autorisé (A2LA) :	Dany Careau	*Signature:*	ELECTRONIC SIGNATURE

Étalons de travail

Retracabilité: Les poids de test utilisés se réfèrent au National Institute of Standards and Technology.

Jeu de poids no :	*Traçabilité NIST No.:*	*Classe ASTM/OIML*	*Date d'étalonnage :*	*Date proch. étalonnage*
0718	M15-050	M1	22-avr-2015	22-avr-2016
142	MT00997	F1	7-mai-2014	30-avr-2016
Q1	1415126	M1	1-juin-2015	1-juin-2016

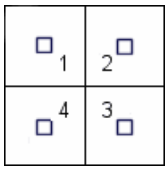
METTLER TOLEDO

Résultats de mesure

La température : 22 °C

Les conditions ambiantes ont été vérifiées afin d'assurer l'exactitude de l'étalonnage.

Test de variation



		Avant Réglage
Poids Appliqués	*Position*	*Valeur lue*
1: 100 kg	*Position 1*	100,00 kg
2: 100 kg	*Position 2*	100,04 kg
3: 100 kg	*Position 3*	100,02 kg
4: 100 kg	*Position 4*	99,96 kg
Erreur maximum :		0,08 kg
Max Erreur Admissible :		0,10 kg

Linéarité

	Avant réglage					
	Poids Appliqués	*Valeur lue*	*Erreur*		*Erreur admissible*	*Dans la Tolérance*
Zero 1,00	0,00 kg	0,00 kg	0,00 kg	0 d	1 d	OUI
2,00	40,00 kg	40,00 kg	0,00 kg	0 d	2 d	OUI
3,00	80,00 kg	80,00 kg	0,00 kg	0 d	3 d	OUI
4,00	120,00 kg	120,00 kg	0,00 kg	0 d	5 d	OUI
5,00	160,00 kg	160,00 kg	0,00 kg	0 d	5 d	OUI
Max 6,00	200,00 kg	200,00 kg	0,00 kg	0 d	5 d	OUI

☐ Méthode de substitution utilisée

Un réglage de la balance a été requis

Si non, les résultats "avant réglage" correspondent aux résultats tel que laissé.

☐ **OUI** ☑ **NON**

Répétabilité

Poids appliqués : 100,00 kg

	Chargé	*Vide*	*Différence*
1	100,00 kg	0,00 kg	100 kg
2	100,00 kg	0,00 kg	100 kg
3	100,00 kg	0,00 kg	100 kg
	Erreur maximale :	0,00 kg	0,0 d
	Tolérance :	0,10 kg	5 d

Incertitude

Mesure de l'incertitude = 0,012 kg

L'incertitude de mesure représente les incertitudes étendues selon un facteur de sécurité K=2 générant un niveau de confiance approximatif de 95 %. Des dispositions doivent être prises en matière d'environnement au lieu d'étalonnage, d'incertitude induite par l'article en étalonnage et d'effets indésirables causés par le transport du matériel d'étalonnage. Ces facteurs pourraient entraîner une incertitude plus grande que le CMC.

Remarques

Aucune.

MICRO PRECISION CALIBRATION INC.

MICRO PRECISION CALIBRATION
22835 INDUSTRIAL PLACE
GRASS VALLEY CA 95949
530-268-1860

ACCREDITED
Calibration Laboratory
CERT # 935.01

Certificate of Calibration

Date: Jun 10, 2015 **Cert No. 222008122545133**

Customer:
STOVE BUILDERS INTERNATIONAL INC.
PORTES 11-12
250 DE COPENHAGUE
SAINT-AUGUSTIN-DE-DESMAURES QC G3A 2H3

MPC Control #:	DB8361	Work Order #:	SAC-70072244
Asset ID:	SBI-203	Purchase Order #:	44831
Gage Type:	PITOT STATIC TUBE	Serial Number:	160S-24A50U
Manufacturer:	DWYER INSTRUMENTS, INC.	Department:	N/A
Model Number:	160S-24	Performed By:	BARRY MORRIS
Size:	N/A	Received Condition:	IN TOLERANCE
Temp/RH:	69°F / 41 %	Returned Condition:	IN TOLERANCE
		Cal. Date:	June 09, 2015
		Cal. Interval:	12 MONTHS
		Cal. Due Date:	June 09, 2016

Calibration Notes:
UNIT WAS CALIBRATED INJUNCTION WITH GAGE SBI-105.

Test Points

Seq.	Description	Standard	Tolerance -	Tolerance +	As Found	As Left	UOM	Result	Uncertainty
1	Tested At:	0.100	0.090	0.110	0.100	0.100	in/H20	Passed	0.003
2	Tested At:	0.200	0.190	0.210	0.200	0.200	in/H20	Passed	0.003
3	Tested At:	0.300	0.290	0.310	0.300	0.300	in/H20	Passed	0.003
4	Tested At:	0.400	0.390	0.410	0.400	0.400	in/H20	Passed	0.003

Standards Used to Calibrate Equipment

I.D.	Description.	Model	Serial	Manufacturer	Cal. Due Date	Traceability #
AW3587	TIMER	N/A	N/A	SPORTLINE	Jun 4, 2016	222008122539739
AW4419	MULTI-FUNCTION PRESSURE INDICATOR	DPI 145	14501283	DRUCK	Nov 19, 2015	2008120226860

Procedures Used in this Event

Procedure Name	Description
MPC-00062	Pressure and Vacuum

Calibrating Technician: Barry Morris

BARRY MORRIS

QC Approval:

Brian Gold

The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k=2, which for normal distribution corresponds to a coverage probability of approximately 95%. The standard uncertainty of measurement has been determined in accordance with EA's Publication and NIST Technical Note 1297, 1994 Edition. Services rendered comply with ISO 17025:2005, ANSI/NCSL Z540-1, MPC Quality Manual, MPC CSD and with customer purchase order instructions.

Calibration cycles and resulting due dates were submitted/approved by the customer. Any number of factors may cause an instrument to drift out of tolerance before the next scheduled calibration. Recalibration cycles should be based on frequency of use, environmental conditions and customer's established systematic accuracy. The information on this report, pertains only to the instrument identified.

All standards are traceable to SI through the National Institute of Standards and Technology (NIST) and/or recognized national or international standards laboratories. Services rendered include proper manufacturer's service instruction and are warranted for no less than thirty (30) days. This report may not be reproduced in part or in a whole without the prior written approval of the issuing MPC lab.

Rapport d'étalonnage No. CA0003-509-040116

Mettler Toledo
Service Business Unit Industrial
1900 Polaris Parkway
Columbus, Ohio 43240
1-800-METTLER

METTLER TOLEDO

ISO 9001 Registered

ANSI/NCSL Z540-1 Accrédité

Accrédité par l'American Association for Laboratory Accreditation (A2LA)

CERT.CALIBRATION #1902.02

Certificat d'étalonnage

Client

Société :	SBI Fabricant De Poeles		
Adresse :	250 Rue de Copenhague		
Ville :	Saint-Augustin-De-Desmaures	*État/Province :*	Quebec
Code postal :	G3A 2H3	Astea Customer ID:	300276257

Instrument

Constructeur :	SARTORIUS	*Modèle de terminal :*	N/A
Modèle :	TE214S	*# série du terminal:*	N/A
No de série :	25851066	*# série de l'imprimant*	N/A
Capacité :	210 g		N/A
Résolution :	0,0001 g	*Nbre de Divisions:*	2100000
Classe :	I	*Procédure utilisée :*	NIST Handbook 44
No./ID d'inventaire:	SBI-206		
Procédure:	Le présent certificat est émis conformément aux conditions de certification accordées par l'A2LA, en vertu de la norme ISO/IEC 17025. A2LA a évalué la capacité de mesure du laboratoire et la traçabilité des normes nationales reconnues.		

Date de calibrage :	1-avr-2016	*Date, prochaine Cal.*	31-mars-2017
Signataire autorisé (A2LA) :	Dany Careau	*Signature:*	ELECTRONIC SIGNATURE

Étalons de travail

Retracabilité: Les poids de test utilisés se réfèrent au National Institute of Standards and Technology.

Jeu de poids no :	*Traçabilité NIST No.:*	*Classe ASTM/OIML*	*Date d'étalonnage :*	*Date proch. étalonnage*
0718	M15-050	M1	22-avr-2015	22-avr-2016
142	MT00997	F1	7-mai-2014	30-avr-2016
Q1	1415126	M1	1-juin-2015	1-juin-2016

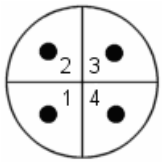
METTLER TOLEDO

Résultats de mesure

La température : 22 °C

Les conditions ambiantes ont été vérifiées afin d'assurer l'exactitude de l'étalonnage.

Test de variation



		Avant Réglage
Poids Appliqués	*Position*	*Valeur lue*
1: 50 g	*Position 1*	50,0001 g
2: 50 g	*Position 2*	50,0000 g
3: 50 g	*Position 3*	50,0001 g
4: 50 g	*Position 4*	50,0002 g
Erreur maximum :		0,0002 g
Max Erreur Admissible :		0,0003 g

Linéarité

	Avant réglage					
	Poids Appliqués	*Valeur lue*	*Erreur*		*Erreur admissible*	*Dans la Tolérance*
Zero 1,00	0,0000 g	0,0000 g	0,0000 g	0 d	1 d	OUI
2,00	0,1000 g	0,1000 g	0,0000 g	0 d	1 d	OUI
3,00	1,0000 g	0,9999 g	-0,0001 g	1 d	1 d	OUI
4,00	10,0000 g	9,9999 g	-0,0001 g	1 d	2 d	OUI
5,00	50,0000 g	50,0001 g	0,0001 g	1 d	3 d	OUI
6,00	100,0000 g	99,9999 g	-0,0001 g	1 d	3 d	OUI
7,00	150,0000 g	149,9998 g	-0,0002 g	2 d	3 d	OUI
Max 8,00	200,0000 g	200,0001 g	0,0001 g	1 d	3 d	OUI

☐ Méthode de substitution utilisée

Un réglage de la balance a été requis
Si non, les résultats "avant réglage" correspondent aux résultats tel que laissé.

☐ **OUI** ☑ **NON**

Répétabilité

Poids appliqués : 10,0000 g

	Chargé	*Vide*	*Différence*
1	9,9999 g	0,0000 g	9,9999 g
2	10,0000 g	0,0000 g	10 g
3	9,9999 g	0,0000 g	9,9999 g
	Erreur maximale :	0,0001 g	1,0 d
	Tolérance :	0,0002 g	2 d

Incertitude

Mesure de l'incertitude = 0,00017 g

L'incertitude de mesure représente les incertitudes étendues selon un facteur de sécurité K=2 générant un niveau de confiance approximatif de 95 %. Des dispositions doivent être prises en matière d'environnement au lieu d'étalonnage, d'incertitude induite par l'article en étalonnage et d'effets indésirables causés par le transport du matériel d'étalonnage. Ces facteurs pourraient entraîner une incertitude plus grande que le CMC.

Remarques

Aucune.

Ulrich Métrologie inc.
Ulrich Metrology Inc.
9912, Côte-de-Liesse
Montréal (Québec) H8T 1A1

Tél. (514) 631-6653
Fax (514) 631-6122
info@ulrich.ca
www.ulrich.ca

ACCREDITATION ISO 17025

CALIBRATION CERTIFICATE

Certificate no.:	496310	**Calibration date:**	October 14, 2015
Identification:	SBI-213	**Certificate issued:**	October 14, 2015
Description:	THERMO-HYGROMETER, AMPROBE TH-3	**Interval:**	12 months
Manufacturer:	AMPROBE	**Due date:**	October 14, 2016
Model no.:	TH-3	**Procedure no.:**	MET/CAL
Serial no.:	101004044	**Environment:**	CLAS Type 2 Laboratory
		Temperature:	23 ± 2°C
		Humidity:	35 - 55% RH
		Metrologist:	NFS

Property of: SBI
250 RUE DE COPENHAGUE
ST-AUGUSTIN-DE-DESMAURES, QC G3A 2H3

Approved by: David Llorens, Quality Manager

This calibration certificate is issued in accordance with the applicable requirements of ISO/IEC 17025 and Ulrich Metrology's quality manual QM-09 Revision 9. Measurement results provided are traceable to either the National Research Council Canada (NRC), the National Institute of Standards and Technology (NIST), a national laboratory of another country signatory to the CIPM Mutual Recognition Arrangement (MRA), or a calibration laboratory accredited by an accrediting body with which Canada has an equivalence agreement.

CALIBRATION STANDARDS

See notes below.

MEASUREMENT UNCERTAINTY

The above listed instrument meets or exceeds all specifications as stated in the reference procedure, unless noted otherwise. For measurement results associated with the conformance to a tolerance, the uncertainty in the measurement system did not exceed 25% (4:1 test uncertainty ratio) of the acceptable tolerance for each characteristic calibrated, unless otherwise noted in the report.

CALIBRATION DATA

See next page for measurement results.

Notes:

EQUIPMENT RECEIVED OUT OF SPECIFICATIONS:

High humidity is out of tolerance @80% (reading of 75.1% instead of 77% minimum).
No adjustment. No support from manufacturer.

LIMITED CALIBRATION

226673 L

Ulrich Métrologie inc.
Ulrich Metrology inc.
9912, Côte-de-Liesse
Montréal (Québec) H8T 1A1

Tél. (514) 631-6663
Fax (514) 631-6122
info@ulrich.ca
www.ulrich.ca

CALIBRATION DATA

Certificate no.: 496310
Identification: SBI-213
Description: THERMO-HYGROMETER
Serial no.: 101004044
Procedure: Amprobe TH-3: 2500ST-LT-M

Result: PASS
Condition: FOUND-LEFT

CALIBRATION STANDARDS

Identification	Description	Manufacturer	Model no.	Cal. Date	Due Date
1304953	HUMIDITY GENERATOR	THUNDER SCIENTIFIC	2500ST-LT	2015/06/19	2016/06/30

MEASUREMENT RESULTS (Per MET/CAL)

PARAMETER	TRUE VALUE	TEST RESULT	ACCEPTANCE LIMITS LOW	HIGH	PASS/ FAIL	TUR
TEMPERATURE CALIBRATION						
23°C						
23.01degC		23.30	22.21	23.81	PASS	
RELATIVE HUMIDITY CALIBRATION AT 23°C						
20% RH						
20.01%		19.00	17.01	23.01	PASS	
50% RH						
50.02%		48.40	47.02	53.02	PASS	
80% RH						
80.00%		75.10	77.00	83.00	FAIL	

End of Test Data

Report of Calibration

As Found / As Left

ACCREDITED
CALIBRATION
CERT #2260.01

Procedure: Dwyer MS-121-LCD 0 to 0.1;0.25 inH2O/7520lp 8845A: Rev.1.0.A

UUT

Made by:	Dwyer
Model:	MS-121-LCD
Serial No.:	E51U01003410
ID No.:	SBI-247
Description:	Digital Pressure Gauge

Calibration

Report No.:	AC16031301-E51U01003410
Adjusted:	No
Condition:	In Tolerance
Calibration Date:	18-Mar-2016
Calibration Due:	18-Mar-2017

Customer

STOVE BUILDER INTERNATIONAL INC.
250 RUE DE COPENHAGUE
ST-AUSTIN-DE-DESMAURES, QC
G3A 2H3

Environment

Temperature:	21.2°C
Humidity:	28%RH

STATEMENT OF UNCERTAINTY: The reported expanded uncertainty of measurement is stated as the standard measurement uncertainty multiplied by the coverage factor K = 2, which for a normal distribution corresponds to a coverage probability of approximately 95 percent. Alpha Controls & Instrumentation Inc. certifies this instrument was calibrated on the date shown using standards traceable to NIST/NRC or accepted intrinsic standards and in compliance with ISO/IEC-17025:2005 and ANSI/NCSL Z540-1.

Any statement of compliance is made without taking measurement uncertainty into account and is based on UUT performance against required tolerance only. The customer must ensure equipment calibrated meets the intended use.

Tolerance is based on manufacturer specification if not stated otherwise. Calibration results relate to items calibrated only.

STANDARDS

Instrument	Model	ID No./Serial No.	Traceability No.	Recall Date
Low Pressure Calibrator	Ruska 7250LP	PRE-CAL-06	1500188474/1500188475	29-Sep-2016
Multimeter	Fluke 8845A	ELC-MTR-04	AC15121397-9366020	13-Jan-2017

REMARKS:

None

Performed by: Tony Wheaton
Tony Wheaton

Reviewed by:
Slava Peciurov

Report of Calibration
As Found / As Left

ACCREDITED
CALIBRATION
CERT #2260.01

UUT

Made by:	Dwyer
Model:	MS-121-LCD
Serial No.:	E51U01003410
ID No.:	SBI-247
Description:	Digital Pressure Gauge

Calibration

Report No.:	AC16031301-E51U01003410
Adjusted:	No
Condition:	In Tolerance
Calibration Date:	18-Mar-2016
Calibration Due:	18-Mar-2017

Test Description	STD	UUT	Error	Tolerance	Units	P/F	Uncertainty
Range: 0 to 0.1 inH2O							
Output signal: 4 to 20 mA							
PRESSURE TEST							
Display Reading		-0.0005					
Output @ 0.0000 inH2O, mA		3.919					
0.000 inH2O	0.0000	-0.0005	-0.0005	±0.0020	inH2O	Pass	1.5e-04
Display Reading		0.0244					
Output @ 0.025 inH2O, mA		7.912					
0.025 inH2O	0.0250	0.0245	-0.0005	±0.0020	inH2O	Pass	1.5e-04
Display Reading		0.0493					
Output @ 0.050 inH2O, mA		11.885					
0.050 inH2O	0.0500	0.0493	-0.0007	±0.0020	inH2O	Pass	1.5e-04
Display Reading		0.0745					
Output @ 0.075 inH2O, mA		15.912					
0.075 inH2O	0.0750	0.0745	-0.0005	±0.0020	inH2O	Pass	1.5e-04
Display Reading		0.0994					
Output @ 0.100 inH2O, mA		19.906					
0.100 inH2O	0.1000	0.0994	-0.0006	±0.0020	inH2O	Pass	1.5e-04
Display Reading		0.0745					
Output @ 0.075 inH2O, mA		15.913					
0.075 inH2O	0.0750	0.0745	-0.0005	±0.0020	inH2O	Pass	1.5e-04
Display Reading		0.0491					
Output @ 0.050 inH2O, mA		11.886					
0.050 inH2O	0.0500	0.0493	-0.0007	±0.0020	inH2O	Pass	1.5e-04
Display Reading		0.0242					
Output @ 0.025 inH2O, mA		7.858					
0.025 inH2O	0.0250	0.0241	-0.0009	±0.0020	inH2O	Pass	1.5e-04
Display Reading		-0.0007					
Output @ 0.0000 inH2O, mA		3.884					
0.000 inH2O	0.0000	-0.0007	-0.0007	±0.0020	inH2O	Pass	1.5e-04
Range: 0 to 0.25 inH2O							
Output signal: 4 to 20 mA							
PRESSURE TEST							
Display Reading		-0.0005					
Output @ 0.0000 inH2O, mA		3.971					
0.0000 inH2O	0.0000	-0.0005	-0.0005	±0.0025	inH2O	Pass	1.5e-04
Display Reading		0.0618					
Output @ 0.0625 inH2O, mA		7.948					
0.0625 inH2O	0.0625	0.0617	-0.0008	±0.0025	inH2O	Pass	1.5e-04
Display Reading		0.1238					
Output @ 0.1250 inH2O, mA		11.920					
0.1250 inH2O	0.1250	0.1238	-0.0012	±0.0025	inH2O	Pass	1.5e-04

Report of Calibration
As Found / As Left

ACCREDITED CALIBRATION CERT #2260.01

UUT

Made by: Dwyer
Model: MS-121-LCD
Serial No.: E51U01003410
ID No.: SBI-247
Description: Digital Pressure Gauge

Calibration

Report No.: AC16031301-E51U01003410
Adjusted: No
Condition: In Tolerance
Calibration Date: 18-Mar-2016
Calibration Due: 18-Mar-2017

Test Description	STD	UUT	Error	Tolerance	Units	P/F	Uncertainty
Display Reading		0.1858					
Output @ 0.1875 inH2O, mA		15.895					
0.1875 inH2O	0.1875	0.1859	-0.0016	±0.0025	inH2O	Pass	1.5e-04
Display Reading		0.2483					
Output @ 0.2500 inH2O, mA		19.889					
0.2500 inH2O	0.2500	0.2483	-0.0017	±0.0025	inH2O	Pass	1.5e-04
Display Reading		0.1870					
Output @ 0.1875 inH2O, mA		15.983					
0.1875 inH2O	0.1875	0.1872	-0.0003	±0.0025	inH2O	Pass	1.5e-04
Display Reading		0.1252					
Output @ 0.1250 inH2O, mA		12.008					
0.1250 inH2O	0.1250	0.1251	0.0001	±0.0025	inH2O	Pass	1.5e-04
Display Reading		0.0630					
Output @ 0.0625 inH2O, mA		8.034					
0.0625 inH2O	0.0625	0.0630	0.0005	±0.0025	inH2O	Pass	1.5e-04
Display Reading		0.0005					
Output @ 0.0000 inH2O, mA		4.023					
0.0000 inH2O	0.0000	0.0004	0.0004	±0.0025	inH2O	Pass	1.5e-04

END OF REPORT

Report of Calibration

As Found / As Left

ACCREDITED
CALIBRATION
CERT #2260.01

Procedure: Dwyer MS-121-LCD 0 to 0.1;0.25 inH2O/7520lp 8845A: Rev.1.0.A

UUT

Made by:	Dwyer
Model:	MS-121-LCD
Serial No.:	E51U01003612
ID No.:	SBI-253
Description:	Digital Pressure Gauge

Calibration

Report No.:	AC16031301-E51U01003612
Adjusted:	No
Condition:	In Tolerance
Calibration Date:	18-Mar-2016
Calibration Due:	18-Mar-2017

Customer

STOVE BUILDER INTERNATIONAL INC.
250 RUE DE COPENHAGUE
ST-AUSTIN-DE-DESMAURES, QC
G3A 2H3

Environment

Temperature:	20.9°C
Humidity:	29%RH

STATEMENT OF UNCERTAINTY: The reported expanded uncertainty of measurement is stated as the standard measurement uncertainty multiplied by the coverage factor K = 2, which for a normal distribution corresponds to a coverage probability of approximately 95 percent. Alpha Controls & Instrumentation Inc. certifies this instrument was calibrated on the date shown using standards traceable to NIST/NRC or accepted intrinsic standards and in compliance with ISO/IEC-17025:2005 and ANSI/NCSL Z540-1.

Any statement of compliance is made without taking measurement uncertainty into account and is based on UUT performance against required tolerance only. The customer must ensure equipment calibrated meets the intended use.

Tolerance is based on manufacturer specification if not stated otherwise. Calibration results relate to items calibrated only.

STANDARDS

Instrument	Model	ID No./Serial No.	Traceability No.	Recall Date
Low Pressure Calibrator	Ruska 7250LP	PRE-CAL-06	1500188474/1500188475	29-Sep-2016
Multimeter	Fluke 8845A	ELC-MTR-04	AC15121397-9366020	13-Jan-2017

REMARKS:

Calibrated in vertical position.

Performed by: Tony Wheaton
Tony Wheaton

Reviewed by:
Slava Peciurov

Report of Calibration
As Found / As Left

ACCREDITED
CALIBRATION
CERT #2260.01

UUT

Made by: Dwyer
Model: MS-121-LCD
Serial No.: E51U01003612
ID No.: SBI-253
Description: Digital Pressure Gauge

Calibration

Report No.: AC16031301-E51U01003612
Adjusted: No
Condition: In Tolerance
Calibration Date: 18-Mar-2016
Calibration Due: 18-Mar-2017

Test Description	STD	UUT	Error	Tolerance	Units	P/F	Uncertainty
Range: 0 to 0.1 inH2O							
Output signal: 4 to 20 mA							
PRESSURE TEST							
Display Reading		0.0000					
Output @ 0.0000 inH2O, mA		3.998					
0.000 inH2O	0.0000	0.0000	0.0000	±0.0020	inH2O	Pass	1.5e-04
Display Reading		0.0244					
Output @ 0.025 inH2O, mA		7.894					
0.025 inH2O	0.0250	0.0243	-0.0007	±0.0020	inH2O	Pass	1.5e-04
Display Reading		0.0488					
Output @ 0.050 inH2O, mA		11.803					
0.050 inH2O	0.0500	0.0488	-0.0012	±0.0020	inH2O	Pass	1.5e-04
Display Reading		0.0737					
Output @ 0.075 inH2O, mA		15.802					
0.075 inH2O	0.0750	0.0738	-0.0012	±0.0020	inH2O	Pass	1.5e-04
Display Reading		0.0991					
Output @ 0.100 inH2O, mA		19.905					
0.100 inH2O	0.1000	0.0994	-0.0006	±0.0020	inH2O	Pass	1.5e-04
Display Reading		0.0735					
Output @ 0.075 inH2O, mA		15.755					
0.075 inH2O	0.0750	0.0735	-0.0015	±0.0020	inH2O	Pass	1.5e-04
Display Reading		0.0491					
Output @ 0.050 inH2O, mA		11.891					
0.050 inH2O	0.0500	0.0493	-0.0007	±0.0020	inH2O	Pass	1.5e-04
Display Reading		0.0247					
Output @ 0.025 inH2O, mA		7.947					
0.025 inH2O	0.0250	0.0247	-0.0003	±0.0020	inH2O	Pass	1.5e-04
Display Reading		0.0000					
Output @ 0.0000 inH2O, mA		3.999					
0.000 inH2O	0.0000	0.0000	0.0000	±0.0020	inH2O	Pass	1.5e-04
Range: 0 to 0.25 inH2O							
Output signal: 4 to 20 mA							
PRESSURE TEST							
Display Reading		0.0002					
Output @ 0.0000 inH2O, mA		3.999					
0.0000 inH2O	0.0000	0.0000	0.0000	±0.0025	inH2O	Pass	1.5e-04
Display Reading		0.0620					
Output @ 0.0625 inH2O, mA		7.964					
0.0625 inH2O	0.0625	0.0619	-0.0006	±0.0025	inH2O	Pass	1.5e-04
Display Reading		0.1243					
Output @ 0.1250 inH2O, mA		11.942					
0.1250 inH2O	0.1250	0.1241	-0.0009	±0.0025	inH2O	Pass	1.5e-04

Report of Calibration
As Found / As Left

ACCREDITED
CALIBRATION
CERT #2260.01

UUT

Made by: Dwyer
Model: MS-121-LCD
Serial No.: E51U01003612
ID No.: SBI-253
Description: Digital Pressure Gauge

Calibration

Report No.: AC16031301-E51U01003612
Adjusted: No
Condition: In Tolerance
Calibration Date: 18-Mar-2016
Calibration Due: 18-Mar-2017

Test Description	STD	UUT	Error	Tolerance	Units	P/F	Uncertainty
Display Reading		0.1860					
Output @ 0.1875 inH2O, mA		15.906					
0.1875 inH2O	0.1875	0.1860	-0.0015	±0.0025	inH2O	Pass	1.5e-04
Display Reading		0.2490					
Output @ 0.2500 inH2O, mA		19.940					
0.2500 inH2O	0.2500	0.2491	-0.0009	±0.0025	inH2O	Pass	1.5e-04
Display Reading		0.1868					
Output @ 0.1875 inH2O, mA		15.959					
0.1875 inH2O	0.1875	0.1869	-0.0006	±0.0025	inH2O	Pass	1.5e-04
Display Reading		0.1245					
Output @ 0.1250 inH2O, mA		11.960					
0.1250 inH2O	0.1250	0.1244	-0.0006	±0.0025	inH2O	Pass	1.5e-04
Display Reading		0.0618					
Output @ 0.0625 inH2O, mA		7.943					
0.0625 inH2O	0.0625	0.0616	-0.0009	±0.0025	inH2O	Pass	1.5e-04
Display Reading		0.0000					
Output @ 0.0000 inH2O, mA		3.998					
0.0000 inH2O	0.0000	0.0000	0.0000	±0.0025	inH2O	Pass	1.5e-04

END OF REPORT

Report of Calibration

As Found / As Left

ACCREDITED
CALIBRATION
CERT #2260.01

Procedure: Mass Flow Meter/Controller: 5pts: Rev. 1.0.A

UUT

Made by:	Aalborg
Model:	GFC37
Serial No.:	251111-4
ID No.:	SBI-261
Description:	Mass Flow Controller

Customer

STOVE BUILDER INTERNATIONAL INC.
250 RUE DE COPENHAGUE
ST-AUSTIN-DE-DESMAURES, QC
G3A 2H3

Calibration

Report No.:	AC16041499-251111-4
Adjusted:	No
Condition:	In Tolerance
Calibration Date:	28-Apr-2016
Calibration Due:	28-Apr-2017

Environment

Temperature:	22.2°C
Humidity:	19%RH

STATEMENT OF UNCERTAINTY: The reported expanded uncertainty of measurement is stated as the standard measurement uncertainty multiplied by the coverage factor K = 2, which for a normal distribution corresponds to a coverage probability of approximately 95 percent. Alpha Controls & Instrumentation Inc. certifies this instrument was calibrated on the date shown using standards traceable to NIST/NRC or accepted intrinsic standards and in compliance with ISO/IEC-17025:2005 and ANSI/NCSL Z540-1.

Any statement of compliance is made without taking measurement uncertainty into account and is based on UUT performance against required tolerance only. The customer must ensure equipment calibrated meets the intended use.

Tolerance is based on manufacturer specification if not stated otherwise. Calibration results relate to items calibrated only.

STANDARDS

Instrument	Model	ID No./Serial No.	Traceability No.	Recall Date
Molbloc-L Laminar Element	Fluke 3E4	FLOW-3E4-01	1500183748	26-Jun-2016
Process Calibrator	Fluke 744	ELC-CAL-02	AC15101258-8223003	20-Oct-2016
Mass Flow Terminal	Fluke Molbox1+	FLOW-CAL-01	1500183843	30-Jun-2016

REMARKS:

None

Performed by: Slava Peciurov

Reviewed by: Ben Lemelin

Report of Calibration
As Found / As Left

ACCREDITED
CALIBRATION
CERT #2260.01

Procedure: Mass Flow Meter/Controller: 5pts: Rev. 1.0.A

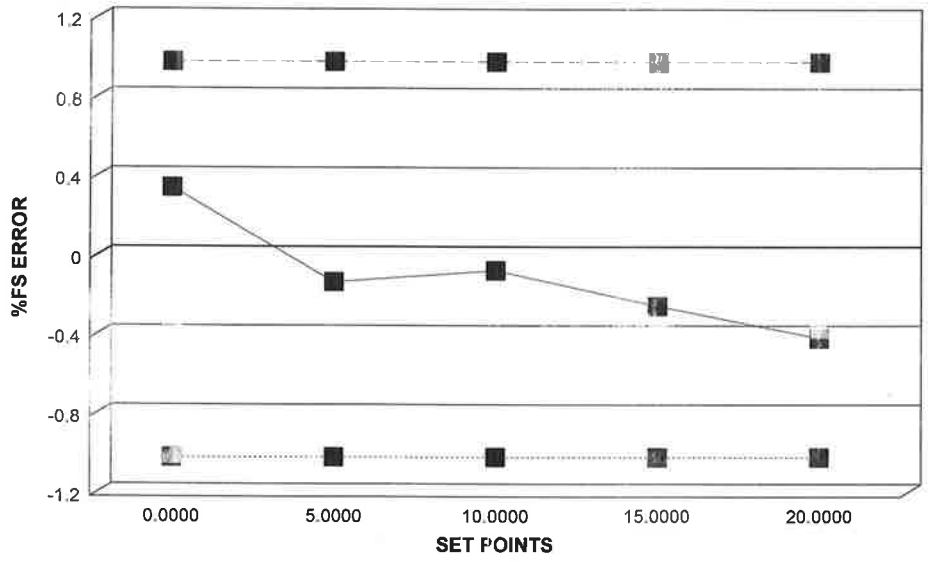
UUT

Made by:	Aalborg
Model:	GFC37
Serial No.:	251111-4
ID No.:	SBI-261
Description:	Mass Flow Controller

Calibration

Report No :	AC16041499-251111-4
Adjusted:	No
Condition:	In Tolerance
Calibration Date:	28-Apr-2016
Calibration Due:	28-Apr-2017

Test Description	Output	STD	UUT	Error (%FS)	Tolerance (%FS)	Units	P/F
0.0000	0.021V	0.0112	0.08	0.363800	±1.000000	slm@70.0F	Pass
5.0000	1.286V	5.1667	5.14	-0.113400	±1.000000	slm@70.0F	Pass
10.0000	2.540V	10.1708	10.16	-0.054200	±1.000000	slm@70.0F	Pass
15.0000	3.794V	15.2231	15.18	-0.235600	±1.000000	slm@70.0F	Pass
20.0000	5.048V	20.2716	20.19	-0.398000	±1.000000	slm@70.0F	Pass



Calibration Gas: N2
Standard Pressure Conditions: 1 atm
Standard Temperature Conditions: see Units
Estimated Measurement Uncertainty: +/-0.3% rdg (MolBloc); +/-0.7% rdg (MCRM)

END OF REPORT

Report of Calibration

As Found

ACCREDITED
CALIBRATION
CERT #2260.01

Procedure: Mass Flow Meter/Controller: 5pts: Rev. 1.0.A

UUT

Made by:	Aalborg
Model:	GFC37
Serial No.:	251111-6
ID No.:	SBI-262
Description:	Mass Flow Controller

Calibration

Report No.:	AC16041499-251111-6
Adjusted:	No
Condition:	In Tolerance
Calibration Date:	26-Apr-2016

Customer

STOVE BUILDER INTERNATIONAL INC.
250 RUE DE COPENHAGUE
ST-AUSTIN-DE-DESMAURES, QC
G3A 2H3

Environment

Temperature:	21.9°C
Humidity:	29%RH

STATEMENT OF UNCERTAINTY: The reported expanded uncertainty of measurement is stated as the standard measurement uncertainty multiplied by the coverage factor K = 2, which for a normal distribution corresponds to a coverage probability of approximately 95 percent. Alpha Controls & Instrumentation Inc. certifies this instrument was calibrated on the date shown using standards traceable to NIST/NRC or accepted intrinsic standards and in compliance with ISO/IEC-17025:2005 and ANSI/NCSL Z540-1.

Any statement of compliance is made without taking measurement uncertainty into account and is based on UUT performance against required tolerance only. The customer must ensure equipment calibrated meets the intended use.

Tolerance is based on manufacturer specification if not stated otherwise. Calibration results relate to items calibrated only.

STANDARDS

Instrument	Model	ID No./Serial No.	Traceability No.	Recall Date
Molbloc-L Laminar Element	Fluke 3E4	FLOW-3E4-01	1500183748	26-Jun-2016
Process Calibrator	Fluke 744	ELC-CAL-02	AC15101258-8223003	20-Oct-2016
Mass Flow Terminal	Fluke Molbox1+	FLOW-CAL-01	1500183843	30-Jun-2016

REMARKS:

None

Performed by: Slava Peciurov

Reviewed by: Ben Lemelin

Report of Calibration
As Found

ACCREDITED
CALIBRATION
CERT #2260.01

Procedure: Mass Flow Meter/Controller: 5pts: Rev. 1.0.A

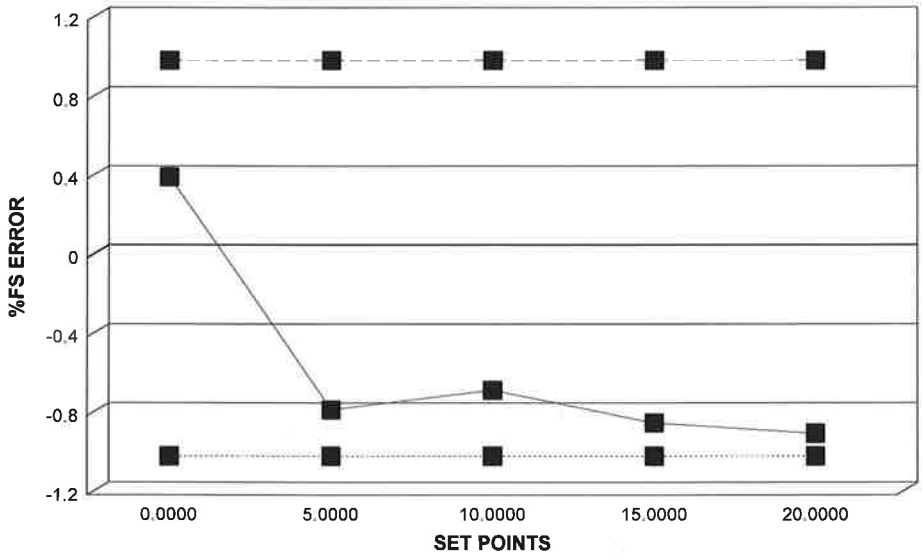
UUT

Made by:	Aalborg
Model:	GFC37
Serial No.:	251111-6
ID No.:	SBI-262
Description:	Mass Flow Controller

Calibration

Report No.:	AC16041499-251111-6
Adjusted:	No
Condition:	In Tolerance
Calibration Date:	26-Apr-2016

Test Description	Output	STD	UUT	Error (%FS)	Tolerance (%FS)	Units	P/F
0.0000	0.021V	0.0020	0.08	0.41	±1.00	slm@70.0F	Pass
5.0000	1.278V	5.2657	5.11	-0.77	±1.00	slm@70.0F	Pass
10.0000	2.532V	10.2619	10.13	-0.67	±1.00	slm@70.0F	Pass
15.0000	3.785V	15.3068	15.14	-0.83	±1.00	slm@70.0F	Pass
20.0000	5.040V	20.3373	20.16	-0.89	±1.00	slm@70.0F	Pass



Calibration Gas:
Standard Pressure Conditions: 1 atm
Standard Temperature Conditions: see Units
Estimated Measurement Uncertainty: +/-0.3% rdg (MolBloc); +/-0.7% rdg (MCRM)

END OF REPORT

Report of Calibration

As Left

ACCREDITED
CALIBRATION
CERT #2260.01

Procedure: Mass Flow Meter/Controller: 5pts: Rev. 1.0.A

UUT

Made by:	Aalborg
Model:	GFC37
Serial No.:	251111-6
ID No.:	SBI-262
Description:	Mass Flow Controller

Customer

STOVE BUILDER INTERNATIONAL INC.
250 RUE DE COPENHAGUE
ST-AUSTIN-DE-DESMAURES, QC
G3A 2H3

Calibration

Report No.:	AC16041499-251111-6
Adjusted:	Yes
Condition:	In Tolerance
Calibration Date:	28-Apr-2016
Calibration Due:	28-Apr-2017

Environment

Temperature:	21.2°C
Humidity:	20%RH

STATEMENT OF UNCERTAINTY: The reported expanded uncertainty of measurement is stated as the standard measurement uncertainty multiplied by the coverage factor K = 2, which for a normal distribution corresponds to a coverage probability of approximately 95 percent. Alpha Controls & Instrumentation Inc. certifies this instrument was calibrated on the date shown using standards traceable to NIST/NRC or accepted intrinsic standards and in compliance with ISO/IEC-17025:2005 and ANSI/NCSL Z540-1.

Any statement of compliance is made without taking measurement uncertainty into account and is based on UUT performance against required tolerance only. The customer must ensure equipment calibrated meets the intended use.

Tolerance is based on manufacturer specification if not stated otherwise. Calibration results relate to items calibrated only.

STANDARDS

Instrument	Model	ID No./Serial No.	Traceability No.	Recall Date
Molbloc-L Laminar Element	Fluke 3E4	FLOW-3E4-01	1500183748	26-Jun-2016
Process Calibrator	Fluke 744	ELC-CAL-02	AC15101258-8223003	20-Oct-2016
Mass Flow Terminal	Fluke Molbox1+	FLOW-CAL-01	1500183843	30-Jun-2016

REMARKS:

None

Performed by: Slava Peciurov

Reviewed by: Ben Lemelin

Report of Calibration
As Left

ACCREDITED
CALIBRATION
CERT #2260.01

Procedure: Mass Flow Meter/Controller: 5pts: Rev. 1.0.A

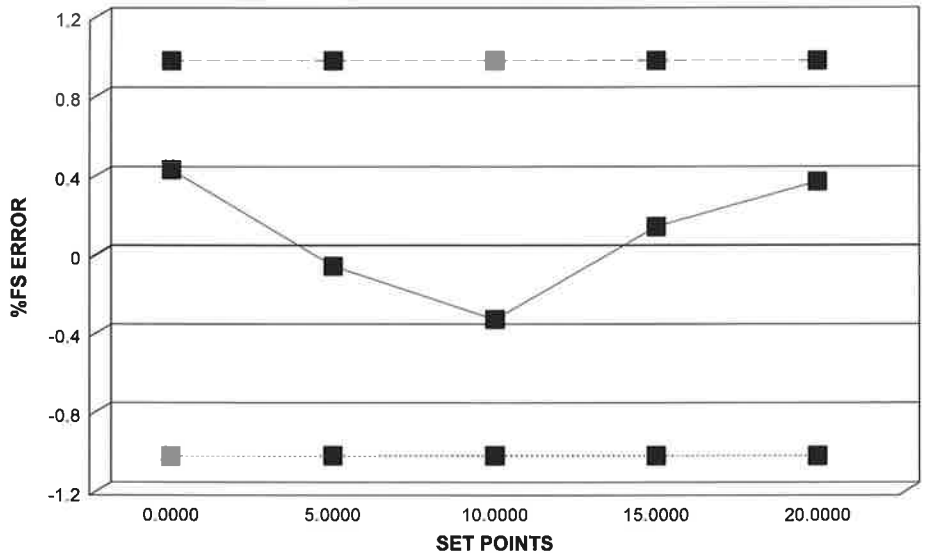
UUT

Made by:	Aalborg
Model:	GFC37
Serial No.:	251111-6
ID No.:	SBI-262
Description:	Mass Flow Controller

Calibration

Report No.:	AC16041499-251111-6
Adjusted:	Yes
Condition:	In Tolerance
Calibration Date:	28-Apr-2016
Calibration Due:	28-Apr-2017

Test Description	Output	STD	UUT	Error (%FS)	Tolerance (%FS)	Units	P/F
0.0000	0.026V	0.0141	0.10	0.45	±1.00	slm@70.0F	Pass
5.0000	1.279V	5.1238	5.12	-0.04	±1.00	slm@70.0F	Pass
10.0000	2.533V	10.1941	10.13	-0.31	±1.00	slm@70.0F	Pass
15.0000	3.790V	15.1280	15.16	0.16	±1.00	slm@70.0F	Pass
20.0000	5.047V	20.1103	20.19	0.39	±1.00	slm@70.0F	Pass



Calibration Gas: N2
Standard Pressure Conditions: 1 atm
Standard Temperature Conditions: see Units
Estimated Measurement Uncertainty: +/-0.3% rdg (MolBloc); +/-0.7% rdg (MCRM)

END OF REPORT

Dry Gas Metering System Calibration
Y factor for Method 5G sampling

Manufacturer:	Rockwell International
Model:	S-275
Serial Number:	00938

Average Gas Meter y Factor
0.983

Calibration Date:	06-02-16
Calibrated by:	Vincent Pelletier
Calibration Frequency:	6-month
Next Calibration Due:	12-01-16
Instrument Range:	1.000 cfm
Standard Temp.:	68.1 oF
Standard Press.:	29.92 "Hg
Barometric Press.:	30.1 "Hg
Signature/Date:	Vincent Pelletier 2016-06-02

Previous Calibration Comparision

Date	N/A	Acceptable	
		Deviation (5%)	Deviation
y Factor	N/A	0	0.983
Acceptance	Out of Limits		

Current Calibration

Acceptable y Deviation	N/A
Maximum y Deviation	N/A
Acceptance	N/A

Reference Standard *		
Standard	Model	Standard Test Meter
Calibrator	S/N	07J264834
	Calib. Date	Sept. 02, 2015
	Calib. Value	0.9931 y factor (ref)

Calibration Parameters	Run 1	Run 2	Run 3
Vacuum ("Hg)	0.00	0.00	0.00
dH ("H2O)	0.00	0.00	0.00
Initial Reference Meter	700.100	705.285	711.504
Final Reference Meter	705.051	711.066	719.923
Initial DGM	501.239	506.448	512.697
Final DGM	506.211	512.369	521.162
Temp. Ref. Meter (°F), Tr	73.2	73.6	74.0
Temperature DGM (°F), Td	74.2	74.0	74.8
Time (Minutes)	51.0	30.0	30.0
Net Volume Ref. Meter, Vr	4.951	5.781	8.419
Net Volume DGM, Vd	4.972	5.921	8.465
Gas Meter y Factor =	**0.991**	**0.970**	**0.989**
Gas Meter y Factor Deviation (from avg.)	0.007	0.013	0.006
Orifice dH@	**0.00**	**0.00**	**0.00**
Orifice dH@ Deviation (from avg.)	0.000	0.000	0.000

where: 0.097490196

1. Deviation = |Average value for all runs - current run value|
2. y = [Vr x (y factor (ref)) x (Pb) x (Td + 460) / [Vd x (Pb + (dH / 13.6)) x (Tr + 460]
3. dH@ = 0.0317 x dH / (Pb (Td + 460)) x [(Tr + 460) x time) / Vr]^2

* Reference calibration is traceable to NIST through NIST Test # 40674, Kimble ASTM E1272

Measurement Canada
An Agency of Industry Canada

Mesures Canada
Un organisme d'Industrie Canada

Approval and Calibration Services Laboratory
Standards Building
151 Tunney's Pasture Driveway
Ottawa, Ontario
K1A 0C9

Laboratoire des services d'approbation et d'étalonnage
Immeuble des normes
151, allée Tunney's Pasture
Ottawa, Ontario
K1A 0C9

Document	Calibrated (YMD) - Étalonné (AMJ)
M15-0050	2015/04/22
Project/Applicant - Projet/Requérant	**Recalibration - Date - de réétalonnage**
CP-ML-15-0007 Mettler-Toledo Inc.	2016/04/22
Owner - Propriétaire	
Mettler-Toledo Inc. 110-780 rue King Ouest, suite 220 Sherbrooke QC J1H 1R7	

Certificate of Calibration and Designation

I, the undersigned, being authorized by the Minister of Industry to exercise the power of the Minister of Industry pursuant to Section 13, sub-section 1 of the Weights and Measures Act,

1) hereby certify that the standard or set of standards has been calibrated in accordance with Part III of the Weights and Measures Regulations in relation to a reference standard traceable to the National Measurement Standards of Canada through an unbroken chain of comparisons where the National Measurement Standards are maintained by the National Research Council of Canada, and

2) designate the said standard or set of standards described below as local standard(s):

Project #: CP-ML-15-0007
Serial No.: 0718
Standard Group: Accredited Weight Kits
Manufacturer: Mettler-Toledo Inc.
Characteristics: Mettler 5 kg to 10 mg - multiple 500g (Version: 2004/03/22)

Certificat d'Étalonnage et de Désignation

Je, soussigné(e), étant autorisé(e) par le ministre d'Industrie à exercer les pouvoirs du ministre d'Industrie conformément à l'article 13, paragraphe 1 de la Loi sur les poids et mesures,

1) certifie par la présente que l'étalon ou jeu d'étalons a été étalonné conformément à la Partie III du Règlement sur les poids et mesures et par rapport à un étalon de référence traçable aux étalons nationaux de mesure du Canada par une chaîne ininterrompue de comparaisons où les étalons nationaux de mesure sont maintenus par le Conseil national de recherches du Canada, et

2) désigne ledit étalon ou jeu d'étalons décris ci-dessous à titre d'étalon(s) local(aux):

No. Projet: CP-ML-15-0007
No. de série: 0718
Groupe d'étalons: Jeux de poids accrédités
Fabricant: Mettler-Toledo Inc.
Caractéristiques: Mettler 5 kg a 10 mg - multiple 500g (Version: 2004/03/22)

PROCEDURE(S) USED	SOFTWARE USED	PROCÉDURE(S) UTILISÉ(S)	LOGICIEL(S) UTILISÉ(S)
MA-CP-001 ver. 4.0	DTCS ver. 2.4.0	MA-CP-001 ver. 4.0	SECI ver. 2.4.0

STANDARD(S) USED / ÉTALON(S) UTILISÉ(S)

Device / Instrument	Model / Modèle	Manufacturer / Fabricant	Certificate / Certificat	Standard Group / Groupe d'étalons
874017	N/A	Oertling	M14-0552Rev1	BM Metric Mass Standards BM Étalons de masse - syst. mé
ML88025	Class S-1	Henry Troemner Inc.	M13-0138	BM Metric Mass Standards BM Étalons de masse - syst. mé
MS58		Troemner Inc.	M13-0137	BM Metric Mass Standards BM Étalons de masse - syst. mé

Calibrated by: **Denis D'Aoust**
Étalonné par: Legal Metrologist
Métrologiste légal

Designated by: **Isabelle Tremblay**
Désigné par: Laboratory Manager
Gestionnaire de laboratoire

Date APR 22 2015

The Calibration Laboratory Assessment Service (CLAS) of the National Research Council of Canada (NRC) has assessed and certified specific calibration capabilities of this laboratory and traceability to the International System of Units (SI) or to standards acceptable to the CLAS program. This certificate of calibration is issued in accordance with the conditions of certification granted by CLAS and the conditions of accreditation granted by the Standards Council. Neither CLAS nor SCC guarantee the accuracy of individual calibrations by accredited laboratories.

Le Service d'évaluation des laboratoires d'étalonnage (CLAS) du Conseil national de recherches du Canada (CNRC) a évalué et certifié la capacité d'étalonnage du laboratoire et la traçabilité au Système international d'unités (SI) ou à des étalons acceptables selon le CLAS. Le présent certificat d'étalonnage est délivré conformément aux conditions de certification du CLAS et aux conditions d'accréditation du Conseil canadien des normes (CCN). Le CLAS et le CCN ne garantissent pas l'exactitude des étalonnages individuels effectués par les laboratoires accrédités.

CLAS NRC-CNRC CLAS 2009-03 SCC 659

Canada

Measurement Canada
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Mesures Canada
Un organisme d'Industrie Canada

Document	Calibrated (YMD) - Étalonné (AMJ)
M15-0050	2015/04/22
Project/Applicant - Projet/Requérant	Recalibration - Date - de réétalonnage
CP-ML-15-0007 Mettler-Toledo Inc.	2016/04/22

Certificate of Calibration and Designation

Certificat d'Étalonnage et de Désignation

VERIFICATION VALUES - VALEURS D'ESSAI

Identification Number Numéro d'identification	Nominal Value Valeur nominale
718A	5 kg
718B	5 kg
718A	2 kg
718B	2 kg
718B	1 kg
718A	500 g
718B	500 g
718C	500 g
718D	500 g
718E	500 g
718A	200 g
718B	200 g
718A	100 g
718A	50 g
718A	20 g
718B	20 g
718A	10 g
718A	5 g
718A	2 g
718B	2 g
718	1 g
	500 mg
	200 mg
•	200 mg
	100 mg
	50 mg
	20 mg
•	20 mg
	10 mg

NOTES:

All weights listed above were calibrated and adjusted when necessary, with deviations less than or equal to one-half of the maximum permissible error (MPE).

All values were determined in conventional mass, as defined by the Organisation internationale de métrologie légale (OIML)."For a weight taken at a reference temperature of 20 °C, the conventional mass is the mass of a reference weight of a density of 8 000 kg m^3 which it balances in air of a reference density of 1.2 kg m^3."

The applied standard tolerances are those established in Section 54 and set out in Schedule IV, Part III and IV of the Weights and Measures Regulations.

Nominal values marked with a "*" were found to have deviations between one-half of the MPE and the MPE. Nominal values marked with a "**" were found to have deviations greater than the MPE.

NOTES:

Tous les poids ci-haut ont été étalonnés et ajustés lorsque nécessaire, avec un écart qui ne dépasse pas la moitié de l'erreur maximale tolérée (EMT).

Toutes les valeurs étaient déterminées en masse conventionnelle tel est définie par l'Organisation internationale de métrologie légale (OIML). " Pour poids pris à la température de référence de 20 °C, la masse conventionnelle est la masse d'un poids de référence d'une densité de 8000 kg m^3 qu'elle équilibre dans un air de masse volumique de 1,2 kg m^3. "

Les marges de tolérance appliquées sont établies à l'article 54 et décrites à l'annexe IV, parties III et IV du Règlement sur les poids et mesures.

Les valeurs nominales identifiées par «*» indiquent des valeurs trouvées ayant un écart entre la moitié de l'EMT et l'EMT. Les valeurs nominales identifiées par «**» indiquent des valeurs trouvées ayant un écart qui dépasse l'EMT.

Mesures Canada
Un organisme d'Industrie Canada

Measurement Canada
An Agency of Industry Canada

District de Québec
1550, avenue d'Estimauville
Québec, Québec, G1J 0C4

Numéro du jeu de poids	Émis le (AAAA-MM-JJ)	Date d'expiration (AAAA-MM-JJ)
Q1	2015-06-01	2016-06-01
Propriétaire: Mettler Toledo Inc.		
Adresse: 2345 rue Watt, Porte #15B, Québec, Québec G1P 3X2		
Personne ressource: Sylvain Doyon	Numéro de téléphone: 581-742-3483	

CERTIFICAT DE DÉSIGNATION

Étalons gravimétriques

Je soussigné(e), étant autorisé(e) par le ministre d'Industrie à exercer les pouvoirs du ministre d'Industrie conformément à l'article 13 (1) de la *Loi sur les poids et mesures*,

1) certifie par la présente que l'étalon ou jeu d'étalons a été étalonné conformément à la Partie III du Règlement sur les poids et mesures et par rapport à un étalon de référence traçable aux étalons nationaux de mesure du Canada par une chaîne ininterrompue de comparaisons où les étalons nationaux de mesure sont maintenus par le Conseil national de recherches du Canada, et

2) désigne ledit étalon ou jeu d'étalons décris ci-dessous à titre d'étalon(s) local(aux):

Numéro d'identification	Valeur Nominale	Numéro d'identification	Valeur Nominale	Numéro d'identification	Valeur Nominale	Numéro d'identification	Valeur Nominale
Q1-101	20 kg	Q1-102	20 kg	Q1-103	20 kg	Q1-104	20 kg
Q1-105	20 kg	Q1-106	20 kg	Q1-107	20 kg	Q1-108	20 kg
Q1-109	20 kg	Q1-110	20 kg	Q1-111	20 kg	Q1-112	20 kg
Q1-113	20 kg	Q1-114	20 kg	Q1-115	20 kg	Q1-116	20 kg
Q1-117	20 kg	Q1-118	20 kg	Q1-119	20 kg	Q1-120	20 kg
Q1-121	20 kg	Q1-122	20 kg	Q1-123	20 kg	Q1-124	20 kg
Q1-125	20 kg	Q1-126	20 kg	Q1-127	20 kg	Q1-128	20 kg
Q1-129	20 kg	Q1-130	20 kg	Q1-131	20 kg	Q1-132	20 kg
Q1-133	20 kg	Q1-134	20 kg	Q1-135	20 kg	Q1-136	20 kg
Q1-137	20 kg	Q1-138	20 kg	Q1-139	20 kg	Q1-140	20 kg
Q1-141	20 kg	Q1-142	20 kg	Q1-143	20 kg	Q1-144	20 kg
Q1-145	20 kg	Q1-146	20 kg	Q1-147	20 kg	Q1-148	20 kg
Q1-149	20 kg	Q1-150	20 kg				

District	Certifié par	Désigné par : (Lettres moulées)	Titre du poste
District de Québec (28)	Benoit Coutu-Castonguay Numéro du certificat d'étalonnage 1415126	Guy Tessier (Signature)	Gestionnaire de district / District manager

Canada

Measurement Canada / Mesures Canada
An Agency of Industry Canada / Un organisme d'Industrie Canada

DEVICE INSPECTION CERTIFICATE / CERTIFICAT D'INSPECTION D'INSTRUMENT

1

1415126

Establishment Name - Nom de l'entreprise	Banner - Bannière	District	Zone	Establishment Code - Code d'établissement
METTLER-TOLEDO INC.		28		2046881

Address - Adresse	Place - Endroit	Province
2345 RUE WATT, PORTE # 15B	QUÉBEC	QUÉBEC

Postal Code - Code postal	Telephone - N° de téléphone	Directions - Coordonnées
G1P 3X2	581-742-3483	

Device - Instrument	Serial Number - N° de série	Capacity / Interval Capacité / Échelon	Approval # N° d'approbation	Device Instrument Type	Device Instrument Sub-type Sous-type	Product Code Code de produit	Inspec. Type Genre d'inspec.	Project # N° du projet	As Found Tel que trouvé	Result Résultat	Trade Sector Secteur commercial	Should be recertified before/ Devrait être recertifié avant Y-A M	Equipment Used Équipement utilisé	Com. Line No. N° ligne com.
ÉTALONS	Q1-101 @ Q1-150	20kg	—	S1	20	1	502	—	—	V	9001	— —	M32M	1
GRAVIMÉTRIQUES														
(50 POIDS)														

☐ All Devices inspected / Instruments tous inspectés — Types Fully Inspected / Types tous inspectés ▶

Com. Line No. N° Ligne com.	Capture Enregistrer	Comments - Commentaires
1	☐	M32M
1	☐	SENSIBILITÉ RÉCIPROQUE @ 10 mg
1	☐	BALANCE # 826453
	☐	
	☐	
	☐	

Details - Détails		Amount - Montant
Inspector's Time / Temps de l'inspecteur	h. at / h. à $	
	h. at / h. à $	
Distance	km. at / km à $ /km	
Other charges / Autres frais		
Sub-Total / Sous-total		
GST - TPS		
PST - TVP		
TOTAL		

Federal Government GST Registration Number / N° d'enregistrement TPS du gouvernement fédéral: R121491807

Trader's Signature - Signature du commerçant	I certify that the above devices have been inspected / Je certifie que les instruments ci-dessus ont été inspectés	Date Y-A M D-J	Purchase Order # N° de bon de commande	I certify that the charges as shown have been paid / Je certifie que les frais indiqués ont été payés	Date Y-A M D-J
	2843	2015 06 01			

IC 3417 (2009/04)

METTLER TOLEDO
1900 Polaris Pkwy
Coumbus, OH 43240
1-800-METTLER

ACCREDITED CALIBRATION LABORATORY
Certificate No. 178801

METTLER TOLEDO

Certificate No: **MT00957**
Serial Number : 493
Date Issued 02/24/2014
Next Calibration Due : 02/28/2015
Calibrated by : MTNA
Traceability Number : MT5061

Authorized Signature:

Nominal Value&Suffix	Serial Number	Conv. Mass (g)	Uncertainty (mg, k = 2)
1 mg	(493)	0.0010001	0.0011
2 mg	(493)	0.0019982	0.0011
2 mg *	(493)	0.0019993	0.0011
5 mg	(493)	0.0050010	0.0011
10 mg	(493)	0.0099991	0.0011
20 mg	(493)	0.0200003	0.0011
20 mg *	(493)	0.0199985	0.0011
50 mg	(493)	0.0499994	0.0013
100 mg	(493)	0.1000019	0.0017
200 mg	(493)	0.2000086	0.0021
200 mg *	(493)	0.2000043	0.0021
500 mg	(493)	0.5000039	0.0025
1 g	(493)	1.0000090	0.0030
2 g	(493)	2.0000015	0.0040
2 g *	(493)	2.0000063	0.0040
5 g	(493)	5.0000116	0.0050
10 g	(493)	10.0000060	0.0078
20 g	(493)	20.0000268	0.0094
20 g *	(493)	20.0000273	0.0094
50 g	(493)	50.000062	0.012
100 g	(493)	100.000069	0.019
200 g	(493)	200.000063	0.030
200 g *	(493)	200.000087	0.030

METTLER TOLEDO
1900 Polaris Pkwy
Coumbus, OH 43240
1-800-METTLER

ACCREDITED CALIBRATION LABORATORY
Certificate No. 178801

METTLER TOLEDO

Certificate No: **MT00997**
Serial Number : 142
Date Issued 05/07/2014
Next Calibration Due : 04/30/2016
Calibrated by : MTNA
Traceability Number : MT5061

Authorized Signature:

Nominal Value&Suffix	Serial Number	Conv. Mass (g)	Uncertainty (mg, k = 2)
1 g 2	(142)	0.9999752	0.0030
2 g	(142)	1.9999811	0.0040
2 g *	(142)	1.9999735	0.0040
5 g	(142)	4.9999845	0.0050
10 g	(142)	9.9999710	0.0078
20 g	(142)	19.9999618	0.0094
20 g *	(142)	19.9999623	0.0094
50 g	(142)	50.000042	0.012
100 g	(142)	99.999930	0.019
200 g	(142)	200.000133	0.036
200 g *	(142)	200.000266	0.036
500 g	(142)	500.000215	0.084
1 kg	(142)	1000.00101	0.16
1 kg *	(142)	1000.00259	0.20
2 kg	(142)	2000.00798	0.51
2 kg *	(142)	2000.00398	0.51
5 kg 1	(142)	5000.0171	2.2
5 kg 2	(142)	5000.0111	2.2
5 kg 3	(142)	5000.0111	2.2
5 kg 4	(142)	5000.0131	2.2
5 kg 5	(142)	5000.0151	2.2
5 kg 6	(142)	5000.0091	2.2

Unit Drawings and Installation Manual
Appendix D

INFORMATION REMOVED FOR Non-CBI VERSION OF REPORT

Dry Gas Meter Calibration Data
Appendix E

CERTIFICATE OF NIST TRACEABLE CALIBRATION

Calibration Certificate No: 51068

LABORATORY ACCREDITATION BUREAU a division of A-S-B
ACCREDITED ISO/IEC 17025
Certificate # L2115-1 Calibration

Customer Information

Customer: SBI St-Augustin

Address : 250, De Copenhague
Doors 11-12
St-Augustin-de-Desmaures

Customer PO #: 45864

Calibration Procedure Information

Procedure ID: GTP FLOW_INDI Revision #: 7 Revision Date: 1/6/2013

Calibration Standards Information

Graftel ID	Manufacturer	Model #	Description	CAL Due
10126	Graftel	N/A	LFE-D System	7/6/2016
10126-T	Graftel	9202	Temperature Sensor	8/17/2018
51202	Paroscientific	760-100A	Pressure, 100 Psia	8/17/2016
10127	Furness	352	Delta P	7/6/2016
60030	Paroscientific	760-100A	Pressure, 100 psia	5/7/2016
10159	HOBO	U12-011	Environment Monitor System	11/18/2015

Sensor Information

Manufacturer: American Meter Description: Gas Meter Method Used: Laminar

Model #: DTM-200A Rated Accuracy: ± 1 % of Reading Accuracy Specified By: AmericanMeter

Instrument ID#: SBI-103 Range: 0 to 250 scfh Condition: Functional

Serial #: 07J264834

Comments: Calibration Date: 09/02/2015

The instruments(s) listed on this certificate have been calibrated against standards traceable to the National Institue of Standards & Technology (NIST) or compared to nationally or internationally recognized consensus standards. The reported calibration uncertainty has a confidence level of 95% (k=2). A calibration uncertainty ratio of 4:1 was maintained unless required uncertainty is supported by analysis. Graftel, LLC. Quality Assurance System complies with applicable requirements of ISO/IEC-17025-2005, ANSI/NCSL Z540-I-1994 and ISO 9001: 2008. All results contained within this certificate relate only to item(s) calibrated. This certificate shall not be reproduced except in full and with the written consent of Graftel, LLC. Acceptance Criteria per Simple Acceptance Rule: Measurement Uncertainty is not applied to the measured value when in/out of tolerance statement is made.

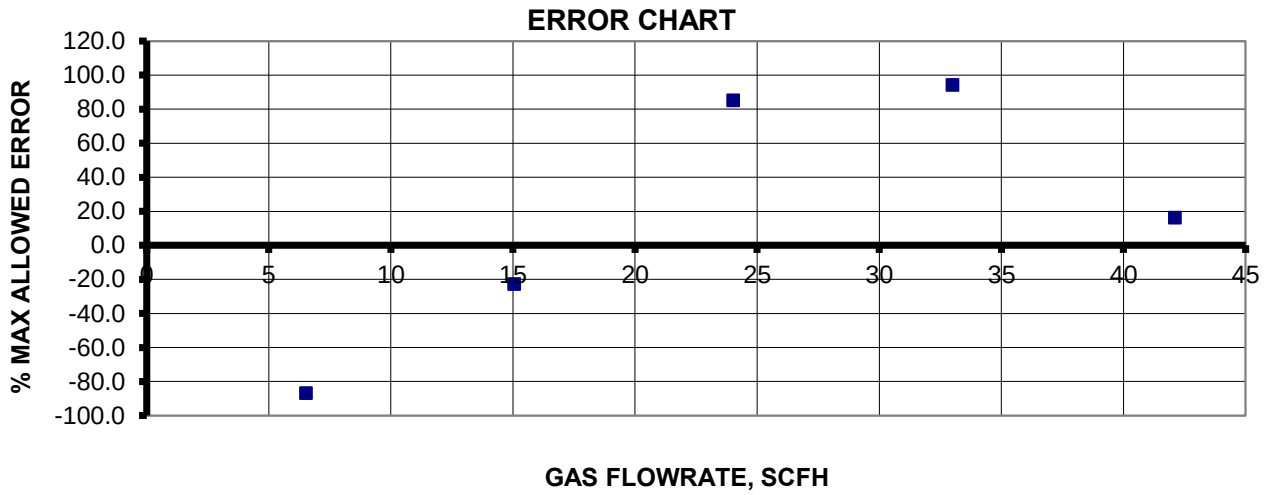
Performed By: _____ Date: 9/2/2015

I.B. Caoili
Calibration Technician

GRAFTEL, LLC. 870 Cambridge Drive, Elk Grove Village, IL 60007 847.364.2600
www.graftel.com

ATTACHMENT TO CALIBRATION CERTIFICATE 51068
AS FOUND / AS LEFT DATA

Air Flow Rate From Standard, scfh	Air Vol From Standard, scf	Air Vol From Meter, cf	Air vol From Meter, scf	Diff Air Vol STD - METER scf	% Proof	Measurement Uncertainty, scf	STATUS
6.527	0.287	0.3	0.289	-0.002	99.138	0.002	Pass
15.052	0.967	1.0	0.969	-0.002	99.773	0.005	Pass
24.025	0.984	1.0	0.976	0.008	100.859	0.005	Pass
33.003	1.982	2.0	1.963	0.019	100.951	0.010	Pass
42.116	1.982	2.0	1.979	0.003	100.163	0.010	Pass



INSTRUMENT SPECIFICATIONS		
Test Gas	Air	
Standard Pressure,Meter	14.73	psia
Standard Temperature,Meter	60	F
Rated Accuracy	1	% Rding
Full Scale Flow Rate	250	scfh Natural Gas @ 1/2 inch WC
LABORATORY AMBIENT CONDITIONS		
Pressure	14.39	psia
Humidity	52.04	% RH
Temperature	71.40	F

Flow - Humidity - Temperature - Pressure - Design - Consulting - Engineering
NIST Traceable Calibration Data Sheet
Graftel, LLC. 870 Cambridge Drive, Elk Grove Village, IL.60007
P. 847-364-2600 F. 847-364-2899
www.graftel.com

Dry Gas Metering System Calibration
Y factor for Method 5G sampling

Manufacturer:	American Meter Company
Model:	DTM-200A
Serial Number:	98Z332226

Previous Calibration Comparision

Date	2015-09-08	Acceptable	
		Deviation (5%)	Deviation
y Factor	1.000	0.05	0.006
Acceptance			

Average Gas Meter y Factor

1.006

Calibration Date:	03-30-16
Calibrated by:	Vincent Pelletier
Calibration Frequency:	6-months
Next Calibration Due:	09-26-16
Instrument Range:	1.000 cfm
Standard Temp.:	73 oF
Standard Press.:	29.92 "Hg
Barometric Press.:	30.09 "Hg
Signature/Date:	Vincent Pelletier 2016-03-30

Current Calibration

Acceptable y Deviation	0.050
Maximum y Deviation	0.014
Acceptance	Acceptable

Reference Standard *		
Standard Calibrator	Model	Standard Test Meter
	S/N	07J264834
	Calib. Date	Sept. 02, 2015
	Calib. Value	0.9931 y factor (ref)

Calibration Parameters	Run 1	Run 2	Run 3
Vacuum ("Hg)	0.00	0.00	0.00
dH ("H2O)	0.00	0.00	0.00
Initial Reference Meter	614.643	667.231	672.581
Final Reference Meter	667.231	672.581	692.897
Initial DGM	956.596	1008.026	1013.254
Final DGM	1008.026	1013.254	1033.598
Temp. Ref. Meter (°F), Tr	73.3	72.2	69.0
Temperature DGM (°F), Td	73.8	69.4	69.2
Time (Minutes)	1028.0	35.0	67.0
Net Volume Ref. Meter, Vr	52.588	5.350	20.316
Net Volume DGM, Vd	51.43	5.228	20.344
Gas Meter y Factor =	**1.016**	**1.011**	**0.992**
Gas Meter y Factor Deviation (from avg.)	0.010	0.004	0.014
Orifice dH@	**0.00**	**0.00**	**0.00**
Orifice dH@ Deviation (from avg.)	0.000	0.000	0.000

where: 0.050029183

1. Deviation = |Average value for all runs - current run value|
2. y = [Vr x (y factor (ref)) x (Pb) x (Td + 460) / [Vd x (Pb + (dH / 13.6)) x (Tr + 460]
3. dH@ = 0.0317 x dH / (Pb (Td + 460)) x [(Tr + 460) x time) / Vr]^2

* Reference calibration is traceable to NIST through NIST Test # 40674, Kimble ASTM E1272

Thermal Metering System Calibration
Y factor for Method 5G sampling

Manufacturer:	American Meter Company
Model:	DTM-200A
Serial Number:	90R054300

Previous Calibration Comparision

Date	2015-09-08	Acceptable	
		Deviation (5%)	Deviation
y Factor	0.994	0.0497	0.009
Acceptance			

Average Gas Meter y Factor
1.003

Calibration Date:	03-30-16
Calibrated by:	Vincent Pelletier
Calibration Frequency:	6-months
Next Calibration Due:	03-08-16
Instrument Range:	1.000 cfm
Standard Temp.:	73 oF
Standard Press.:	29.92 "Hg
Barometric Press.:	30.09 "Hg
Signature/Date:	Vincent Pelletier 2016-03-30

Current Calibration

Acceptable y Deviation	0.050
Maximum y Deviation	0.023
Acceptance	Acceptable

Reference Standard *		
Standard Calibrator	Model	Standard Test Meter
	S/N	07J264834
	Calib. Date	Sept. 02, 2015
	Calib. Value	0.9931 y factor (ref)

Calibration Parameters	Run 1	Run 2	Run 3
Vacuum ("Hg)	0.00	0.00	0.00
dH ("H2O)	0.00	0.00	0.00
Initial Reference Meter	579.840	584.385	589.425
Final Reference Meter	584.385	589.425	614.643
Initial DGM	467.453	471.857	476.954
Final DGM	471.857	476.954	501.989
Temp. Ref. Meter (°F), Tr	66.6	70.9	71.9
Temperature DGM (°F), Td	67.0	69.5	73.4
Time (Minutes)	102.0	40.0	91.0
Net Volume Ref. Meter, Vr	4.545	5.040	25.218
Net Volume DGM, Vd	4.404	5.097	25.035
Gas Meter y Factor =	**1.026**	**0.979**	**1.003**
Gas Meter y Factor Deviation (from avg.)	0.023	0.023	0.000
Orifice dH@	**0.00**	**0.00**	**0.00**
Orifice dH@ Deviation (from avg.)	0.000	0.000	0.000

where: 0.043176471

1. Deviation = |Average value for all runs - current run value|
2. y = [Vr x (y factor (ref)) x (Pb) x (Td + 460) / [Vd x (Pb + (dH / 13.6)) x (Tr + 460]
3. dH@ = 0.0317 x dH / (Pb (Td + 460)) x [(Tr + 460) x time) / Vr]^2

* Reference calibration is traceable to NIST through NIST Test # 40674, Kimble ASTM E1272

Dry Gas Metering System Calibration
Y factor for Method 5G sampling

Manufacturer:	Rockwell International
Model:	S-275
Serial Number:	00938

Average Gas Meter y Factor
0.983

Calibration Date:	06-02-16
Calibrated by:	Vincent Pelletier
Calibration Frequency:	6-month
Next Calibration Due:	12-01-16
Instrument Range:	1.000 cfm
Standard Temp.:	68.1 oF
Standard Press.:	29.92 "Hg
Barometric Press.:	30.1 "Hg
Signature/Date:	Vincent Pelletier 2016-06-02

Previous Calibration Comparision

Date	N/A	Acceptable	
		Deviation (5%)	Deviation
y Factor	N/A	0	0.983
Acceptance	Out of Limits		

Current Calibration

Acceptable y Deviation	N/A
Maximum y Deviation	N/A
Acceptance	N/A

Reference Standard *		
Standard	Model	Standard Test Meter
Calibrator	S/N	07J264834
	Calib. Date	Sept. 02, 2015
	Calib. Value	0.9931 y factor (ref)

Calibration Parameters	Run 1	Run 2	Run 3
Vacuum ("Hg)	0.00	0.00	0.00
dH ("H2O)	0.00	0.00	0.00
Initial Reference Meter	700.100	705.285	711.504
Final Reference Meter	705.051	711.066	719.923
Initial DGM	501.239	506.448	512.697
Final DGM	506.211	512.369	521.162
Temp. Ref. Meter (°F), Tr	73.2	73.6	74.0
Temperature DGM (°F), Td	74.2	74.0	74.8
Time (Minutes)	51.0	30.0	30.0
Net Volume Ref. Meter, Vr	4.951	5.781	8.419
Net Volume DGM, Vd	4.972	5.921	8.465
Gas Meter y Factor =	**0.991**	**0.970**	**0.989**
Gas Meter y Factor Deviation (from avg.)	0.007	0.013	0.006
Orifice dH@	**0.00**	**0.00**	**0.00**
Orifice dH@ Deviation (from avg.)	0.000	0.000	0.000

where: 0.097490196

1. Deviation = |Average value for all runs - current run value|
2. y = [Vr x (y factor (ref)) x (Pb) x (Td + 460) / [Vd x (Pb + (dH / 13.6)) x (Tr + 460]
3. dH@ = 0.0317 x dH / (Pb (Td + 460)) x [(Tr + 460) x time) / Vr]^2

* Reference calibration is traceable to NIST through NIST Test # 40674, Kimble ASTM E1272

Unit Pre-burn Documentation
Appendix F

April 8th,2016

Elapsed Time (min)	Flue temp °F	Room temp °F	Tunnel dry bulb °F	top °F	back °F	right °F	left °F	bottom °F	scale lbs
0	180.10	70.95	99.50	N/A	N/A	N/A	N/A	N/A	2.88
10	180.30	70.89	99.50	N/A	N/A	N/A	N/A	N/A	2.65
20	180.40	70.98	100.20	N/A	N/A	N/A	N/A	N/A	2.38
30	181.30	71.09	100.10	N/A	N/A	N/A	N/A	N/A	2.14
40	181.40	71.28	100.50	N/A	N/A	N/A	N/A	N/A	1.92
50	181.90	71.30	100.40	N/A	N/A	N/A	N/A	N/A	1.69
60	181.80	71.25	100.60	N/A	N/A	N/A	N/A	N/A	1.47
70	188.20	71.06	101.50	N/A	N/A	N/A	N/A	N/A	1.18
80	202.60	71.21	103.70	N/A	N/A	N/A	N/A	N/A	0.91
90	192.90	72.05	102.50	N/A	N/A	N/A	N/A	N/A	0.69
100	192.10	71.98	102.40	N/A	N/A	N/A	N/A	N/A	0.47
110	194.90	71.95	102.90	N/A	N/A	N/A	N/A	N/A	0.24
120	200.10	72.69	104.40	N/A	N/A	N/A	N/A	N/A	0.00

April 9th,2016

Elapsed Time (min)	Flue temp °F	Room temp °F	Tunnel dry bulb °F	top °F	back °F	right °F	left °F	bottom °F	scale lbs
0	262.40	74.98	114.20	N/A	N/A	N/A	N/A	N/A	5.18
10	263.90	75.37	115.40	N/A	N/A	N/A	N/A	N/A	4.75
20	264.10	75.24	115.30	N/A	N/A	N/A	N/A	N/A	4.32
30	266.40	76.14	115.90	N/A	N/A	N/A	N/A	N/A	3.89
40	265.90	75.98	115.60	N/A	N/A	N/A	N/A	N/A	3.46
50	273.50	75.56	116.10	N/A	N/A	N/A	N/A	N/A	3.03
60	274.50	76.54	116.30	N/A	N/A	N/A	N/A	N/A	2.60
70	271.20	78.08	117.30	N/A	N/A	N/A	N/A	N/A	2.17
80	270.90	75.69	118.40	N/A	N/A	N/A	N/A	N/A	1.73
90	267.90	78.10	117.30	N/A	N/A	N/A	N/A	N/A	1.30

100	268.50	76.44	117.10	N/A	N/A	N/A	N/A	N/A	0.87
110	264.70	76.33	115.50	N/A	N/A	N/A	N/A	N/A	0.43
120	263.90	77.23	115.30	N/A	N/A	N/A	N/A	N/A	0.00

April 10th,2016

Elapsed Time (min)	Flue temp °F	Room temp °F	Tunnel dry bulb °F	top °F	back °F	right °F	left °F	bottom °F	scale lbs
0	283.00	75.14	121.90	N/A	N/A	N/A	N/A	N/A	6.60
10	286.00	74.23	121.80	N/A	N/A	N/A	N/A	N/A	6.05
20	287.00	74.48	124.70	N/A	N/A	N/A	N/A	N/A	5.50
30	288.00	75.12	124.90	N/A	N/A	N/A	N/A	N/A	4.95
40	291.00	75.68	120.40	N/A	N/A	N/A	N/A	N/A	4.40
50	290.00	74.12	120.80	N/A	N/A	N/A	N/A	N/A	3.85
60	289.00	74.92	121.00	N/A	N/A	N/A	N/A	N/A	3.30
70	296.00	75.38	124.80	N/A	N/A	N/A	N/A	N/A	2.75
80	298.00	74.82	125.60	N/A	N/A	N/A	N/A	N/A	2.20
90	302.00	75.00	126.40	N/A	N/A	N/A	N/A	N/A	1.65
100	297.00	75.05	126.70	N/A	N/A	N/A	N/A	N/A	1.10
110	303.00	75.90	126.20	N/A	N/A	N/A	N/A	N/A	0.55
120	304.00	76.38	128.70	N/A	N/A	N/A	N/A	N/A	0.00

April 11th,2016

Elapsed Time (min)	Flue temp °F	Room temp °F	Tunnel dry bulb °F	top °F	back °F	right °F	left °F	bottom °F	scale lbs
0	307.40	74.89	126.40	N/A	N/A	N/A	N/A	N/A	6.43
10	307.90	75.44	127.90	N/A	N/A	N/A	N/A	N/A	5.89
20	308.40	74.09	127.40	N/A	N/A	N/A	N/A	N/A	5.36
30	308.40	74.08	128.44	N/A	N/A	N/A	N/A	N/A	4.82
40	310.90	74.12	127.10	N/A	N/A	N/A	N/A	N/A	4.29
50	309.70	73.95	127.30	N/A	N/A	N/A	N/A	N/A	3.75

60	306.80	74.10	129.40	N/A	N/A	N/A	N/A	N/A	3.21
70	301.50	73.78	128.60	N/A	N/A	N/A	N/A	N/A	2.68
80	303.40	74.03	129.40	N/A	N/A	N/A	N/A	N/A	2.14
90	302.10	74.55	129.30	N/A	N/A	N/A	N/A	N/A	1.61
100	311.60	74.57	131.50	N/A	N/A	N/A	N/A	N/A	1.07
110	309.60	74.71	131.90	N/A	N/A	N/A	N/A	N/A	0.54
120	307.20	75.09	131.30	N/A	N/A	N/A	N/A	N/A	0.00

April 12th,2016

Elapsed Time (min)	Flue temp °F	Room temp °F	Tunnel dry bulb °F	top °F	back °F	right °F	left °F	bottom °F	scale lbs
0	405.70	76.19	153.90	N/A	N/A	N/A	N/A	N/A	6.05
10	338.40	75.50	145.60	N/A	N/A	N/A	N/A	N/A	5.54
20	311.90	74.99	139.70	N/A	N/A	N/A	N/A	N/A	5.02
30	293.70	75.76	135.30	N/A	N/A	N/A	N/A	N/A	4.54
40	287.50	74.81	133.40	N/A	N/A	N/A	N/A	N/A	4.04
50	281.80	75.41	131.40	N/A	N/A	N/A	N/A	N/A	3.56
60	285.50	76.74	133.20	N/A	N/A	N/A	N/A	N/A	3.06
70	274.70	77.13	131.60	N/A	N/A	N/A	N/A	N/A	2.57
80	281.30	76.91	132.70	N/A	N/A	N/A	N/A	N/A	2.07
90	290.70	77.00	134.00	N/A	N/A	N/A	N/A	N/A	1.55
100	297.20	76.48	134.40	N/A	N/A	N/A	N/A	N/A	1.04
110	292.40	75.84	133.00	N/A	N/A	N/A	N/A	N/A	0.51
120	287.00	77.00	129.20	N/A	N/A	N/A	N/A	N/A	0.00

April 13th,2016

Elapsed Time (min)	Flue temp °F	Room temp °F	Tunnel dry bulb °F	top °F	back °F	right °F	left °F	bottom °F	scale lbs
0	328.50	74.58	124.10	N/A	N/A	N/A	N/A	N/A	5.20
10	295.90	73.93	119.00	N/A	N/A	N/A	N/A	N/A	4.81

20	277.40	73.81	115.50	N/A	N/A	N/A	N/A	N/A	4.36
30	269.80	73.61	113.80	N/A	N/A	N/A	N/A	N/A	3.91
40	259.00	73.49	111.70	N/A	N/A	N/A	N/A	N/A	3.61
50	260.60	72.70	111.50	N/A	N/A	N/A	N/A	N/A	2.21
60	261.30	72.99	111.70	N/A	N/A	N/A	N/A	N/A	2.45
70	258.50	73.36	112.60	N/A	N/A	N/A	N/A	N/A	2.02
80	253.10	73.52	111.60	N/A	N/A	N/A	N/A	N/A	1.58
90	253.70	73.42	112.00	N/A	N/A	N/A	N/A	N/A	1.13
100	250.60	73.39	111.10	N/A	N/A	N/A	N/A	N/A	0.72
110	245.50	73.57	110.40	N/A	N/A	N/A	N/A	N/A	0.30
120	232.20	72.59	106.20	N/A	N/A	N/A	N/A	N/A	0.00

April 22th,2016

Elapsed Time (min)	Flue temp °F	Room temp °F	Tunnel dry bulb °F	top °F	back °F	right °F	left °F	bottom °F	scale lbs
0	299.40	78.98	121.90	N/A	N/A	N/A	N/A	N/A	6.06
10	299.30	78.12	121.40	N/A	N/A	N/A	N/A	N/A	5.56
20	299.70	78.45	122.70	N/A	N/A	N/A	N/A	N/A	5.05
30	301.20	78.32	124.10	N/A	N/A	N/A	N/A	N/A	4.55
40	302.80	78.12	124.90	N/A	N/A	N/A	N/A	N/A	4.04
50	304.90	78.44	125.80	N/A	N/A	N/A	N/A	N/A	3.54
60	306.10	78.55	127.40	N/A	N/A	N/A	N/A	N/A	3.03
70	296.50	77.87	125.60	N/A	N/A	N/A	N/A	N/A	2.53
80	300.60	78.06	126.60	N/A	N/A	N/A	N/A	N/A	2.02
90	305.90	78.16	127.50	N/A	N/A	N/A	N/A	N/A	1.52
100	311.20	78.74	128.40	N/A	N/A	N/A	N/A	N/A	1.01
110	306.30	78.64	127.70	N/A	N/A	N/A	N/A	N/A	0.51
120	308.90	78.84	127.50	N/A	N/A	N/A	N/A	N/A	0.00

April 30th,2016

Elapsed Time (min)	Flue temp °F	Room temp °F	Tunnel dry bulb °F	top °F	back °F	right °F	left °F	bottom °F	scale lbs
0	316.90	77.45	118.40	N/A	N/A	N/A	N/A	N/A	6.07
10	316.80	78.42	119.40	N/A	N/A	N/A	N/A	N/A	5.59
20	317.40	79.14	119.80	N/A	N/A	N/A	N/A	N/A	5.07
30	318.40	79.96	120.40	N/A	N/A	N/A	N/A	N/A	4.55
40	320.90	78.50	123.70	N/A	N/A	N/A	N/A	N/A	4.03
50	318.40	78.49	124.80	N/A	N/A	N/A	N/A	N/A	3.55
60	334.10	78.47	128.90	N/A	N/A	N/A	N/A	N/A	3.06
70	316.30	77.83	125.70	N/A	N/A	N/A	N/A	N/A	2.56
80	313.20	77.49	123.90	N/A	N/A	N/A	N/A	N/A	2.07
90	314.50	77.18	123.70	N/A	N/A	N/A	N/A	N/A	1.55
100	312.40	77.54	123.60	N/A	N/A	N/A	N/A	N/A	1.03
110	319.30	78.02	124.10	N/A	N/A	N/A	N/A	N/A	0.48
120	317.30	77.62	116.20	N/A	N/A	N/A	N/A	N/A	0.00

May 12th, 2016

Elapsed Time (min)	Flue temp °F	Room temp °F	Tunnel dry bulb °F	top °F	back °F	right °F	left °F	bottom °F	scale lbs
0	192.30	73.35	91.50	134.10	149.50	300.50	324.30	120.30	3.98
10	194.70	73.29	91.75	134.20	148.30	301.20	324.60	120.40	3.69
20	188.90	73.63	90.69	133.80	147.60	303.60	322.20	120.10	3.32
30	191.20	74.24	90.32	133.10	148.50	300.20	325.30	120.20	3.03
40	189.60	74.63	93.40	133.50	149.70	306.30	324.20	120.50	2.67
50	194.50	73.20	91.25	134.60	149.30	303.50	326.30	120.60	2.32
60	192.40	73.00	91.39	134.20	149.00	302.30	327.00	120.50	2.00
70	189.10	73.34	90.56	133.70	147.50	297.80	326.60	120.90	1.69
80	188.00	74.67	91.70	133.60	146.20	303.90	314.00	121.10	1.37

90	190.70	73.94	91.52	134.50	148.00	310.80	324.50	121.80	1.02
100	195.90	73.89	92.57	135.70	149.10	327.20	328.50	121.90	0.66
110	188.20	74.24	91.94	136.50	145.40	297.70	303.00	122.20	0.37
120	198.70	74.28	93.73	136.90	150.60	320.70	327.70	122.70	0.00
0	197.30	76.27	95.97	139.60	150.70	327.30	324.90	121.00	3.94
10	195.60	76.13	95.30	139.10	150.30	318.50	307.60	120.60	3.60
20	197.80	76.18	99.54	137.30	151.20	321.30	305.30	121.10	3.26
30	196.30	76.48	96.30	140.30	148.60	312.00	310.50	121.50	2.94
40	199.30	76.30	96.13	139.60	147.60	313.50	312.70	121.70	2.64
50	198.40	76.90	96.11	140.20	149.60	314.50	322.80	121.90	2.30
60	197.40	77.35	96.02	140.80	148.20	318.20	317.50	122.00	1.94
70	196.70	76.13	96.80	139.10	149.60	320.30	308.90	121.40	1.66
80	208.80	76.22	98.48	138.80	152.30	320.50	306.90	120.60	1.36
90	193.50	76.36	96.57	139.30	149.10	311.00	316.00	120.90	1.02
100	191.70	76.68	96.13	139.20	147.40	321.70	312.70	121.20	0.68
110	192.40	76.90	96.11	140.10	149.00	332.20	321.70	123.00	0.32
120	190.40	77.35	96.02	140.90	148.10	320.20	318.60	123.30	0.00

May 13th, 2016

Elapsed Time (min)	Flue temp °F	Room temp °F	Tunnel dry bulb °F	top °F	back °F	right °F	left °F	bottom °F	scale lbs
0	195.60	73.20	91.35	130.80	147.20	297.60	323.80	119.40	4.00
10	190.60	73.48	90.54	131.00	147.50	298.60	323.70	119.60	3.68
20	193.50	73.62	91.60	131.50	147.60	297.50	324.20	119.80	3.33
30	192.40	73.84	91.35	131.90	148.10	299.50	325.60	120.00	2.97
40	196.60	73.89	92.45	133.10	148.50	301.30	325.30	120.20	2.61
50	192.50	74.24	91.50	133.40	148.30	300.50	326.40	120.30	2.32
60	198.70	74.28	93.88	133.60	149.00	302.30	327.00	120.50	2.00
70	189.10	73.34	90.56	133.70	147.50	297.80	326.60	120.90	1.69
80	188.00	74.67	91.70	133.60	146.20	303.90	314.00	121.10	1.37

90	190.70	73.94	91.52	134.50	148.00	310.80	324.50	121.80	1.02
100	195.90	73.89	92.57	135.70	149.10	327.20	328.50	121.90	0.66
110	188.20	74.24	91.94	136.50	145.40	297.70	303.00	122.20	0.37
120	198.70	74.28	93.73	136.90	150.60	320.70	327.70	122.70	0.00
0	255.50	79.59	113.80	129.30	151.10	282.90	283.90	121.60	4.05
10	240.40	79.37	110.80	129.40	151.60	283.40	284.40	121.10	3.63
20	224.90	80.48	108.80	129.80	152.10	282.80	283.80	122.30	3.27
30	227.40	79.58	108.20	130.90	151.90	283.20	284.80	122.10	2.91
40	220.10	79.73	107.50	130.20	151.30	283.90	284.90	121.40	2.55
50	217.50	79.75	107.00	131.50	152.10	284.80	285.90	121.50	2.21
60	217.00	80.14	106.70	130.40	152.30	284.60	285.40	121.90	1.85
70	217.40	79.68	107.10	131.20	152.90	285.60	285.10	122.40	1.51
80	223.00	80.40	107.50	131.74	152.40	284.80	285.90	122.40	1.14
90	215.60	82.56	107.50	132.60	151.90	285.30	286.40	122.80	0.81
100	221.00	84.38	107.80	131.80	152.20	285.90	288.40	123.10	0.46
110	191.80	81.06	103.70	132.50	152.30	286.40	289.40	123.20	0.22
120	181.10	81.28	101.40	132.90	152.70	286.50	290.30	123.50	0.00

May 17th,2016

Elapsed Time (min)	Flue temp °F	Room temp °F	Tunnel dry bulb °F	top °F	back °F	right °F	left °F	bottom °F	scale lbs
0	204.30	70.45	94.11	115.10	143.20	269.40	271.25	109.00	3.93
10	201.60	70.30	94.23	115.30	143.50	269.60	272.30	109.10	3.61
20	202.10	70.60	94.12	116.00	143.90	270.50	269.10	109.60	3.28
30	203.40	70.13	94.62	116.20	144.20	270.40	270.30	109.80	2.97
40	205.60	70.65	94.60	116.30	144.10	271.20	269.60	110.09	2.64
50	204.80	70.80	94.73	116.60	144.30	270.30	270.20	111.10	2.32
60	203.20	70.95	94.83	116.10	144.50	268.80	271.40	111.30	1.97
70	203.90	70.70	95.65	120.00	146.10	270.10	269.60	113.80	1.61
80	205.50	70.75	96.21	122.70	146.80	268.50	270.70	115.40	1.29
90	207.30	71.13	96.41	122.90	147.50	274.90	276.30	115.70	0.97

100	209.20	71.29	96.99	124.20	149.60	276.90	279.10	117.10	0.64
110	201.60	71.33	96.95	125.30	147.20	260.30	265.30	117.90	0.33
120	205.60	71.76	96.81	124.70	148.20	272.00	272.60	117.00	0.00
0	205.70	72.84	99.75	128.20	151.90	281.20	283.90	123.00	4.03
10	206.80	73.01	99.70	128.60	152.30	284.10	284.20	123.30	3.67
20	205.70	73.10	99.98	129.30	152.30	283.00	282.20	123.70	3.36
30	204.10	73.38	99.83	129.10	151.60	281.30	280.60	123.70	3.03
40	202.80	73.54	99.85	129.20	150.70	272.90	275.00	123.50	2.69
50	201.20	73.56	99.88	129.20	149.70	271.00	270.80	123.00	2.38
60	209.30	73.53	100.40	128.80	153.60	299.90	296.50	123.40	2.00
70	209.90	73.65	100.30	129.10	153.60	304.50	297.30	123.50	1.67
80	206.90	74.03	100.50	130.40	153.00	293.90	287.00	123.90	1.35
90	203.60	74.00	100.20	130.40	150.40	282.40	279.10	122.90	1.02
100	204.40	75.00	100.60	130.20	151.50	286.80	281.60	123.20	0.71
110	210.10	74.68	101.40	130.90	154.00	295.90	292.90	123.50	0.34
120	207.40	74.53	101.50	132.10	152.80	286.70	283.50	123.90	0.00

May 20th,2016

Elapsed Time (min)	Flue temp °F	Room temp °F	Tunnel dry bulb °F	top °F	back °F	right °F	left °F	bottom °F	scale lbs
0	203.40	77.84	99.56	137.60	152.30	319.40	311.80	128.00	4.20
10	203.10	77.96	99.80	137.90	151.60	315.40	313.40	128.30	3.87
20	204.30	78.10	101.50	138.40	150.70	318.60	310.80	128.50	3.54
30	203.90	77.56	99.56	138.20	149.70	317.80	312.70	128.90	3.20
40	201.60	77.80	100.30	137.80	153.60	325.30	311.80	129.10	2.83
50	202.40	77.78	100.20	138.20	155.20	328.60	313.80	129.40	2.48
60	203.20	77.87	99.70	138.00	156.70	323.00	315.00	129.60	2.13
70	203.30	77.48	99.54	137.90	155.20	331.50	312.00	130.10	1.78
80	204.50	78.17	100.10	137.80	156.70	337.70	320.50	130.60	1.43
90	207.30	77.53	100.20	138.40	157.30	361.10	331.40	131.10	1.06
100	220.00	77.86	103.20	139.70	164.20	336.00	316.90	130.40	0.72

110	205.10	78.13	101.10	138.70	157.10	318.00	308.10	130.40	0.39
120	202.00	78.59	100.70	137.60	155.70	325.60	319.60	130.20	0.00

May 21th,2016

Elapsed Time (min)	Flue temp °F	Room temp °F	Tunnel dry bulb °F	top °F	back °F	right °F	left °F	bottom °F	scale lbs
0	214.70	80.45	106.20	129.10	152.70	268.10	274.13	121.96	4.06
10	215.60	80.35	106.10	129.60	152.60	269.40	274.30	122.80	3.84
20	218.60	80.12	107.60	131.20	151.20	268.00	274.80	122.10	3.47
30	220.40	81.35	106.80	129.70	152.30	269.80	274.10	122.90	3.07
40	217.60	81.96	105.60	128.90	152.60	272.70	274.90	123.20	2.75
50	219.50	81.20	105.70	129.10	154.00	271.90	274.30	123.10	2.38
60	221.10	81.26	106.60	129.20	150.70	272.90	275.00	123.50	2.09
70	220.40	80.43	106.80	129.20	149.70	271.00	270.80	123.00	1.75
80	218.90	81.17	106.70	128.80	153.60	299.90	296.50	123.40	1.46
90	209.90	81.27	105.90	129.10	153.60	304.50	297.30	123.50	1.14
100	222.10	81.02	107.30	130.40	153.00	293.90	287.00	123.90	0.74
110	215.00	81.36	106.90	130.90	154.00	295.90	292.90	123.50	0.37
120	217.80	82.17	107.40	129.30	152.30	283.00	282.20	123.70	0.00
0	263.30	77.08	108.00	185.30	193.30	444.20	445.10	188.90	4.21
10	243.20	77.41	105.50	172.10	175.60	369.50	372.80	168.60	3.84
20	224.70	76.79	102.00	159.20	162.20	357.40	356.90	153.10	3.44
30	214.50	76.81	100.10	150.80	156.00	343.60	346.60	143.30	3.07
40	204.30	76.74	98.68	146.00	150.40	325.90	327.00	137.70	2.16
50	199.70	76.21	97.32	143.10	148.10	329.70	333.80	134.60	2.34
60	196.80	76.60	96.78	141.40	146.80	324.60	329.70	132.30	1.99
70	193.40	77.02	96.59	141.10	145.70	319.20	320.50	132.20	1.62
80	199.10	76.72	97.31	140.60	147.70	327.20	326.60	131.50	1.27
90	201.40	77.01	97.46	140.40	149.40	339.30	341.00	130.40	0.88
100	196.90	77.15	96.86	140.80	147.30	325.90	327.50	130.80	0.54

110	194.90	77.38	96.01	140.10	147.00	333.30	335.90	130.70	0.20
120	176.80	77.37	94.55	138.10	137.40	265.90	270.70	127.50	0.00

May 30th,2016

Elapsed Time (min)	Flue temp °F	Room temp °F	Tunnel dry bulb °F	top °F	back °F	right °F	left °F	bottom °F	scale lbs
0	255.50	79.59	113.80	182.71	392.73	184.66	147.51	391.95	4.05
10	240.40	79.37	110.80	165.52	327.36	164.88	137.00	327.48	3.63
20	224.90	80.48	108.80	148.96	296.25	154.69	124.50	306.44	3.27
30	227.40	79.58	108.20	139.38	286.16	154.25	120.46	302.94	2.91
40	220.10	79.73	107.50	133.87	270.10	145.53	116.63	278.83	2.55
50	217.50	79.75	107.00	130.12	298.07	144.85	113.88	278.48	2.21
60	217.00	80.14	106.70	129.33	282.23	139.61	112.82	261.58	1.85
70	217.40	79.68	107.10	127.87	282.48	140.11	111.29	260.34	1.51
80	223.00	80.40	107.50	128.84	271.92	139.23	112.62	256.43	1.14
90	215.60	82.56	107.50	126.59	288.78	138.77	110.59	265.30	0.81
100	221.00	84.38	107.80	127.86	301.85	144.04	112.86	280.29	0.46
110	191.80	81.06	103.70	129.58	289.91	145.63	114.78	282.25	0.22
120	181.10	81.28	101.40	129.25	242.68	135.90	114.15	237.08	0.00

May 31th,2016

Elapsed Time (min)	Flue temp °F	Room temp °F	Tunnel dry bulb °F	top °F	back °F	right °F	left °F	bottom °F	scale lbs
0	284.10	76.19	115.80	185.42	394.56	192.93	147.88	395.47	4.05
10	241.70	75.33	108.60	165.75	336.71	167.95	134.72	333.72	3.63
20	219.90	76.48	105.20	149.84	302.44	158.49	124.74	314.08	3.27
30	223.80	79.72	105.20	138.93	285.88	150.32	116.31	295.90	2.91
40	217.10	80.28	105.00	133.33	293.52	151.93	113.87	310.50	2.55
50	217.10	80.65	105.30	131.86	280.50	147.69	112.83	285.51	2.21
60	217.20	78.82	103.70	127.89	292.73	146.82	109.91	295.37	1.85
70	207.10	78.18	103.20	127.15	262.96	148.91	110.42	286.14	1.51
80	211.70	79.25	103.60	125.16	262.46	145.76	108.84	281.80	1.14

90	208.80	80.89	103.40	125.04	264.48	146.53	110.22	282.78	0.81
100	216.50	78.46	103.30	125.36	266.40	144.92	109.02	284.02	0.46
110	200.40	78.70	103.90	125.25	265.34	143.97	108.45	281.01	0.22
120	187.50	79.80	101.10	123.97	231.76	134.11	106.75	235.49	0.00

JUNE 1,2016

Elapsed Time (min)	Flue temp °F	Room temp °F	Tunnel dry bulb °F	top °F	back °F	right °F	left °F	bottom °F	scale lbs
0	274.50	79.23	114.00	187.36	478.12	193.92	151.38	475.43	7.75
10	237.40	78.87	108.30	173.09	361.79	167.77	142.33	357.72	7.32
20	224.80	78.06	106.00	158.58	337.75	158.45	134.94	334.49	6.89
30	212.90	80.27	104.40	148.29	337.46	154.68	128.54	341.69	6.40
40	207.40	79.77	103.60	142.52	332.07	150.75	123.79	334.51	6.16
50	212.70	78.90	103.80	136.94	314.65	142.88	117.61	309.03	5.85
60	212.10	78.93	103.60	134.42	328.27	147.04	117.92	327.70	5.45
70	207.60	80.49	103.20	133.94	312.33	144.31	117.13	314.69	4.99
80	208.00	78.58	103.20	131.75	313.14	143.35	114.73	317.51	4.80
90	208.70	78.52	103.30	132.80	315.87	145.39	116.96	319.23	4.49
100	209.00	80.90	103.80	132.05	314.77	141.68	115.27	310.15	3.80
110	215.50	82.39	105.60	130.34	315.05	141.70	113.98	308.92	3.38
120	190.30	82.84	102.50	130.81	264.70	134.42	113.54	261.51	3.07

JUNE 1,2016

Elapsed Time (min)	Flue temp °F	Room temp °F	Tunnel dry bulb °F	top °F	back °F	right °F	left °F	bottom °F	scale lbs
0	337.60	80.37	122.30	182.71	392.73	184.66	147.51	391.95	4.36
10	303.50	80.26	117.50	165.52	327.36	164.88	137.00	327.48	4.00
20	270.30	78.90	112.90	148.96	296.25	154.69	124.50	306.44	3.60
30	251.60	79.78	110.30	139.38	286.16	154.25	120.46	302.94	3.16
40	247.40	79.38	109.00	133.87	270.10	145.53	116.63	278.83	2.78
50	240.40	78.94	107.90	130.12	298.07	144.85	113.88	278.48	2.41
60	232.10	78.97	106.40	129.33	282.23	139.61	112.82	261.58	2.02

70	226.80	78.39	105.20	127.87	282.48	140.11	111.29	260.34	1.65
80	221.40	79.37	105.00	128.84	271.92	139.23	112.62	256.43	1.26
90	223.20	80.63	105.90	126.59	288.78	138.77	110.59	265.30	0.90
100	220.80	80.40	105.10	127.86	301.85	144.04	112.86	280.29	0.56
110	219.30	80.73	104.90	129.58	289.91	145.63	114.78	282.25	0.24
120	211.60	80.82	104.00	129.25	242.68	135.90	114.15	237.08	0.00

JUNE 3,2016

Elapsed Time (min)	Flue temp °F	Room temp °F	Tunnel dry bulb °F	top °F	back °F	right °F	left °F	bottom °F	scale lbs
0	307.29	77.27	114.22	187.36	478.12	193.92	151.38	475.43	4.39
10	246.88	78.44	106.00	173.09	361.79	167.77	142.33	357.72	3.95
20	230.57	78.51	103.48	158.58	337.75	158.45	134.94	334.49	3.47
30	226.38	78.71	103.01	148.29	337.46	154.68	128.54	341.69	3.09
40	223.61	79.37	102.29	142.52	332.07	150.75	123.79	334.51	2.74
50	214.51	77.35	100.92	136.94	314.65	142.88	117.61	309.03	2.48
60	217.31	79.12	100.91	134.42	328.27	147.04	117.92	327.70	2.01
70	213.74	78.30	100.60	133.94	312.33	144.31	117.13	314.69	1.67
80	212.86	78.78	100.11	131.75	313.14	143.35	114.73	317.51	1.39
90	213.51	79.66	100.87	132.80	315.87	145.39	116.96	319.23	0.93
100	212.93	77.79	100.60	132.05	314.77	141.68	115.27	310.15	0.63
110	210.62	79.10	99.86	130.34	315.05	141.70	113.98	308.92	0.31
120	193.08	77.59	97.39	130.81	264.70	134.42	113.54	261.51	0.00

JUNE 3,2016

Elapsed Time (min)	Flue temp °F	Room temp °F	Tunnel dry bulb °F	top °F	back °F	right °F	left °F	bottom °F	scale lbs
0	290.22	76.10	117.18	185.42	394.56	192.93	147.88	395.47	4.27
10	250.20	77.30	110.32	165.75	336.71	167.95	134.72	333.72	3.86
20	231.14	78.54	106.70	149.84	302.44	158.49	124.74	314.08	3.42
30	221.95	76.75	105.02	138.93	285.88	150.32	116.31	295.90	3.08
40	222.78	77.93	104.38	133.33	293.52	151.93	113.87	310.50	2.68

50	216.14	77.43	104.24	131.86	280.50	147.69	112.83	285.51	2.29
60	217.82	76.74	104.05	127.89	292.73	146.82	109.91	295.37	1.99
70	218.60	78.77	104.47	127.15	262.96	148.91	110.42	286.14	1.62
80	213.15	77.18	104.02	125.16	262.46	145.76	108.84	281.80	1.32
90	217.93	79.12	103.67	125.04	264.48	146.53	110.22	282.78	0.93
100	211.93	77.20	103.45	125.36	266.40	144.92	109.02	284.02	0.63
110	209.93	78.16	103.19	125.25	265.34	143.97	108.45	281.01	0.32
120	193.74	77.14	100.60	123.97	231.76	134.11	106.75	235.49	0.00

JUNE 6,2016

Elapsed Time (min)	Flue temp °F	Room temp °F	Tunnel dry bulb °F	top °F	back °F	right °F	left °F	bottom °F	scale lbs
0	282.23	75.82	103.27	182.71	392.73	184.66	147.51	391.95	4.28
10	243.92	78.19	98.94	165.52	327.36	164.88	137.00	327.48	3.79
20	232.99	77.68	97.07	148.96	296.25	154.69	124.50	306.44	3.42
30	229.93	78.54	96.88	139.38	286.16	154.25	120.46	302.94	3.01
40	220.78	76.78	96.08	133.87	270.10	145.53	116.63	278.83	2.70
50	218.29	78.24	95.43	130.12	298.07	144.85	113.88	278.48	2.33
60	212.30	76.97	95.23	129.33	282.23	139.61	112.82	261.58	2.00
70	209.54	78.41	94.47	127.87	282.48	140.11	111.29	260.34	1.67
80	206.69	77.74	94.36	128.84	271.92	139.23	112.62	256.43	1.31
90	210.01	77.94	94.50	126.59	288.78	138.77	110.59	265.30	0.99
100	217.67	78.32	95.44	127.86	301.85	144.04	112.86	280.29	0.58
110	216.99	78.26	95.62	129.58	289.91	145.63	114.78	282.25	0.25
120	193.45	78.25	92.93	129.25	242.68	135.90	114.15	237.08	0.00
0	310.03	76.86	108.60	193.94	477.50	200.25	164.07	474.50	4.48
10	273.89	77.49	104.89	175.36	360.80	176.26	147.76	356.80	4.06
20	255.85	76.93	101.97	157.80	338.50	164.25	134.41	335.40	3.64
30	248.91	78.35	100.64	145.68	338.10	157.35	125.39	331.86	3.25
40	236.12	79.77	99.62	139.88	331.58	152.06	121.82	334.25	2.85
50	239.60	78.91	99.41	136.17	314.50	150.99	119.22	311.48	2.46
60	225.52	78.36	97.89	133.89	328.12	146.55	117.36	326.96	2.12

70	238.77	78.62	98.59	132.11	312.80	150.86	116.83	314.23	1.71
80	236.16	78.48	98.50	131.77	310.80	150.26	116.19	318.47	1.35
90	232.06	78.75	98.35	131.72	315.10	148.27	116.14	319.24	0.97
100	226.95	78.39	97.12	130.75	314.88	147.06	114.89	311.02	0.65
110	242.52	78.80	99.42	130.93	315.90	150.95	115.59	309.85	0.20
120	194.88	77.92	94.00	130.78	264.80	136.09	114.36	264.59	0.00

Stack Loss Efficiency data/Results
Appendix G

VERSION: 2.4 2010-04-15

Manufacturer: SBI
Model: Cambridge
Date: 2016-06-07
Run: 2
Control #: QC20160606
Test Duration: 180
Output Category: Integrated

Appliance Type: Pellet (Cat, Non-Cat, Pellet)

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

Wood Moisture (% wet): 4.50
Load Weight (lb wet): 3.56
Burn Rate (dry kg/h): 0.51
Total Particulate Emissions: 17.33 g

Fuel Data
Energex P.

HHV	20 119	kJ/kg
%C	48.73	
%H	6.87	
%O	43.785	
%Ash	0.615	

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

Note 1: For other fuels, use the heating value and fuel composition determined by analysis of fuel sample in accordance with Clause 9.2.

Note 2: In cases where the "Fuel Weight Remaining" is the same for three or more readings in a row, a "divide by zero error" will occur in the calculation sheet. In such cases, adjust the weight values by interpolation between the first occurence and the next reading showing a decrease in weight.

Averages		**0.09**	**1.14**	**19.89**	**165.54**	**80.52**
					Temp. (ºF)	
Elapsed Time (min)	**Fuel Weight Remaining (lb)**	**Flue Gas Composition (%) CO**	**CO_2**	**O_2**	**Flue Gas**	**Room Temp**
0	3.56	0.10	1.65	19.81	210.6	79.9
10	3.31	0.09	1.11	19.54	187.7	78.3
20	3.12	0.07	1.09	20.19	166.5	78.1
30	2.93	0.08	1.09	20.05	160.2	77.1
40	2.69	0.09	1.04	19.64	156.3	78.3
50	2.52	0.08	1.18	20.04	155.5	82.3
60	2.29	0.09	1.19	19.97	156.6	78.7
70	2.07	0.08	1.34	19.80	158.1	79.0
80	1.86	0.09	0.91	19.96	158.4	80.5
90	1.68	0.08	1.00	20.02	162.3	80.9
100	1.49	0.11	1.17	19.80	164.9	81.4
110	1.32	0.08	1.15	20.00	160.1	81.9
120	1.12	0.09	0.94	19.88	164.6	81.7
130	0.92	0.08	0.99	20.01	165.1	82.0
140	0.77	0.08	1.22	19.65	159.2	81.6
150	0.60	0.08	1.23	19.99	159.7	81.9
160	0.38	0.08	1.14	19.91	170.9	82.0
170	0.20	0.10	0.99	19.83	164.7	82.0
180	0.00	0.08	1.31	19.85	164.0	82.4

Manufacturer: SBI
Model: Cambridge
Date: 06-07-16
Run: 2
Control #: QC20160606
Test Duration: 180 min

Note: In the "Input data", "Calc. % O_2", "Fuel Properties", and "Mass Balance" columns, [e], [d], [g], [a]. [b], [c], [h], [u], [w], [j], and [k] refer to their respective variables in Clauses 13.7.3 to 13.7.5.

	HHV	LHV
Eff	65.58%	70.80%
Comb Eff	98.69%	98.69%
HT Eff	66.46%	71.74%
Output	6 785	kJ/h
Burn Rate	0.51	kg/h
Grams CO	134	g
Input	10 345	kJ/h
MC wet	4.50	

Ultimate CO_2
$CO_{2\text{-ult}}$ 19.63
F_0
1.034

Overall Heating Efficiency: 65.58%
Combustion Efficiency: 98.69%
Heat Transfer Efficiency: 66.46%

Air Fuel Ratio (A/F)	
Dry Molecular Weight (M_d)	28.97
Dry Moles Exhaust Gas (N_t):	2093.17
Air Fuel Ratio (A/F)	60.13

%HC 0.8

Heat Output: 6 436 Btu/h 6 785 kJ/h
Heat Input: 9 813 Btu/h 10 345 kJ/h

Burn Duration: 3.00 h

Burn Rate: 1.13 lb/h 0.514 kg/h

Stack Temp: 163.0 Deg. F 72.8 Deg. C

	Averages	0.09	1.14	15.22	20.86	19.67	74.19	26.96	98.8%	67.7%	66.9%	99.00	0.78	51.49	0.75	51.49	31917	4.06
	INPUT DATA			Oxygen Calculation			Input Data		Combust	Heat	Net	Air	Wet Wt	% Wet	Dry Wt.	% Dry		
Elapsed Time	Weight Remaining (kg)	% CO [e]	% CO_2 [d]	Excess Air EA	Total O_2	Calc. % O_2 [g]	Flue Gas (°C)	Room Temp (°C)	Eff %	Transfer %	Eff %	Fuel Ratio	Now Wt	Consumed x	Now Wt_{dn}	Comsumed y	Total Input	Carbon /12= [a]
0	1.62	0.10	1.65	1020.8%	20.82	19.12	99.2	26.6	98.3%	65.9%	64.8%	68.0	1.62	0.00	1.54	0.00	0	4.06
10	1.50	0.09	1.11	1540.1%	20.86	19.71	86.5	25.7	98.7%	60.3%	59.5%	100.1	1.50	6.97	1.44	6.97	3020	4.06
20	1.41	0.07	1.09	1597.1%	20.86	19.74	74.7	25.6	100.1%	65.8%	65.9%	103.9	1.41	12.49	1.35	12.49	1681	4.06
30	1.33	0.08	1.09	1573.9%	20.86	19.73	71.2	25.1	99.0%	67.4%	66.7%	102.3	1.33	17.81	1.27	17.81	1866	4.06
40	1.22	0.09	1.04	1640.4%	20.86	19.78	69.0	25.7	98.5%	67.9%	66.9%	106.3	1.22	24.51	1.16	24.51	1777	4.06
50	1.14	0.08	1.18	1461.3%	20.86	19.64	68.6	27.9	99.4%	71.8%	71.4%	95.3	1.14	29.26	1.09	29.26	1722	4.06
60	1.04	0.09	1.19	1429.8%	20.85	19.62	69.2	25.9	98.3%	70.7%	69.6%	93.2	1.04	35.61	0.99	35.61	1936	4.06
70	0.94	0.08	1.34	1278.6%	20.84	19.46	70.0	26.1	99.0%	72.7%	72.0%	84.0	0.94	41.73	0.90	41.73	1869	4.06
80	0.85	0.09	0.91	1854.0%	20.87	19.92	70.2	27.0	97.8%	64.7%	63.3%	119.5	0.85	47.66	0.81	47.66	1736	4.06
90	0.76	0.08	1.00	1713.1%	20.87	19.83	72.4	27.2	98.9%	65.9%	65.1%	110.9	0.76	52.92	0.73	52.92	1647	4.06
100	0.67	0.11	1.17	1438.1%	20.85	19.63	73.8	27.5	97.5%	68.9%	67.2%	93.6	0.67	58.27	0.64	58.27	1547	4.06
110	0.60	0.08	1.15	1491.2%	20.86	19.67	71.1	27.7	98.9%	70.0%	69.2%	97.1	0.60	62.89	0.57	62.89	1612	4.06
120	0.51	0.09	0.94	1805.7%	20.87	19.89	73.7	27.6	98.3%	63.8%	62.7%	116.6	0.51	68.66	0.48	68.66	1742	4.06
130	0.42	0.08	0.99	1740.3%	20.87	19.84	74.0	27.8	99.4%	65.1%	64.6%	112.7	0.42	74.12	0.40	74.12	1520	4.06
140	0.35	0.08	1.22	1406.2%	20.85	19.59	70.6	27.6	99.0%	71.3%	70.6%	91.9	0.35	78.46	0.33	78.46	1409	4.06
150	0.27	0.08	1.23	1402.3%	20.85	19.58	70.9	27.7	99.4%	71.4%	71.0%	91.7	0.27	83.20	0.26	83.20	1703	4.06
160	0.17	0.08	1.14	1505.2%	20.86	19.68	77.2	27.8	99.0%	66.8%	66.1%	98.0	0.17	89.43	0.16	89.43	1725	4.06
170	0.09	0.10	0.99	1698.0%	20.87	19.83	73.7	27.8	97.4%	65.3%	63.6%	109.7	0.09	94.32	0.09	94.32	2522	4.06
180	0.00	0.08	1.31	1313.4%	20.85	19.50	73.3	28.0	99.3%	71.6%	71.1%	86.2	0.00	100.00	0.00	100.00	882	4.06

Moisture Content $M_{Ow\,b}$: 4.5

Combustion Efficiency:	98.69%		Moisture of Wood (wet basis):	4.5	Dry kg :	1.54
Total Input (kJ):	31 035	29 435 (Btu)	Initial Dry Weight Wt_{do} (kg):	1.54	CA:	48.73
Total Output (kJ):	20 354	19 305 (Btu)	Moisture Content Dry	4.71	HY:	6.87
Efficiency:	65.58%				OX:	43.785
Total CO (g):	134.36					

Load Weight (kg):	**1.62**				
Fuel Heating	**HHV**	**LHV**		**HHV**	**LHV**
Value in kJ/kg - CV:	**20 119**	**18 638**	Btu/lb	**8655.4**	**8018.1**

6.87	**2.74**	**20119.00**	**4.50**	**79.10**	**20.98**	**0.30**	**1.06**	**-0.02**	**0.03**	**38.56**	**675.51**	**2.95**	**-0.66**	**2713.33**	**35.88**	**2.62**	**347.34**	**1839.38**	**1402.81**	**1368.69**	**1352.56**
Fuel Properties			**Mw**	**Mass Balance**					**kg Wood per**								**Stack**	**Heat Content Change - Ambient to Stack**			
				(moles/100 mole dry flue gas)					**100 mole dfp**	**Moles per kg of Dry Wood**						**Moisture**	**Temp**	**Flue Gas Constituent**			
Hydrogen	**Oxygen**	**Calorific**	**Moisture**																		
/1= [b]	**/16= [c]**	**Value**	**Fuel Burnt**	**[h]**	**[u]**	**[w]**	**[j]**	**[k]**	**Nk**	**CO_2**	**O_2**	**CO**	**HC**	**N_2**	**H_2O**	**Present**	**K**	**CO_2**	**O_2**	**CO**	**N_2**
6.87	2.74	20119.00	4.50	79.13	20.99	0.43	1.50	-0.02	0.04	38.85	450.20	2.39	-0.38	1862.88	35.32	2.62	372.38	2852.65	2164.33	2108.95	2084.67
6.87	2.74	20119.00	4.50	79.10	20.98	0.29	1.03	-0.02	0.03	38.51	683.63	3.01	-0.66	2743.87	35.88	2.62	359.63	2375.99	1808.09	1763.14	1742.57
6.87	2.74	20119.00	4.50	79.10	20.98	0.28	1.00	-0.02	0.03	39.25	710.84	2.40	-0.79	2848.61	36.15	2.62	347.85	1911.11	1458.14	1422.82	1406.02
6.87	2.74	20119.00	4.50	79.10	20.98	0.28	1.01	-0.02	0.03	38.63	699.20	2.93	-0.70	2803.03	35.96	2.62	344.38	1793.51	1369.62	1336.73	1320.89
6.87	2.74	20119.00	4.50	79.09	20.98	0.27	0.98	-0.02	0.03	38.32	728.88	3.24	-0.70	2914.36	35.96	2.62	342.18	1682.71	1285.45	1254.70	1239.80
6.87	2.74	20119.00	4.50	79.11	20.98	0.30	1.09	-0.02	0.03	38.98	648.67	2.55	-0.67	2613.04	35.91	2.62	341.77	1581.17	1207.39	1178.39	1164.43
6.87	2.74	20119.00	4.50	79.10	20.98	0.31	1.11	-0.02	0.03	38.43	633.55	3.01	-0.58	2554.49	35.72	2.62	342.39	1682.54	1285.20	1254.42	1239.54
6.87	2.74	20119.00	4.50	79.11	20.98	0.35	1.23	-0.02	0.03	38.97	566.10	2.44	-0.56	2301.06	35.67	2.62	343.18	1706.87	1303.50	1272.22	1257.14
6.87	2.74	20119.00	4.50	79.08	20.98	0.24	0.87	-0.02	0.02	37.70	825.02	3.92	-0.76	3275.95	36.08	2.62	343.36	1680.82	1283.31	1252.44	1237.61
6.87	2.74	20119.00	4.50	79.09	20.98	0.26	0.94	-0.02	0.03	38.44	762.20	3.18	-0.76	3040.56	36.09	2.62	345.53	1759.27	1342.51	1310.04	1294.57
6.87	2.74	20119.00	4.50	79.09	20.98	0.31	1.10	-0.02	0.03	37.94	636.52	3.45	-0.52	2564.42	35.61	2.62	346.96	1804.53	1376.52	1343.10	1327.26
6.87	2.74	20119.00	4.50	79.10	20.98	0.30	1.07	-0.02	0.03	38.70	661.76	2.82	-0.65	2661.75	35.87	2.62	344.29	1689.32	1289.33	1258.20	1243.32
6.87	2.74	20119.00	4.50	79.08	20.98	0.25	0.89	-0.02	0.02	37.98	803.53	3.64	-0.76	3195.47	36.09	2.62	346.82	1794.06	1368.53	1335.31	1319.56
6.87	2.74	20119.00	4.50	79.09	20.98	0.26	0.93	-0.02	0.03	38.67	775.07	3.00	-0.81	3089.76	36.18	2.62	347.11	1797.37	1370.91	1337.59	1321.82
6.87	2.74	20119.00	4.50	79.11	20.98	0.32	1.12	-0.02	0.03	38.83	623.49	2.65	-0.62	2517.49	35.80	2.62	343.80	1674.85	1278.45	1247.63	1232.87
6.87	2.74	20119.00	4.50	79.11	20.98	0.32	1.13	-0.02	0.03	39.07	622.08	2.44	-0.65	2512.81	35.86	2.62	344.09	1681.46	1283.38	1252.41	1237.60
6.87	2.74	20119.00	4.50	79.10	20.98	0.30	1.06	-0.02	0.03	38.71	668.15	2.81	-0.67	2685.93	35.89	2.62	350.32	1925.32	1467.47	1431.55	1414.73
6.87	2.74	20119.00	4.50	79.08	20.98	0.26	0.94	-0.02	0.03	37.64	753.77	3.87	-0.65	3006.59	35.86	2.62	346.88	1788.14	1363.93	1330.81	1315.11
6.87	2.74	20119.00	4.50	79.11	20.98	0.34	1.20	-0.02	0.03	39.10	581.93	2.35	-0.59	2361.22	35.75	2.62	346.50	1766.41	1347.42	1314.71	1299.20

			SUMS							AVERAGE	SUMS						
1730.06	1639.31	300.11	1348.00	17838.67	15953.65	69127.20	-11133.06	31088.62	2268.49	6657.45	10681.38	407.67	10273.7	21235.6	407.7	134.4	-17.1
Temperature		Room Temp	Energy Losses (kJ/kg of Dry Fuel) Flue Gas Constituent							Total Loss	Total	Chemical	Sensible and	Total	Chem	Grams Produced	
CH_4	H_2O	K	CO_2	O_2	CO	N_2	CH_4	H_2O Comb	H_2O Fuel MC	Rate	Loss	Loss 1	Latent Loss	Output	Loss 2	CO	HC
2707.79	2525.06	299.77	110.82	974.38	681.23	3883.50	-336.03	1641.95	121.71	7077.57	0.00	0	0.00	0	0	0.00	0.00
2243.51	2111.44	298.85	91.49	1236.06	858.42	4781.37	-589.94	1653.58	120.63	8151.61	1223.59	40	1183.87	1796	40	12.67	-1.59
1796.19	1704.18	298.74	75.02	1036.50	683.15	4005.20	-708.46	1651.14	119.56	6862.10	573.34	-2	575.62	1108	-2	5.62	-1.06
1683.02	1601.17	298.22	69.28	957.64	833.29	3702.50	-622.86	1638.67	119.29	6697.82	621.20	19	601.94	1245	19	7.61	-1.04
1578.07	1502.94	298.85	64.48	936.94	920.66	3613.23	-625.30	1635.40	119.04	6664.45	588.71	26	562.88	1189	26	8.01	-0.99
1483.90	1411.49	301.08	61.63	783.20	725.61	3042.69	-599.25	1629.46	118.80	5762.15	493.28	11	482.64	1229	11	6.12	-0.92
1578.17	1502.59	299.07	64.66	814.24	855.55	3166.38	-518.20	1624.46	119.04	6126.13	589.46	32	557.27	1346	32	8.11	-0.89
1601.61	1523.89	299.25	66.53	737.91	693.69	2892.76	-495.46	1622.90	119.09	5637.42	523.80	18	505.58	1346	18	6.35	-0.83
1577.82	1500.18	300.12	63.36	1058.76	1113.93	4054.34	-674.90	1640.36	119.03	7374.88	636.30	38	598.74	1100	38	9.47	-1.04
1653.00	1569.12	300.31	67.63	1023.27	903.89	3936.21	-680.97	1643.46	119.21	7012.70	574.04	18	556.03	1073	18	7.29	-1.00
1696.68	1608.68	300.61	68.46	876.19	979.99	3403.66	-465.71	1622.88	119.31	6604.78	507.98	39	468.71	1039	39	7.42	-0.64
1586.84	1507.04	300.86	65.37	853.23	800.60	3309.42	-583.87	1631.32	119.05	6195.11	496.35	17	479.18	1116	17	6.32	-0.84
1686.82	1599.35	300.74	68.14	1099.65	1035.13	4216.63	-680.32	1644.48	119.29	7503.00	649.75	30	619.33	1093	30	8.83	-1.06
1690.27	1602.07	300.95	69.51	1062.55	851.94	4084.12	-723.29	1648.97	119.30	7113.09	537.49	10	527.97	983	10	6.34	-0.98
1572.86	1494.39	300.73	65.03	797.10	753.52	3103.74	-550.44	1627.46	119.02	5915.41	414.23	14	400.17	995	14	5.20	-0.69
1579.33	1500.11	300.85	65.69	798.37	692.51	3109.86	-576.36	1630.31	119.03	5839.40	494.29	10	484.63	1209	10	5.77	-0.88
1812.86	1714.53	300.93	74.53	980.49	800.64	3799.87	-593.41	1639.72	119.59	6821.44	584.96	18	567.43	1140	18	6.76	-0.91
1681.43	1593.95	300.95	67.30	1028.09	1100.42	3954.01	-578.96	1633.93	119.28	7324.07	918.01	65	853.15	1604	65	13.58	-1.30
1660.87	1574.67	301.13	69.06	784.11	669.50	3067.70	-529.35	1628.17	119.23	5808.43	254.59	6	248.54	627	6	2.89	-0.42

Intertek Testing Services

Manufacturer:	SBI	**Technicians:**	Claude Pelland
Model:	Cambridge		
Date:	06-07-16		
Run:	2		
Control #:	QC20160606		
Test Duration:	180		
Output Category:	Integrated		

Test Results in Accordance with CSA B415.1-10

	HHV Basis	LHV Basis
Overall Efficiency	65.6%	70.8%
Combustion Efficiency	98.7%	98.7%
Heat Transfer Efficiency	66%	71.7%

Output Rate (kJ/h)	6 785	6 436	**(Btu/h)**
Burn Rate (kg/h)	0.51	1.13	**(lb/h)**
Input (kJ/h)	10 345	9 813	**(Btu/h)**

Test Load Weight (dry kg)	1.54	3.40	**dry lb**
MC wet (%)	4.5		
MC dry (%)	4.71		
Particulate (g)	17.33		
CO (g)	134		
Test Duration (h)	3.00		

Emissions	**Particulate**	**CO**
g/MJ Output	0.85	6.60
g/kg Dry Fuel	11.23	87.10
g/h	5.78	44.79
lb/MM Btu Output	1.98	15.34

Air/Fuel Ratio (A/F)	60.13

VERSION: **2.4** **2010-04-15**

VERSION:	**2.4**	**2010-04-15**				
Manufacturer:	SBI		**Appliance Type:**	Pellet	(Cat, Non-Cat, Pellet)	
Model:	Cambridge					
Date:	2016-06-07		**Temp. Units**	F	(F or C)	
Run:	2		**Weight Units**	lb	(kg or lb)	
Control #:	QC20160606					
Test Duration:	120					
Output Category:	Integrated		**Fuel Data**			
				Energex P.		
Wood Moisture (% wet):	4.50		**HHV**	20 119	kJ/kg	
Load Weight (lb wet):	4.81		**%C**	48.73		
Burn Rate (dry kg/h):	1.04		**%H**	6.87		
Total Particulate Emissions:	17.33	g	**%O**	43.785		
			%Ash	0.615		

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

Note 1: For other fuels, use the heating value and fuel composition determined by analysis of fuel sample in accordance with Clause 9.2.

Note 2: In cases where the "Fuel Weight Remaining" is the same for three or more readings in a row, a "divide by zero error" will occur in the calculation sheet. In such cases, adjust the weight values by interpolation between the first occurence and the next reading showing a decrease in weight.

Averages		**0.09**	**2.24**	**18.68**	**237.61**	**79.03**
					Temp. (ºF)	
Elapsed Time (min)	**Fuel Weight Remaining (lb)**	**Flue Gas Composition (%) CO**	**CO_2**	**O_2**	**Flue Gas**	**Room Temp**
0	4.81	0.06	3.72	17.26	361.2	76.9
10	4.28	0.08	2.64	18.52	306.6	77.1
20	3.74	0.09	2.47	18.99	261.2	82.0
30	3.34	0.09	2.30	18.74	243.0	80.6
40	2.96	0.09	1.89	18.54	226.9	80.9
50	2.60	0.08	2.01	17.87	212.6	78.7
60	2.21	0.09	2.15	19.00	207.6	77.4
70	1.78	0.09	2.22	19.34	213.3	78.7
80	1.41	0.09	2.02	18.91	216.8	77.3
90	1.08	0.10	2.12	18.94	208.1	82.3
100	0.70	0.08	1.93	18.05	214.5	78.6
110	0.43	0.09	1.94	18.86	206.4	76.9
120	0.00	0.10	1.65	19.81	210.6	79.9

Manufacturer: SBI
Model: Cambridge
Date: 06-07-16
Run: 2
Control #: QC20160606
Test Duration: 120 min

Note: In the "Input data", "Calc. % O_2", "Fuel Properties", and "Mass Balance" columns, [e], [d], [g], [a]. [b], [c], [h], [u], [w], [j], and [k] refer to their respective variables in Clauses 13.7.3 to 13.7.5.

	HHV	LHV
Eff	66.17%	71.43%
Comb Eff	99.03%	99.03%
HT Eff	66.82%	72.13%
Output	13 873	kJ/h
Burn Rate	1.04	kg/h
Grams CO	100	g
Input	20 966	kJ/h
MC wet	4.50	

Ultimate CO_2
$CO_{2\text{-ult}}$ 19.63
F_0
1.050

Overall Heating Efficiency: 66.17%
Combustion Efficiency: 99.03%
Heat Transfer Efficiency: 66.82%

Heat Output: 13 160 Btu/h 13 873 kJ/h
Heat Input: 19 888 Btu/h 20 966 kJ/h

Burn Duration: 2.00 h

Burn Rate: 2.30 lb/h 1.042 kg/h

Stack Temp: 227.3 Deg. F 108.5 Deg. C

Air Fuel Ratio (A/F)	
Dry Molecular Weight (M_d)	29.10
Dry Moles Exhaust Gas (N_t):	1360.96
Air Fuel Ratio (A/F)	39.09

%HC 0.8

Combustion Efficiency:
Total Input (kJ):
Total Output (kJ):
Efficiency:
Total CO (g):

Averages	0.09	2.24	7.74	20.79	18.51	114.23	26.13	99.1%	68.4%	67.8%	52.96	1.02	53.08	0.98	53.08	43806	4.06	6.87	2.74	20119.00
INPUT DATA			Oxygen Calculation			Input Data		Combust	Heat	Net	Air	Wet Wt	% Wet	Dry Wt.	% Dry		Fuel Properties			
Elapsed Time	Weight Remaining (kg)	% CO [e]	% CO_2 [d]	Excess Air EA	Total O_2	Calc. % O_2 [g]	Flue Gas (°C)	Room Temp (°C)	Eff %	Transfer %	Eff %	Fuel Ratio	Now Wt	Consumed x	Now Wt_{dn}	Comsumed y	Total Input	Carbon /12= [a]	Hydrogen /1= [b]	Oxygen /16= [c]	Calorific Value
0	2.18	0.06	3.72	419.3%	20.69	16.94	182.9	24.9	100.0%	65.5%	65.5%	31.4	2.18	0.00	2.08	0.00	0	4.06	6.87	2.74	20119.00
10	1.94	0.08	2.64	621.1%	20.76	18.08	152.6	25.1	99.4%	62.6%	62.2%	43.6	1.94	11.02	1.85	11.02	6974	4.06	6.87	2.74	20119.00
20	1.70	0.09	2.47	667.8%	20.77	18.26	127.3	27.8	99.2%	67.6%	67.0%	46.5	1.70	22.25	1.62	22.25	4097	4.06	6.87	2.74	20119.00
30	1.52	0.09	2.30	722.3%	20.78	18.44	117.2	27.0	99.2%	68.3%	67.7%	49.8	1.52	30.56	1.45	30.56	3400	4.06	6.87	2.74	20119.00
40	1.34	0.09	1.89	889.4%	20.81	18.87	108.3	27.2	98.8%	66.4%	65.6%	60.0	1.34	38.46	1.28	38.46	3226	4.06	6.87	2.74	20119.00
50	1.18	0.08	2.01	840.1%	20.80	18.75	100.4	26.0	99.5%	69.8%	69.4%	57.0	1.18	45.95	1.13	45.95	3269	4.06	6.87	2.74	20119.00
60	1.00	0.09	2.15	777.1%	20.79	18.60	97.6	25.2	99.1%	71.8%	71.1%	53.1	1.00	54.05	0.96	54.05	3574	4.06	6.87	2.74	20119.00
70	0.81	0.09	2.22	750.6%	20.79	18.52	100.7	25.9	99.1%	71.7%	71.1%	51.5	0.81	62.99	0.77	62.99	3487	4.06	6.87	2.74	20119.00
80	0.64	0.09	2.02	829.5%	20.80	18.73	102.7	25.2	98.9%	69.0%	68.3%	56.3	0.64	70.69	0.61	70.69	3051	4.06	6.87	2.74	20119.00
90	0.49	0.10	2.12	783.7%	20.79	18.62	97.9	28.0	98.6%	72.2%	71.2%	53.5	0.49	77.55	0.47	77.55	3095	4.06	6.87	2.74	20119.00
100	0.32	0.08	1.93	875.6%	20.81	18.83	101.4	25.9	99.3%	68.6%	68.1%	59.2	0.32	85.45	0.30	85.45	2833	4.06	6.87	2.74	20119.00
110	0.20	0.09	1.94	864.8%	20.80	18.82	96.9	24.9	98.8%	69.8%	69.0%	58.5	0.20	91.06	0.19	91.06	4925	4.06	6.87	2.74	20119.00
120	0.00	0.10	1.65	1020.8%	20.82	19.12	99.2	26.6	98.3%	65.9%	64.8%	68.0	0.00	100.00	0.00	100.00	1874	4.06	6.87	2.74	20119.00

Moisture Content M_{Cwb}: 4.5

99.03%		Moisture of Wood (wet basis):	4.5	Dry kg :	2.08
41 932	39 770 (Btu)	Initial Dry Weight Wt_{do} (kg):	2.08	CA:	48.73
27 746	26 316 (Btu)	Moisture Content Dry	4.71	HY:	6.87
66.17%				OX:	43.785
100.28					

Load Weight (kg):	**2.18**				
Fuel Heating	**HHV**	**LHV**		**HHV**	**LHV**
Value in kJ/kg - CV:	**20 119**	**18 638**	Btu/lb	**8655.4**	**8018.1**

4.50	**79.17**	**21.00**	**0.57**	**1.98**	**-0.02**	**0.06**	**39.55**	**340.81**	**1.63**	**-0.31**	**1451.43**	**35.19**	**2.62**	**387.38**	**3488.78**	**2634.58**	**2564.16**	**2535.27**	**3338.71**	**3069.13**	**299.28**	**1797.53**	**11121.30**
Mw	**Mass Balance**					**kg Wood per**								**Stack**	**Heat Content Change - Ambient to Stack Temperature**						**Room**		
Moisture	**(moles/100 mole dry flue gas)**					**100 mole dfp**	**Moles per kg of Dry Wood**						**Moisture**	**Temp**	**Flue Gas Constituent**						**Temp**		
Fuel Burnt	**[h]**	**[u]**	**[w]**	**[j]**	**[k]**	**Nk**	**CO_2**	**O_2**	**CO**	**HC**	**N_2**	**H_2O**	**Present**	**K**	**CO_2**	**O_2**	**CO**	**N_2**	**CH_4**	**H_2O**	**K**	**CO_2**	**O_2**
4.50	79.28	21.03	0.93	3.22	-0.02	0.09	40.40	183.96	0.66	-0.20	861.11	34.96	2.62	456.03	6393.37	4766.53	4624.05	4575.12	6253.00	5529.91	298.07	258.32	876.87
4.50	79.20	21.01	0.67	2.32	-0.02	0.07	39.87	273.04	1.24	-0.26	1196.25	35.08	2.62	425.72	5105.23	3830.45	3721.98	3681.33	4939.96	4453.04	298.20	203.57	1045.87
4.50	79.19	21.00	0.63	2.18	-0.02	0.06	39.73	293.68	1.39	-0.27	1273.87	35.10	2.62	400.47	3951.69	2979.24	2898.39	2865.99	3792.49	3468.81	300.95	157.02	874.95
4.50	79.18	21.00	0.58	2.04	-0.02	0.06	39.65	317.81	1.50	-0.29	1364.82	35.15	2.62	390.39	3569.32	2697.28	2625.64	2595.97	3411.68	3142.87	300.14	141.51	857.24
4.50	79.15	20.99	0.48	1.70	-0.02	0.05	39.25	391.93	1.95	-0.35	1643.78	35.26	2.62	381.41	3197.57	2420.98	2357.80	2330.92	3046.24	2822.62	300.30	125.52	948.84
4.50	79.16	21.00	0.51	1.79	-0.02	0.05	39.69	370.28	1.54	-0.37	1563.16	35.31	2.62	373.51	2923.18	2217.61	2160.81	2135.95	2775.23	2587.14	299.11	116.02	821.15
4.50	79.17	21.00	0.55	1.91	-0.02	0.05	39.55	342.10	1.62	-0.31	1456.32	35.19	2.62	370.73	2838.50	2155.02	2100.22	2075.97	2691.24	2514.72	298.39	112.27	737.23
4.50	79.17	21.00	0.56	1.97	-0.02	0.06	39.60	330.39	1.56	-0.30	1412.19	35.17	2.62	373.85	2938.02	2228.72	2171.60	2146.62	2789.65	2600.04	299.08	116.34	736.34
4.50	79.15	21.00	0.52	1.81	-0.02	0.05	39.39	365.34	1.79	-0.33	1543.69	35.22	2.62	375.84	3046.96	2310.73	2251.35	2225.49	2894.47	2695.48	298.34	120.03	844.19
4.50	79.16	21.00	0.54	1.90	-0.02	0.05	39.27	344.89	1.88	-0.28	1466.10	35.13	2.62	371.00	2746.12	2083.52	2030.21	2006.84	2606.62	2430.79	301.10	107.83	718.58
4.50	79.15	21.00	0.49	1.72	-0.02	0.05	39.55	385.97	1.68	-0.38	1622.06	35.31	2.62	374.55	2967.42	2250.68	2192.92	2167.71	2818.29	2625.54	299.06	117.36	868.70
4.50	79.15	20.99	0.50	1.74	-0.02	0.05	39.28	380.96	1.92	-0.33	1602.39	35.23	2.62	370.06	2824.05	2144.50	2090.09	2065.93	2676.53	2502.63	298.07	110.92	816.96
4.50	79.13	20.99	0.43	1.50	-0.02	0.04	38.85	450.20	2.39	-0.38	1862.88	35.32	2.62	372.38	2852.65	2164.33	2108.95	2084.67	2707.79	2525.06	299.77	110.82	974.38

SUMS					AVERAGE	SUMS						
6032.82	45850.23	-3618.86	21515.02	1600.79	6484.52	14185.91	407.56	13778.4	29620.2	407.6	100.3	-10.9
Energy Losses (kJ/kg of Dry Fuel)					Total							
Flue Gas Constituent					Loss	Total	Chemical	Sensible and	Total	Chem	Grams Produced	
CO	N_2	CH_4	H_2O Comb	H_2O Fuel MC	Rate	Loss	Loss 1	Latent Loss	Output	Loss 2	CO	HC
188.65	3939.67	-179.77	1730.66	129.58	6943.99	0.00	0	0.00	0	0	0.00	0.00
356.41	4403.80	-231.23	1698.61	126.76	7603.78	2635.79	42	2593.56	4338	42	12.07	-1.43
398.74	3650.90	-240.87	1665.14	124.18	6630.05	1350.23	32	1318.69	2747	32	7.95	-0.88
429.82	3543.02	-261.14	1655.84	123.33	6489.62	1096.67	28	1068.66	2303	28	7.12	-0.79
557.09	3831.51	-309.32	1649.65	122.49	6925.78	1110.36	39	1071.20	2115	39	8.76	-0.89
439.21	3338.83	-331.79	1643.70	121.88	6148.99	999.14	17	982.06	2270	17	7.01	-0.97
462.57	3023.28	-280.52	1635.81	121.69	5812.32	1032.58	32	1000.70	2542	32	8.07	-0.89
446.10	3031.44	-271.29	1637.84	121.91	5818.68	1008.50	30	978.64	2479	30	7.59	-0.84
511.23	3435.46	-291.88	1643.35	122.16	6384.53	968.25	33	935.46	2083	33	7.61	-0.79
534.76	2942.22	-251.45	1629.83	121.47	5803.24	892.67	43	849.56	2202	43	8.08	-0.69
480.40	3516.16	-335.57	1645.45	121.98	6414.47	903.31	20	883.29	1930	20	6.64	-0.85
546.57	3310.44	-297.99	1637.20	121.65	6245.76	1529.06	60	1468.97	3396	60	13.14	-1.31
681.29	3883.50	-336.03	1641.95	121.71	7077.62	659.35	32	627.56	1215	32	6.23	-0.56

Intertek Testing Services

Manufacturer:	SBI	**Technicians:**	Claude Pelland
Model:	Cambridge		
Date:	06-07-16		
Run:	2		
Control #:	QC20160606		
Test Duration:	120		
Output Category:	Integrated		

Test Results in Accordance with CSA B415.1-10

	HHV Basis	LHV Basis
Overall Efficiency	66.2%	71.4%
Combustion Efficiency	99.0%	99.0%
Heat Transfer Efficiency	67%	72.1%

Output Rate (kJ/h)	13 873	13 160	**(Btu/h)**
Burn Rate (kg/h)	1.04	2.30	**(lb/h)**
Input (kJ/h)	20 966	19 888	**(Btu/h)**

Test Load Weight (dry kg)	2.08	4.59	**dry lb**
MC wet (%)	4.5		
MC dry (%)	4.71		
Particulate (g)	17.33		
CO (g)	100		
Test Duration (h)	2.00		

Emissions	**Particulate**	**CO**
g/MJ Output	0.62	3.61
g/kg Dry Fuel	8.31	48.12
g/h	8.67	50.14
lb/MM Btu Output	1.45	8.40

Air/Fuel Ratio (A/F)	39.09

VERSION: **2.4** **2010-04-15**

VERSION: 2.4 2010-04-15

Manufacturer: SBI
Model: Cambridge
Date: 2016-06-07
Run: 2
Control #: QC20160606
Test Duration: 60
Output Category: Integrated

Appliance Type: Pellet (Cat, Non-Cat, Pellet)

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

Wood Moisture (% wet): 4.50
Load Weight (lb wet): 4.96
Burn Rate (dry kg/h): 2.15
Total Particulate Emissions: 17.33 g

Fuel Data
Energex P.

HHV	20 119	kJ/kg
%C	48.73	
%H	6.87	
%O	43.785	
%Ash	0.615	

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

Note 1: For other fuels, use the heating value and fuel composition determined by analysis of fuel sample in accordance with Clause 9.2.

Note 2: In cases where the "Fuel Weight Remaining" is the same for three or more readings in a row, a "divide by zero error" will occur in the calculation sheet. In such cases, adjust the weight values by interpolation between the first occurence and the next reading showing a decrease in weight.

	Averages	0.05	5.60	15.33	357.68	77.69
					Temp. (ºF)	
Elapsed Time (min)	Fuel Weight Remaining (lb)	Flue Gas Composition (%) CO	CO_2	O_2	Flue Gas	Room Temp
0	4.96	0.06	5.90	15.37	359.7	76.5
10	4.15	0.04	5.79	14.84	355.5	79.9
20	3.35	0.05	5.81	14.96	355.5	78.1
30	2.57	0.03	5.88	14.99	352.8	77.8
40	1.75	0.05	6.20	14.31	355.4	77.0
50	0.87	0.06	5.92	15.57	363.7	77.6
60	0.00	0.06	3.72	17.26	361.2	76.9

Manufacturer: SBI
Model: Cambridge
Date: 06-07-16
Run: 2
Control #: QC20160606
Test Duration: 60 min

Note: In the "Input data", "Calc. % O_2", "Fuel Properties", and "Mass Balance" columns, [e], [d], [g], [a]. [b], [c], [h], [u], [w], [j], and [k] refer to their respective variables in Clauses 13.7.3 to 13.7.5.

	HHV	LHV
Eff	71.49%	77.17%
Comb Eff	99.50%	99.50%
HT Eff	71.85%	77.56%
Output	30 912	kJ/h
Burn Rate	2.15	kg/h
Grams CO	23	g
Input	43 239	kJ/h
MC wet	4.50	

Ultimate CO_2
$CO_{2\text{-ult}}$ 19.63
F_0
1.060

Overall Heating Efficiency: 71.49%
Combustion Efficiency: 99.50%
Heat Transfer Efficiency: 71.85%

Air Fuel Ratio (A/F)	
Dry Molecular Weight (M_d)	29.49
Dry Moles Exhaust Gas (N_d):	658.74
Air Fuel Ratio (A/F)	18.92

%HC 0.8

Heat Output: 29 323 Btu/h 30 912 kJ/h
Heat Input: 41 017 Btu/h 43 239 kJ/h
Burn Duration: 1.00 h
Burn Rate: 4.74 lb/h 2.149 kg/h
Stack Temp: 357.3 Deg. F 180.7 Deg. C

Combustion Efficiency:
Total Input (kJ):
Total Output (kJ):
Efficiency:
Total CO (g):

Averages	0.05	5.60	2.56	20.56	14.94	180.94	25.38	100.0%	73.7%	73.7%	21.57	1.14	49.16	1.09	49.16	47032	4.06	6.87	2.74	20119.00
INPUT DATA			Oxygen Calculation			Input Data		Combust	Heat	Net	Air	Wet Wt	% Wet	Dry Wt.	% Dry		Fuel Properties			
Elapsed Time	Weight Remaining (kg)	% CO [e]	% CO_2 [d]	Excess Air EA	Total O_2	Calc. % O_2 [g]	Flue Gas (°C)	Room Temp (°C)	Eff %	Transfer %	Eff %	Fuel Ratio	Now Wt	Consumed x	Now Wt_{dn}	Comsumed y	Total Input	Carbon /12= [a]	Hydrogen /1= [b]	Oxygen /16= [c]	Calorific Value
0	2.25	0.06	5.90	229.6%	20.54	14.61	182.1	24.7	99.9%	74.8%	74.7%	19.9	2.25	0.00	2.15	0.00	0	4.06	6.87	2.74	20119.00
10	1.88	0.04	5.79	236.8%	20.55	14.74	179.7	26.6	100.2%	74.9%	75.1%	20.4	1.88	16.33	1.80	16.33	10548	4.06	6.87	2.74	20119.00
20	1.52	0.05	5.81	235.2%	20.55	14.72	179.7	25.6	100.1%	74.9%	74.9%	20.3	1.52	32.46	1.45	32.46	6887	4.06	6.87	2.74	20119.00
30	1.17	0.03	5.88	231.9%	20.55	14.65	178.2	25.5	100.2%	75.2%	75.4%	20.1	1.17	48.19	1.11	48.19	6974	4.06	6.87	2.74	20119.00
40	0.79	0.05	6.20	214.3%	20.52	14.30	179.7	25.0	100.1%	75.8%	75.8%	19.0	0.79	64.72	0.76	64.72	7410	4.06	6.87	2.74	20119.00
50	0.39	0.06	5.92	228.1%	20.54	14.59	184.3	25.3	99.8%	74.6%	74.5%	19.8	0.39	82.46	0.38	82.46	11420	4.06	6.87	2.74	20119.00
60	0.00	0.06	3.72	419.3%	20.69	16.94	182.9	24.9	100.0%	65.5%	65.5%	31.4	0.00	100.00	0.00	100.00	3792	4.06	6.87	2.74	20119.00

Moisture Content M_{Cwb}: 4.5

99.50%		Moisture of Wood (wet basis):	4.5	Dry kg :	2.15
43 239	41 010 (Btu)	Initial Dry Weight Wt_{do} (kg):	2.15	CA:	48.73
30 912	29 318 (Btu)	Moisture Content Dry	4.71	HY:	6.87
71.49%				OX:	43.785
22.63					

Load Weight (kg):	**2.25**				
Fuel Heating	**HHV**	**LHV**		**HHV**	**LHV**
Value in kJ/kg - CV:	**20 119**	**18 638**	Btu/lb	**8655.4**	**8018.1**

4.50	**79.41**	**21.06**	**1.39**	**4.80**	**-0.02**	**0.14**	**40.62**	**112.34**	**0.37**	**-0.13**	**591.06**	**34.82**	**2.62**	**454.09**	**6292.56**	**4692.80**	**4552.88**	**4504.63**	**6151.27**	**5444.91**	**298.53**	**1789.01**	**3696.11**
Mw	**Mass Balance**					**kg Wood per**								**Stack**	**Heat Content Change - Ambient to Stack Temperature**						**Room**		
Moisture	**(moles/100 mole dry flue gas)**					**100 mole dfp**	**Moles per kg of Dry Wood**						**Moisture**	**Temp**	**Flue Gas Constituent**						**Temp**		
Fuel Burnt	**[h]**	**[u]**	**[w]**	**[j]**	**[k]**	**Nk**	**CO_2**	**O_2**	**CO**	**HC**	**N_2**	**H_2O**	**Present**	**K**	**CO_2**	**O_2**	**CO**	**N_2**	**CH_4**	**H_2O**	**K**	**CO_2**	**O_2**
4.50	79.43	21.07	1.46	5.06	-0.02	0.15	40.58	100.52	0.38	-0.11	546.33	34.77	2.62	455.22	6365.65	4746.85	4605.21	4556.42	6223.74	5507.45	297.89	258.32	477.16
4.50	79.43	21.07	1.43	4.95	-0.02	0.14	40.72	103.68	0.27	-0.13	558.64	34.82	2.62	452.87	6193.98	4619.30	4481.58	4434.08	6054.86	5359.64	299.75	252.23	478.95
4.50	79.43	21.07	1.44	4.97	-0.02	0.14	40.66	102.99	0.32	-0.12	555.88	34.80	2.62	452.85	6230.37	4647.40	4509.08	4461.24	6088.33	5392.61	298.78	253.34	478.66
4.50	79.44	21.07	1.45	5.02	-0.02	0.14	40.75	101.52	0.24	-0.13	550.57	34.82	2.62	451.39	6174.46	4607.29	4470.55	4423.04	6030.23	5346.65	298.61	251.63	467.75
4.50	79.45	21.08	1.53	5.30	-0.02	0.15	40.67	93.81	0.30	-0.11	521.20	34.78	2.62	452.81	6252.36	4664.46	4525.79	4477.74	6108.41	5412.64	298.16	254.28	437.56
4.50	79.43	21.07	1.47	5.08	-0.01	0.15	40.53	99.87	0.43	-0.10	543.72	34.76	2.62	457.43	6437.69	4797.77	4653.91	4604.76	6300.31	5565.48	298.47	260.89	479.16
4.50	79.28	21.03	0.93	3.22	-0.02	0.09	40.40	183.96	0.66	-0.20	861.11	34.96	2.62	456.03	6393.37	4766.53	4624.05	4575.12	6253.00	5529.91	298.07	258.32	876.87

SUMS					AVERAGE	SUMS						
744.44	18658.62	-796.50	12042.93	905.50	5291.44	12085.54	-25.77	12111.3	34946.0	-25.8	22.6	-4.6
Energy Losses (kJ/kg of Dry Fuel)					Total							
Flue Gas Constituent					Loss	Total	Chemical	Sensible and	Total	Chem	Grams Produced	
CO	N_2	CH_4	H_2O Comb	H_2O Fuel MC	Rate	Loss	Loss 1	Latent Loss	Output	Loss 2	CO	HC
110.56	2489.29	-94.82	1720.50	129.52	5090.53	0.00	0	0.00	0	0	0.00	0.00
76.43	2477.07	-114.88	1717.57	129.13	5016.50	2630.13	-20	2650.51	7918	-20	3.90	-1.08
91.35	2479.91	-107.11	1717.86	129.22	5043.23	1726.34	-6	1731.98	5161	-6	3.05	-0.65
67.74	2435.18	-115.71	1717.21	129.10	4952.90	1716.88	-17	1733.61	5257	-17	2.29	-0.72
85.44	2333.78	-96.54	1717.39	129.27	4861.19	1790.41	-4	1794.75	5620	-4	3.06	-0.63
124.25	2503.72	-87.68	1721.73	129.67	5131.74	2912.91	20	2892.95	8507	20	6.87	-0.89
188.68	3939.67	-179.77	1730.66	129.58	6944.02	1308.86	1	1307.51	2483	1	3.46	-0.60

Intertek Testing Services

Manufacturer:	SBI	**Technicians:**	Claude Pelland
Model:	Cambridge		
Date:	06-07-16		
Run:	2		
Control #:	QC20160606		
Test Duration:	60		
Output Category:	Integrated		

Test Results in Accordance with CSA B415.1-10

	HHV Basis	LHV Basis
Overall Efficiency	71.5%	77.2%
Combustion Efficiency	99.5%	99.5%
Heat Transfer Efficiency	72%	77.6%

Output Rate (kJ/h)	30 912	29 323	**(Btu/h)**
Burn Rate (kg/h)	2.15	4.74	**(lb/h)**
Input (kJ/h)	43 239	41 017	**(Btu/h)**

Test Load Weight (dry kg)	2.15	4.74	**dry lb**
MC wet (%)	4.5		
MC dry (%)	4.71		
Particulate (g)	17.33		
CO (g)	23		
Test Duration (h)	1.00		

Emissions	**Particulate**	**CO**
g/MJ Output	0.56	0.73
g/kg Dry Fuel	8.06	10.53
g/h	17.33	22.63
lb/MM Btu Output	1.30	1.70

Air/Fuel Ratio (A/F)	18.92

VERSION: **2.4** **2010-04-15**

VERSION: 2.4 2010-04-15

Manufacturer: SBI
Model: Cambridge
Date: 2016-06-07
Run: 2
Control #: QC20160606
Test Duration: 360
Output Category: Integrated

Appliance Type: Pellet (Cat, Non-Cat, Pellet)

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

Wood Moisture (% wet): 4.50
Load Weight (lb wet): 13.32
Burn Rate (dry kg/h): 0.96
Total Particulate Emissions: 17.33 g

Fuel Data
Energex P.
HHV 20 119 kJ/kg
%C 48.73
%H 6.87
%O 43.785
%Ash 0.615

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

Note 1: For other fuels, use the heating value and fuel composition determined by analysis of fuel sample in accordance with Clause 9.2.

Note 2: In cases where the "Fuel Weight Remaining" is the same for three or more readings in a row, a "divide by zero error" will occur in the calculation sheet. In such cases, adjust the weight values by interpolation between the first occurence and the next reading showing a decrease in weight.

	Averages	0.08	2.29	18.68	220.71	79.58
					Temp. (ºF)	
Elapsed Time (min)	Fuel Weight Remaining (lb)	Flue Gas Composition (%) CO	CO_2	O_2	Flue Gas	Room Temp
0	13.32	0.06	5.90	15.37	359.7	76.5
10	12.51	0.04	5.79	14.84	355.5	79.9
20	11.71	0.05	5.81	14.96	355.5	78.1
30	10.93	0.03	5.88	14.99	352.8	77.8
40	10.12	0.05	6.20	14.31	355.4	77.0
50	9.23	0.06	5.92	15.57	363.7	77.6
60	8.37	0.06	3.72	17.26	361.2	76.9
70	7.84	0.08	2.64	18.52	306.6	77.1
80	7.30	0.09	2.47	18.99	261.2	82.0
90	6.90	0.09	2.30	18.74	243.0	80.6
100	6.52	0.09	1.89	18.54	226.9	80.9
110	6.16	0.08	2.01	17.87	212.6	78.7
120	5.77	0.09	2.15	19.00	207.6	77.4
130	5.34	0.09	2.22	19.34	213.3	78.7
140	4.97	0.09	2.02	18.91	216.8	77.3
150	4.64	0.10	2.12	18.94	208.1	82.3
160	4.26	0.08	1.93	18.05	214.5	78.6
170	3.99	0.09	1.94	18.86	206.4	76.9
180	3.56	0.10	1.65	19.81	210.6	79.9
190	3.31	0.09	1.11	19.54	187.7	78.3
200	3.12	0.07	1.09	20.19	166.5	78.1
210	2.93	0.08	1.09	20.05	160.2	77.1
220	2.69	0.09	1.04	19.64	156.3	78.3
230	2.52	0.08	1.18	20.04	155.5	82.3
240	2.29	0.09	1.19	19.97	156.6	78.7

250	2.07	0.08	1.34	19.80	158.1	79.0
260	1.86	0.09	0.91	19.96	158.4	80.5
270	1.68	0.08	1.00	20.02	162.3	80.9
280	1.49	0.11	1.17	19.80	164.9	81.4
290	1.32	0.08	1.15	20.00	160.1	81.9
300	1.12	0.09	0.94	19.88	164.6	81.7
310	0.92	0.08	0.99	20.01	165.1	82.0
320	0.77	0.08	1.22	19.65	159.2	81.6
330	0.60	0.08	1.23	19.99	159.7	81.9
340	0.38	0.08	1.14	19.91	170.9	82.0
350	0.20	0.10	0.99	19.83	164.7	82.0
360	0.00	0.08	1.31	19.85	164.0	82.4

Manufacturer: SBI
Model: Cambridge
Date: 06-07-16
Run: 2
Control #: QC20160606
Test Duration: 360 min

	HHV	LHV
Eff	69.65%	75.18%
Comb Eff	99.35%	99.35%
HT Eff	70.10%	75.67%
Output	13 481	kJ/h
Burn Rate	0.96	kg/h
Grams CO	247	g
Input	19 356	kJ/h
MC wet	4.50	

Note: In the "Input data", "Calc. % O_2", "Fuel Properties", and "Mass Balance" columns, [e], [d], [g], [a]. [b], [c], [h], [u], [w], [j], and [k] refer to their respective variables in Clauses 13.7.3 to 13.7.5.

Ultimate CO_2
$CO_{2\text{-ult}}$ 19.63
F_0
1.050

Overall Heating Efficiency:	69.65%	Air Fuel Ratio (A/F)	
Combustion Efficiency:	99.35%	Dry Molecular Weight (M_d)	29.10
Heat Transfer Efficiency:	70.10%	Dry Moles Exhaust Gas (N_t):	1341.68
		Air Fuel Ratio (A/F)	38.54

%HC 0.8

Heat Output: 12 788 Btu/h 13 481 kJ/h
Heat Input: 18 361 Btu/h 19 356 kJ/h

Burn Duration: 6.00 h

Burn Rate: 2.12 lb/h 0.962 kg/h

Stack Temp: 216.8 Deg. F 102.7 Deg. C

Combustior
Tota
Total
T

Averages	0.08	2.29	10.63	20.78	18.45	104.84	26.43	99.1%	69.2%	68.6%	70.84	2.12	64.96	2.02	64.96	117018	4.06	6.87	2.74
INPUT DATA			Oxygen Calculation			Input Data		Combust	Heat	Net	Air	Wet Wt	% Wet	Dry Wt.	% Dry		Fuel Properties		
Elapsed	Weight	%	%	Excess	Total	Calc. %	Flue	Room	Eff	Transfer	Eff	Fuel	Now	Consumed	Now	Comsumed	Total	Carbon	Hydrogen	Oxygen
Time	Remaining (kg)	CO [e]	CO_2 [d]	Air EA	O_2	O_2 [g]	Gas (°C)	Temp (°C)	%	%	%	Ratio	Wt	x	Wt_{dn}	y	Input	/12= [a]	/1= [b]	/16= [c]
0	6.04	0.06	5.90	229.6%	20.54	14.61	182.1	24.7	99.9%	74.8%	74.7%	19.9	6.04	0.00	5.77	0.00	0	4.06	6.87	2.74
10	5.68	0.04	5.79	236.8%	20.55	14.74	179.7	26.6	100.2%	74.9%	75.1%	20.4	5.68	6.07	5.42	6.07	10539	4.06	6.87	2.74
20	5.31	0.05	5.81	235.2%	20.55	14.72	179.7	25.6	100.1%	74.9%	74.9%	20.3	5.31	12.08	5.08	12.08	6885	4.06	6.87	2.74
30	4.96	0.03	5.88	231.9%	20.55	14.65	178.2	25.5	100.2%	75.2%	75.4%	20.1	4.96	17.93	4.74	17.93	6962	4.06	6.87	2.74
40	4.59	0.05	6.20	214.3%	20.52	14.30	179.7	25.0	100.1%	75.8%	75.8%	19.0	4.59	24.07	4.38	24.07	7410	4.06	6.87	2.74
50	4.19	0.06	5.92	228.1%	20.54	14.59	184.3	25.3	99.8%	74.6%	74.5%	19.8	4.19	30.69	4.00	30.69	7624	4.06	6.87	2.74
60	3.80	0.06	3.72	419.3%	20.69	16.94	182.9	24.9	100.0%	65.5%	65.5%	31.4	3.80	37.20	3.63	37.20	6090	4.06	6.87	2.74
70	3.56	0.08	2.64	621.1%	20.76	18.08	152.6	25.1	99.4%	62.6%	62.2%	43.6	3.56	41.18	3.40	41.18	4661	4.06	6.87	2.74
80	3.31	0.09	2.47	667.8%	20.77	18.26	127.3	27.8	99.2%	67.6%	67.0%	46.5	3.31	45.22	3.16	45.22	4068	4.06	6.87	2.74
90	3.13	0.09	2.30	722.3%	20.78	18.44	117.2	27.0	99.2%	68.3%	67.7%	49.8	3.13	48.18	2.99	48.18	3379	4.06	6.87	2.74
100	2.96	0.09	1.89	889.4%	20.81	18.87	108.3	27.2	98.8%	66.4%	65.6%	60.0	2.96	51.04	2.83	51.04	3252	4.06	6.87	2.74
110	2.79	0.08	2.01	840.1%	20.80	18.75	100.4	26.0	99.5%	69.8%	69.4%	57.0	2.79	53.78	2.67	53.78	3271	4.06	6.87	2.74
120	2.62	0.09	2.15	777.1%	20.79	18.60	97.6	25.2	99.1%	71.8%	71.1%	53.1	2.62	56.67	2.50	56.67	3542	4.06	6.87	2.74
130	2.42	0.09	2.22	750.6%	20.79	18.52	100.7	25.9	99.1%	71.7%	71.1%	51.5	2.42	59.88	2.32	59.88	3499	4.06	6.87	2.74
140	2.25	0.09	2.02	829.5%	20.80	18.73	102.7	25.2	98.9%	69.0%	68.3%	56.3	2.25	62.70	2.15	62.70	3080	4.06	6.87	2.74
150	2.10	0.10	2.12	783.7%	20.79	18.62	97.9	28.0	98.6%	72.2%	71.2%	53.5	2.10	65.19	2.01	65.19	3105	4.06	6.87	2.74
160	1.93	0.08	1.93	875.6%	20.81	18.83	101.4	25.9	99.3%	68.6%	68.1%	59.2	1.93	68.05	1.84	68.05	2841	4.06	6.87	2.74
170	1.81	0.09	1.94	864.8%	20.80	18.82	96.9	24.9	98.8%	69.8%	69.0%	58.5	1.81	70.08	1.73	70.08	3036	4.06	6.87	2.74
180	1.62	0.10	1.65	1020.8%	20.82	19.12	99.2	26.6	98.3%	65.9%	64.8%	68.0	1.62	73.28	1.54	73.28	2940	4.06	6.87	2.74
190	1.50	0.09	1.11	1540.1%	20.86	19.71	86.5	25.7	98.7%	60.3%	59.5%	100.1	1.50	75.14	1.44	75.14	1938	4.06	6.87	2.74
200	1.41	0.07	1.09	1597.1%	20.86	19.74	74.7	25.6	100.1%	65.8%	65.9%	103.9	1.41	76.61	1.35	76.61	1681	4.06	6.87	2.74
210	1.33	0.08	1.09	1573.9%	20.86	19.73	71.2	25.1	99.0%	67.4%	66.7%	102.3	1.33	78.04	1.27	78.04	1866	4.06	6.87	2.74
220	1.22	0.09	1.04	1640.4%	20.86	19.78	69.0	25.7	98.5%	67.9%	66.9%	106.3	1.22	79.83	1.16	79.83	1777	4.06	6.87	2.74
230	1.14	0.08	1.18	1461.3%	20.86	19.64	68.6	27.9	99.4%	71.8%	71.4%	95.3	1.14	81.10	1.09	81.10	1722	4.06	6.87	2.74
240	1.04	0.09	1.19	1429.8%	20.85	19.62	69.2	25.9	98.3%	70.7%	69.6%	93.2	1.04	82.79	0.99	82.79	1936	4.06	6.87	2.74
250	0.94	0.08	1.34	1278.6%	20.84	19.46	70.0	26.1	99.0%	72.7%	72.0%	84.0	0.94	84.43	0.90	84.43	1869	4.06	6.87	2.74
260	0.85	0.09	0.91	1854.0%	20.87	19.92	70.2	27.0	97.8%	64.7%	63.3%	119.5	0.85	86.01	0.81	86.01	1736	4.06	6.87	2.74
270	0.76	0.08	1.00	1713.1%	20.87	19.83	72.4	27.2	98.9%	65.9%	65.1%	110.9	0.76	87.42	0.73	87.42	1647	4.06	6.87	2.74
280	0.67	0.11	1.17	1438.1%	20.85	19.63	73.8	27.5	97.5%	68.9%	67.2%	93.6	0.67	88.85	0.64	88.85	1547	4.06	6.87	2.74
290	0.60	0.08	1.15	1491.2%	20.86	19.67	71.1	27.7	98.9%	70.0%	69.2%	97.1	0.60	90.08	0.57	90.08	1612	4.06	6.87	2.74
300	0.51	0.09	0.94	1805.7%	20.87	19.89	73.7	27.6	98.3%	63.8%	62.7%	116.6	0.51	91.63	0.48	91.63	1742	4.06	6.87	2.74
310	0.42	0.08	0.99	1740.3%	20.87	19.84	74.0	27.8	99.4%	65.1%	64.6%	112.7	0.42	93.08	0.40	93.08	1520	4.06	6.87	2.74
320	0.35	0.08	1.22	1406.2%	20.85	19.59	70.6	27.6	99.0%	71.3%	70.6%	91.9	0.35	94.24	0.33	94.24	1409	4.06	6.87	2.74
330	0.27	0.08	1.23	1402.3%	20.85	19.58	70.9	27.7	99.4%	71.4%	71.0%	91.7	0.27	95.51	0.26	95.51	1703	4.06	6.87	2.74
340	0.17	0.08	1.14	1505.2%	20.86	19.68	77.2	27.8	99.0%	66.8%	66.1%	98.0	0.17	97.18	0.16	97.18	1725	4.06	6.87	2.74
350	0.09	0.10	0.99	1698.0%	20.87	19.83	73.7	27.8	97.4%	65.3%	63.6%	109.7	0.09	98.48	0.09	98.48	2522	4.06	6.87	2.74
360	0.00	0.08	1.31	1313.4%	20.85	19.50	73.3	28.0	99.3%	71.6%	71.1%	86.2	0.00	100.00	0.00	100.00	882	4.06	6.87	2.74

Moisture Content M_{Cwb}: 4.5

ı Efficiency:	99.35%		Moisture of Wood (wet basis):	4.5	Dry kg : 5.77
ał Input (kJ):	116 136	110 149 (Btu)	Initial Dry Weight Wt_{do} (kg):	5.77	CA: 48.73
Output (kJ):	80 887	76 717 (Btu)	Moisture Content Dry	4.71	HY: 6.87
Efficiency:	69.65%				OX: 43.785
otal CO (g):	247.08				

Load Weight (kg):	**6.04**			
Fuel Heating	**HHV**	**LHV**		**HHV**	**LHV**
Value in kJ/kg - CV:	**20 119**	**18 638**	Btu/lb	**8655.4**	**8018.1**

20119.00	4.50	79.18	21.00	0.58	2.02	-0.02	0.06	39.24	470.74	2.08	-0.46	1941.50	35.47	2.62	377.99	3110.92	2346.53	2283.15	2257.56	2983.04	2732.57	299.58	4565.40
	Mw	Mass Balance (moles/100 mole dry flue gas)					kg Wood per 100 mole dfp	Moles per kg of Dry Wood						Moisture	Stack Temp	Heat Content Change - Ambient to Stack Temperature Flue Gas Constituent						Room Temp	
Calorific Value	Moisture Fuel Burnt	[h]	[u]	[w]	[j]	[k]	Nk	CO_2	O_2	CO	HC	N_2	H_2O	Present	K	CO_2	O_2	CO	N_2	CH_4	H_2O	K	CO_2
20119.00	4.50	79.43	21.07	1.46	5.06	-0.02	0.15	40.58	100.52	0.38	-0.11	546.33	34.77	2.62	455.22	6365.65	4746.85	4605.21	4556.42	6223.74	5507.45	297.89	258.32
20119.00	4.50	79.43	21.07	1.43	4.95	-0.02	0.14	40.72	103.68	0.27	-0.13	558.64	34.82	2.62	452.87	6193.98	4619.30	4481.58	4434.08	6054.86	5359.64	299.75	252.23
20119.00	4.50	79.43	21.07	1.44	4.97	-0.02	0.14	40.66	102.99	0.32	-0.12	555.88	34.80	2.62	452.85	6230.37	4647.40	4509.08	4461.24	6088.33	5392.61	298.78	253.34
20119.00	4.50	79.44	21.07	1.45	5.02	-0.02	0.14	40.75	101.52	0.24	-0.13	550.57	34.82	2.62	451.39	6174.46	4607.29	4470.55	4423.04	6030.23	5346.65	298.61	251.63
20119.00	4.50	79.45	21.08	1.53	5.30	-0.02	0.15	40.67	93.81	0.30	-0.11	521.20	34.78	2.62	452.81	6252.36	4664.46	4525.79	4477.74	6108.41	5412.64	298.16	254.28
20119.00	4.50	79.43	21.07	1.47	5.08	-0.01	0.15	40.53	99.87	0.43	-0.10	543.72	34.76	2.62	457.43	6437.69	4797.77	4653.91	4604.76	6300.31	5565.48	298.47	260.89
20119.00	4.50	79.28	21.03	0.93	3.22	-0.02	0.09	40.40	183.96	0.66	-0.20	861.11	34.96	2.62	456.03	6393.37	4766.53	4624.05	4575.12	6253.00	5529.91	298.07	258.32
20119.00	4.50	79.20	21.01	0.67	2.32	-0.02	0.07	39.87	273.04	1.24	-0.26	1196.25	35.08	2.62	425.72	5105.23	3830.45	3721.98	3681.33	4939.96	4453.04	298.20	203.57
20119.00	4.50	79.19	21.00	0.63	2.18	-0.02	0.06	39.73	293.68	1.39	-0.27	1273.87	35.10	2.62	400.47	3951.69	2979.24	2898.39	2865.99	3792.49	3468.81	300.95	157.02
20119.00	4.50	79.18	21.00	0.58	2.04	-0.02	0.06	39.65	317.81	1.50	-0.29	1364.82	35.15	2.62	390.39	3569.32	2697.28	2625.64	2595.97	3411.68	3142.87	300.14	141.51
20119.00	4.50	79.15	20.99	0.48	1.70	-0.02	0.05	39.25	391.93	1.95	-0.35	1643.78	35.26	2.62	381.41	3197.57	2420.98	2357.80	2330.92	3046.24	2822.62	300.30	125.52
20119.00	4.50	79.16	21.00	0.51	1.79	-0.02	0.05	39.69	370.28	1.54	-0.37	1563.16	35.31	2.62	373.51	2923.18	2217.61	2160.81	2135.95	2775.23	2587.14	299.11	116.02
20119.00	4.50	79.17	21.00	0.55	1.91	-0.02	0.05	39.55	342.10	1.62	-0.31	1456.32	35.19	2.62	370.73	2838.50	2155.02	2100.22	2075.97	2691.24	2514.72	298.39	112.27
20119.00	4.50	79.17	21.00	0.56	1.97	-0.02	0.06	39.60	330.39	1.56	-0.30	1412.19	35.17	2.62	373.85	2938.02	2228.72	2171.60	2146.62	2789.65	2600.04	299.08	116.34
20119.00	4.50	79.15	21.00	0.52	1.81	-0.02	0.05	39.39	365.34	1.79	-0.33	1543.69	35.22	2.62	375.84	3046.96	2310.73	2251.35	2225.49	2894.47	2695.48	298.34	120.03
20119.00	4.50	79.16	21.00	0.54	1.90	-0.02	0.05	39.27	344.89	1.88	-0.28	1466.10	35.13	2.62	371.00	2746.12	2083.52	2030.21	2006.84	2606.62	2430.79	301.10	107.83
20119.00	4.50	79.15	21.00	0.49	1.72	-0.02	0.05	39.55	385.97	1.68	-0.38	1622.06	35.31	2.62	374.55	2967.42	2250.68	2192.92	2167.71	2818.29	2625.54	299.06	117.36
20119.00	4.50	79.15	20.99	0.50	1.74	-0.02	0.05	39.28	380.96	1.92	-0.33	1602.39	35.23	2.62	370.06	2824.05	2144.50	2090.09	2065.93	2676.53	2502.63	298.07	110.92
20119.00	4.50	79.13	20.99	0.43	1.50	-0.02	0.04	38.85	450.20	2.39	-0.38	1862.88	35.32	2.62	372.38	2852.65	2164.33	2108.95	2084.67	2707.79	2525.06	299.77	110.82
20119.00	4.50	79.10	20.98	0.29	1.03	-0.02	0.03	38.51	683.63	3.01	-0.66	2743.87	35.88	2.62	359.63	2375.99	1808.09	1763.14	1742.57	2243.51	2111.44	298.85	91.49
20119.00	4.50	79.10	20.98	0.28	1.00	-0.02	0.03	39.25	710.84	2.40	-0.79	2848.61	36.15	2.62	347.85	1911.11	1458.14	1422.82	1406.02	1796.19	1704.18	298.74	75.02
20119.00	4.50	79.10	20.98	0.28	1.01	-0.02	0.03	38.63	699.20	2.93	-0.70	2803.03	35.96	2.62	344.38	1793.51	1369.62	1336.73	1320.89	1683.02	1601.17	298.22	69.28
20119.00	4.50	79.09	20.98	0.27	0.98	-0.02	0.03	38.32	728.88	3.24	-0.70	2914.36	35.96	2.62	342.18	1682.71	1285.45	1254.70	1239.80	1578.07	1502.94	298.85	64.48
20119.00	4.50	79.11	20.98	0.30	1.09	-0.02	0.03	38.98	648.67	2.55	-0.67	2613.04	35.91	2.62	341.77	1581.17	1207.39	1178.39	1164.43	1483.90	1411.49	301.08	61.63
20119.00	4.50	79.10	20.98	0.31	1.11	-0.02	0.03	38.43	633.55	3.01	-0.58	2554.49	35.72	2.62	342.39	1682.54	1285.20	1254.42	1239.54	1578.17	1502.59	299.07	64.66
20119.00	4.50	79.11	20.98	0.35	1.23	-0.02	0.03	38.97	566.10	2.44	-0.56	2301.06	35.67	2.62	343.18	1706.87	1303.50	1272.22	1257.14	1601.61	1523.89	299.25	66.53
20119.00	4.50	79.08	20.98	0.24	0.87	-0.02	0.02	37.70	825.02	3.92	-0.76	3275.95	36.08	2.62	343.36	1680.82	1283.31	1252.44	1237.61	1577.82	1500.18	300.12	63.36
20119.00	4.50	79.09	20.98	0.26	0.94	-0.02	0.03	38.44	762.20	3.18	-0.76	3040.56	36.09	2.62	345.53	1759.27	1342.51	1310.04	1294.57	1653.00	1569.12	300.31	67.63
20119.00	4.50	79.09	20.98	0.31	1.10	-0.02	0.03	37.94	636.52	3.45	-0.52	2564.42	35.61	2.62	346.96	1804.53	1376.52	1343.10	1327.26	1696.68	1608.68	300.61	68.46
20119.00	4.50	79.10	20.98	0.30	1.07	-0.02	0.03	38.70	661.76	2.82	-0.65	2661.75	35.87	2.62	344.29	1689.32	1289.33	1258.20	1243.32	1586.84	1507.04	300.86	65.37
20119.00	4.50	79.08	20.98	0.25	0.89	-0.02	0.02	37.98	803.53	3.64	-0.76	3195.47	36.09	2.62	346.82	1794.06	1368.53	1335.31	1319.56	1686.82	1599.35	300.74	68.14
20119.00	4.50	79.09	20.98	0.26	0.93	-0.02	0.03	38.67	775.07	3.00	-0.81	3089.76	36.18	2.62	347.11	1797.37	1370.91	1337.59	1321.82	1690.27	1602.07	300.95	69.51
20119.00	4.50	79.11	20.98	0.32	1.12	-0.02	0.03	38.83	623.49	2.65	-0.62	2517.49	35.80	2.62	343.80	1674.85	1278.45	1247.63	1232.87	1572.86	1494.39	300.73	65.03
20119.00	4.50	79.11	20.98	0.32	1.13	-0.02	0.03	39.07	622.08	2.44	-0.65	2512.81	35.86	2.62	344.09	1681.46	1283.38	1252.41	1237.60	1579.33	1500.11	300.85	65.69
20119.00	4.50	79.10	20.98	0.30	1.06	-0.02	0.03	38.71	668.15	2.81	-0.67	2685.93	35.89	2.62	350.32	1925.32	1467.47	1431.55	1414.73	1812.86	1714.53	300.93	74.53
20119.00	4.50	79.08	20.98	0.26	0.94	-0.02	0.03	37.64	753.77	3.87	-0.65	3006.59	35.86	2.62	346.88	1788.14	1363.93	1330.81	1315.11	1681.43	1593.95	300.95	67.30
20119.00	4.50	79.11	20.98	0.34	1.20	-0.02	0.03	39.10	581.93	2.35	-0.59	2361.22	35.75	2.62	346.50	1766.41	1347.42	1314.71	1299.20	1660.87	1574.67	301.13	69.06

SUMS						AVERAGE	SUMS						
30804.82	21861.04	125812.87	-15032.63	61273.95	4523.49	6319.16	35249.30	750.73	34498.6	81768.6	750.7	247.1	-31.4
Energy Losses (kJ/kg of Dry Fuel)						Total							
Flue Gas Constituent						Loss	Total	Chemical	Sensible and	Total	Chem	Grams Produced	
O_2	CO	N_2	CH_4	H_2O Comb	H_2O Fuel MC	Rate	Loss	Loss 1	Latent Loss	Output	Loss 2	CO	HC
477.16	110.56	2489.29	-94.82	1720.50	129.52	5090.53	0.00	0	0.00	0	0	0.00	0.00
478.95	76.43	2477.07	-114.88	1717.57	129.13	5016.50	2627.69	-20	2648.05	7911	-20	3.90	-1.07
478.66	91.35	2479.91	-107.11	1717.86	129.22	5043.23	1725.75	-6	1731.38	5159	-6	3.04	-0.65
467.75	67.74	2435.18	-115.71	1717.21	129.10	4952.90	1713.83	-17	1730.52	5248	-17	2.28	-0.71
437.56	85.44	2333.78	-96.54	1717.39	129.27	4861.19	1790.52	-4	1794.87	5620	-4	3.06	-0.63
479.16	124.25	2503.72	-87.68	1721.73	129.67	5131.74	1944.55	13	1931.22	5679	13	4.58	-0.59
876.87	188.68	3939.67	-179.77	1730.66	129.58	6944.02	2102.06	2	2099.90	3988	2	5.56	-0.97
1045.87	356.41	4403.80	-231.23	1698.61	126.76	7603.78	1761.42	28	1733.20	2899	28	8.06	-0.96
874.95	398.74	3650.90	-240.87	1665.14	124.18	6630.05	1340.66	31	1309.35	2728	31	7.90	-0.87
857.24	429.82	3543.02	-261.14	1655.84	123.33	6489.62	1089.91	28	1062.08	2289	28	7.08	-0.79
948.84	557.09	3831.51	-309.32	1649.65	122.49	6925.78	1119.33	39	1079.86	2132	39	8.83	-0.90
821.15	439.21	3338.83	-331.79	1643.70	121.88	6148.99	999.67	17	982.58	2271	17	7.01	-0.97
737.23	462.57	3023.28	-280.52	1635.81	121.69	5812.32	1023.41	32	991.80	2519	32	8.00	-0.89
736.34	446.10	3031.44	-271.29	1637.84	121.91	5818.68	1011.99	30	982.03	2487	30	7.62	-0.85
844.19	511.23	3435.46	-291.88	1643.35	122.16	6384.53	977.41	33	944.30	2103	33	7.68	-0.80
718.58	534.76	2942.22	-251.45	1629.83	121.47	5803.24	895.76	43	852.50	2210	43	8.11	-0.70
868.70	480.40	3516.16	-335.57	1645.45	121.98	6414.47	905.75	20	885.68	1935	20	6.66	-0.85
816.96	546.57	3310.44	-297.99	1637.20	121.65	6245.76	942.54	37	905.49	2094	37	8.10	-0.81
974.38	681.29	3883.50	-336.03	1641.95	121.71	7077.62	1034.10	50	984.25	1905	50	9.78	-0.88
1236.06	858.42	4781.37	-589.94	1653.58	120.63	8151.61	785.18	25	759.69	1153	25	8.13	-1.02
1036.50	683.15	4005.20	-708.46	1651.14	119.56	6862.10	573.34	-2	575.62	1108	-2	5.62	-1.06
957.64	833.29	3702.50	-622.86	1638.67	119.29	6697.82	621.20	19	601.94	1245	19	7.61	-1.04
936.94	920.66	3613.23	-625.30	1635.40	119.04	6664.45	588.71	26	562.88	1189	26	8.01	-0.99
783.20	725.61	3042.69	-599.25	1629.46	118.80	5762.15	493.28	11	482.64	1229	11	6.12	-0.92
814.24	855.55	3166.38	-518.20	1624.46	119.04	6126.13	589.46	32	557.27	1346	32	8.11	-0.89
737.91	693.69	2892.76	-495.46	1622.90	119.09	5637.42	523.80	18	505.58	1346	18	6.35	-0.83
1058.76	1113.93	4054.34	-674.90	1640.36	119.03	7374.88	636.30	38	598.74	1100	38	9.47	-1.04
1023.27	903.89	3936.21	-680.97	1643.46	119.21	7012.70	574.04	18	556.03	1073	18	7.29	-1.00
876.19	979.99	3403.66	-465.71	1622.88	119.31	6604.78	507.98	39	468.71	1039	39	7.42	-0.64
853.23	800.60	3309.42	-583.87	1631.32	119.05	6195.11	496.35	17	479.18	1116	17	6.32	-0.84
1099.65	1035.13	4216.63	-680.32	1644.48	119.29	7503.00	649.75	30	619.33	1093	30	8.83	-1.06
1062.55	851.94	4084.12	-723.29	1648.97	119.30	7113.09	537.49	10	527.97	983	10	6.34	-0.98
797.10	753.52	3103.74	-550.44	1627.46	119.02	5915.41	414.23	14	400.17	995	14	5.20	-0.69
798.37	692.51	3109.86	-576.36	1630.31	119.03	5839.40	494.29	10	484.63	1209	10	5.77	-0.88
980.49	800.64	3799.87	-593.41	1639.72	119.59	6821.44	584.96	18	567.43	1140	18	6.76	-0.91
1028.09	1100.42	3954.01	-578.96	1633.93	119.28	7324.07	918.01	65	853.15	1604	65	13.58	-1.30
784.11	669.50	3067.70	-529.35	1628.17	119.23	5808.43	254.59	6	248.54	627	6	2.89	-0.42

Intertek Testing Services

Manufacturer:	SBI	**Technicians:**	Claude Pelland
Model:	Cambridge		
Date:	06-07-16		
Run:	2		
Control #:	QC20160606		
Test Duration:	360		
Output Category:	Integrated		

Test Results in Accordance with CSA B415.1-10

	HHV Basis	LHV Basis
Overall Efficiency	69.6%	75.2%
Combustion Efficiency	99.4%	99.4%
Heat Transfer Efficiency	70%	75.7%

Output Rate (kJ/h)	13 481	12 788	**(Btu/h)**
Burn Rate (kg/h)	0.96	2.12	**(lb/h)**
Input (kJ/h)	19 356	18 361	**(Btu/h)**

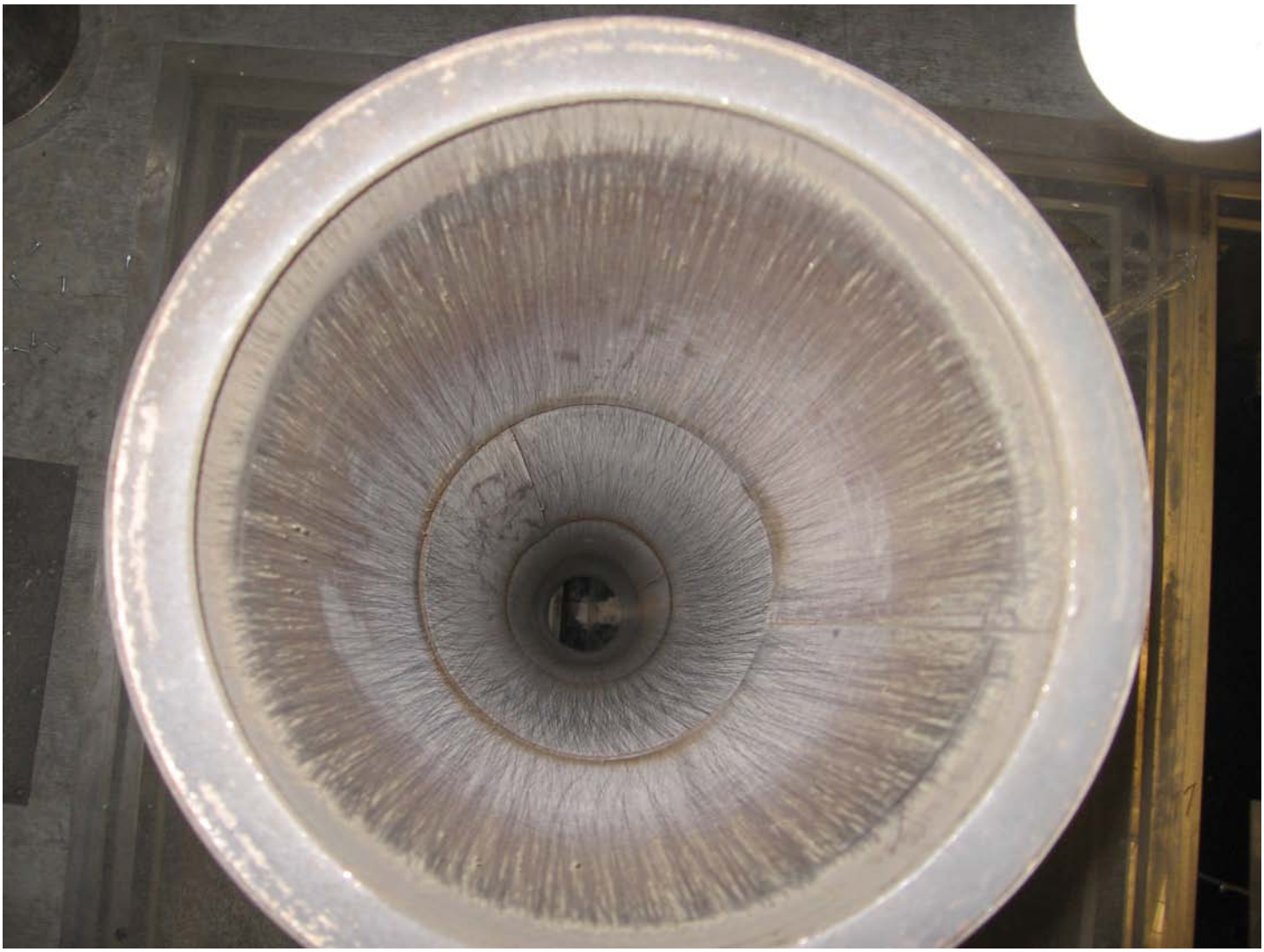
Test Load Weight (dry kg)	5.77	12.72	**dry lb**
MC wet (%)	4.5		
MC dry (%)	4.71		
Particulate (g)	17.33		
CO (g)	247		
Test Duration (h)	6.00		

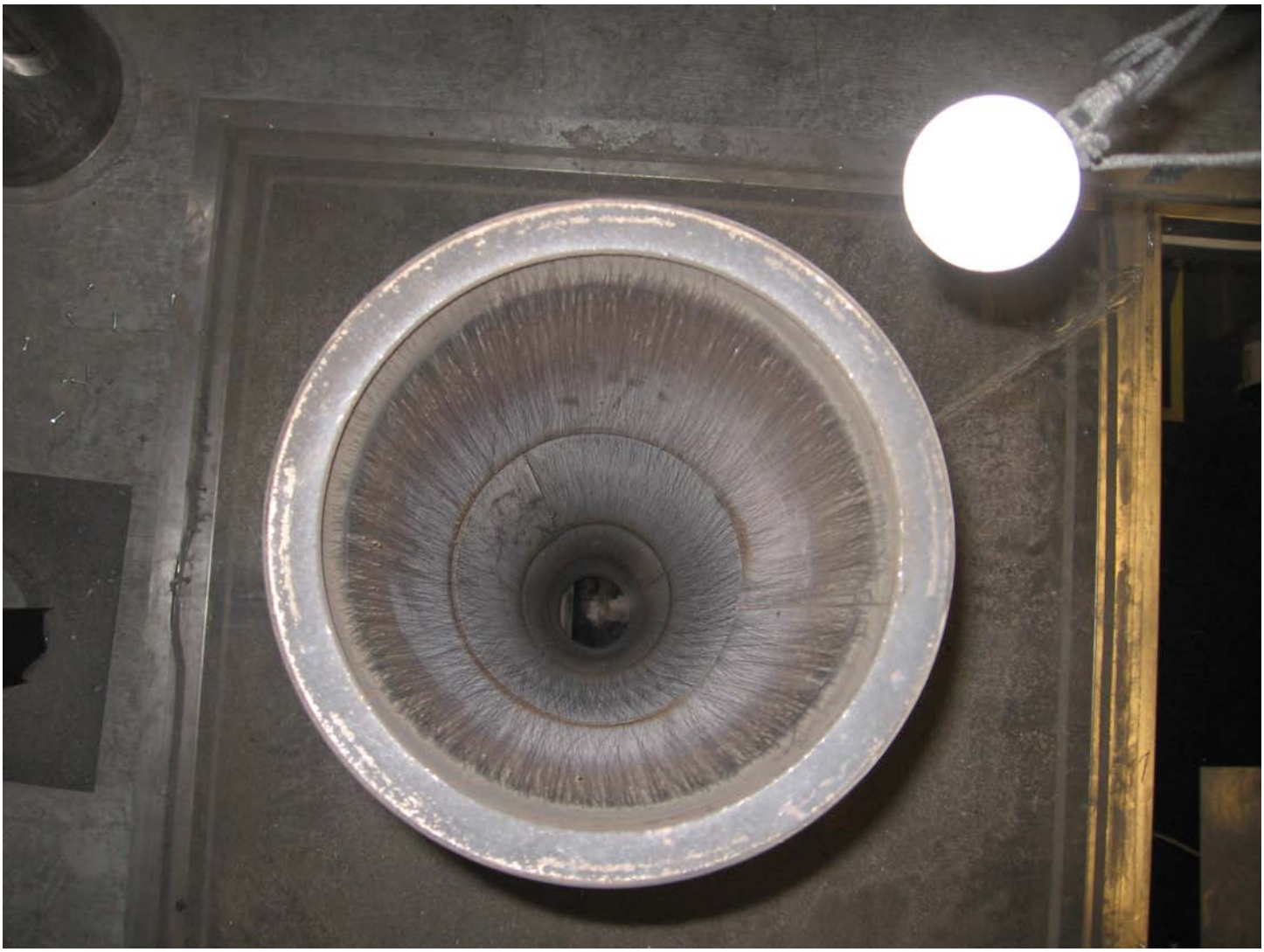
Emissions	**Particulate**	**CO**
g/MJ Output	0.21	3.05
g/kg Dry Fuel	3.00	42.80
g/h	2.89	41.18
lb/MM Btu Output	0.50	7.10

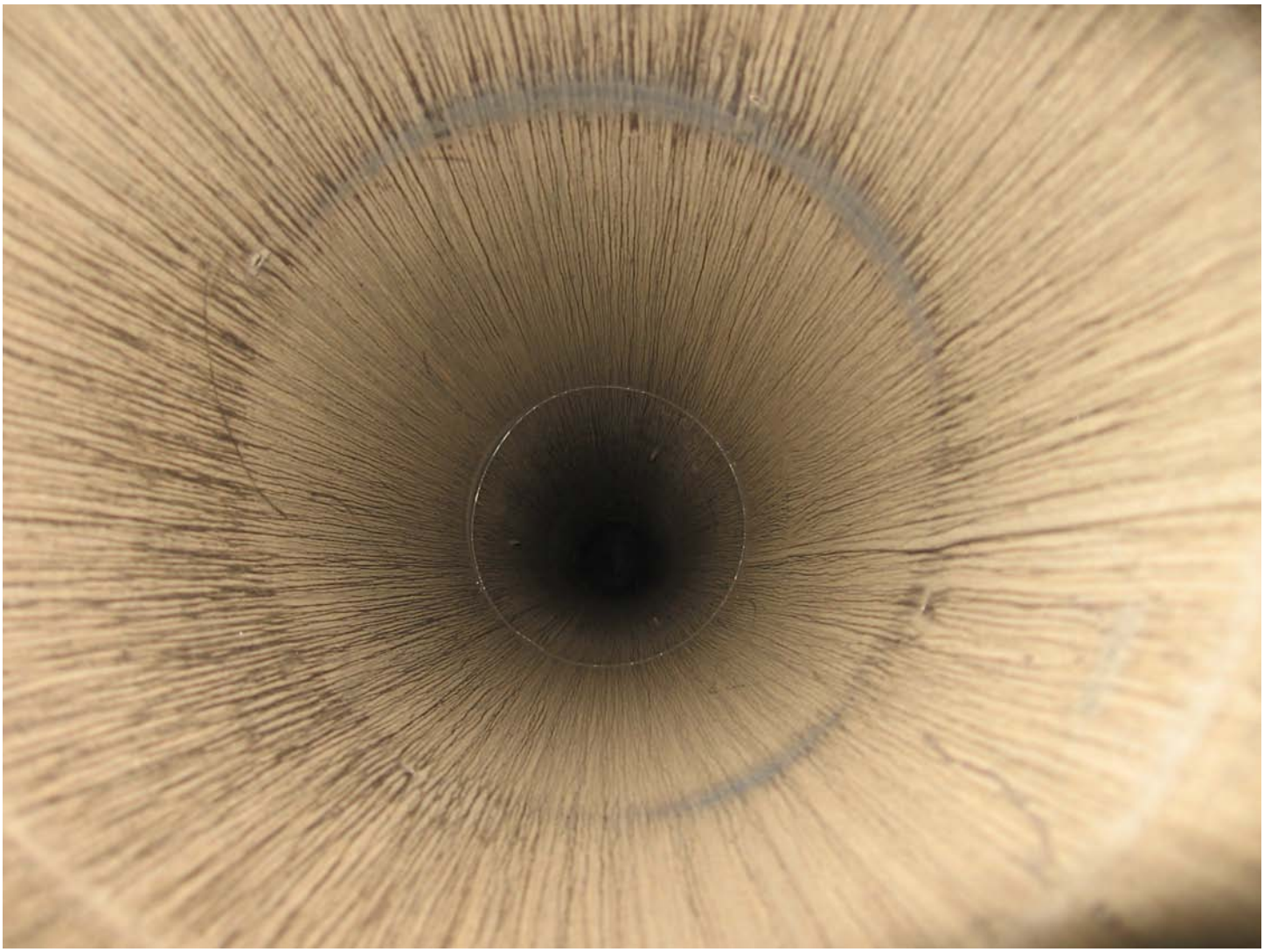
Air/Fuel Ratio (A/F)	38.54

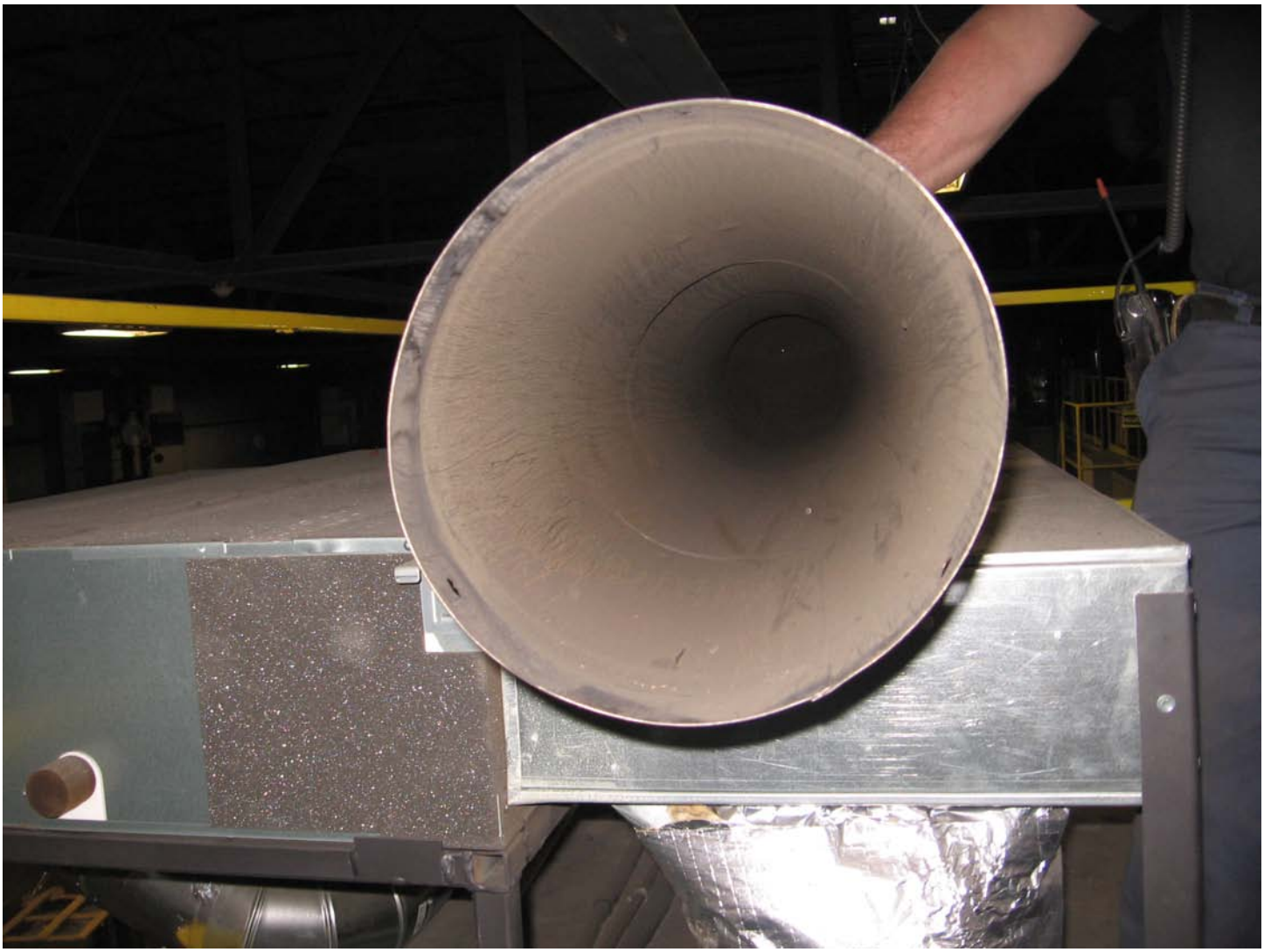
VERSION: **2.4** **2010-04-15**

Tunnel Cleaning and Test Load Photographs
Appendix H

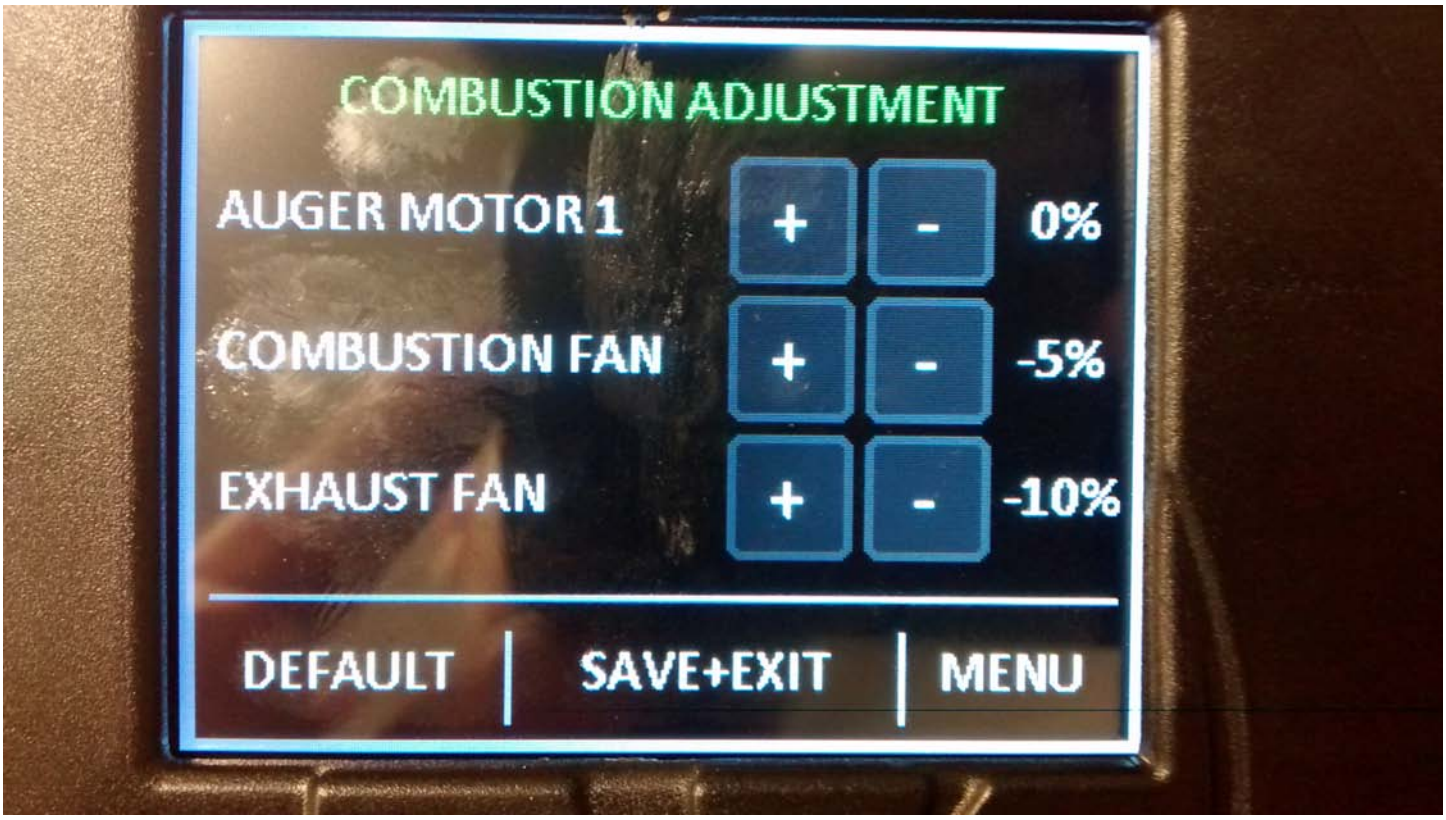


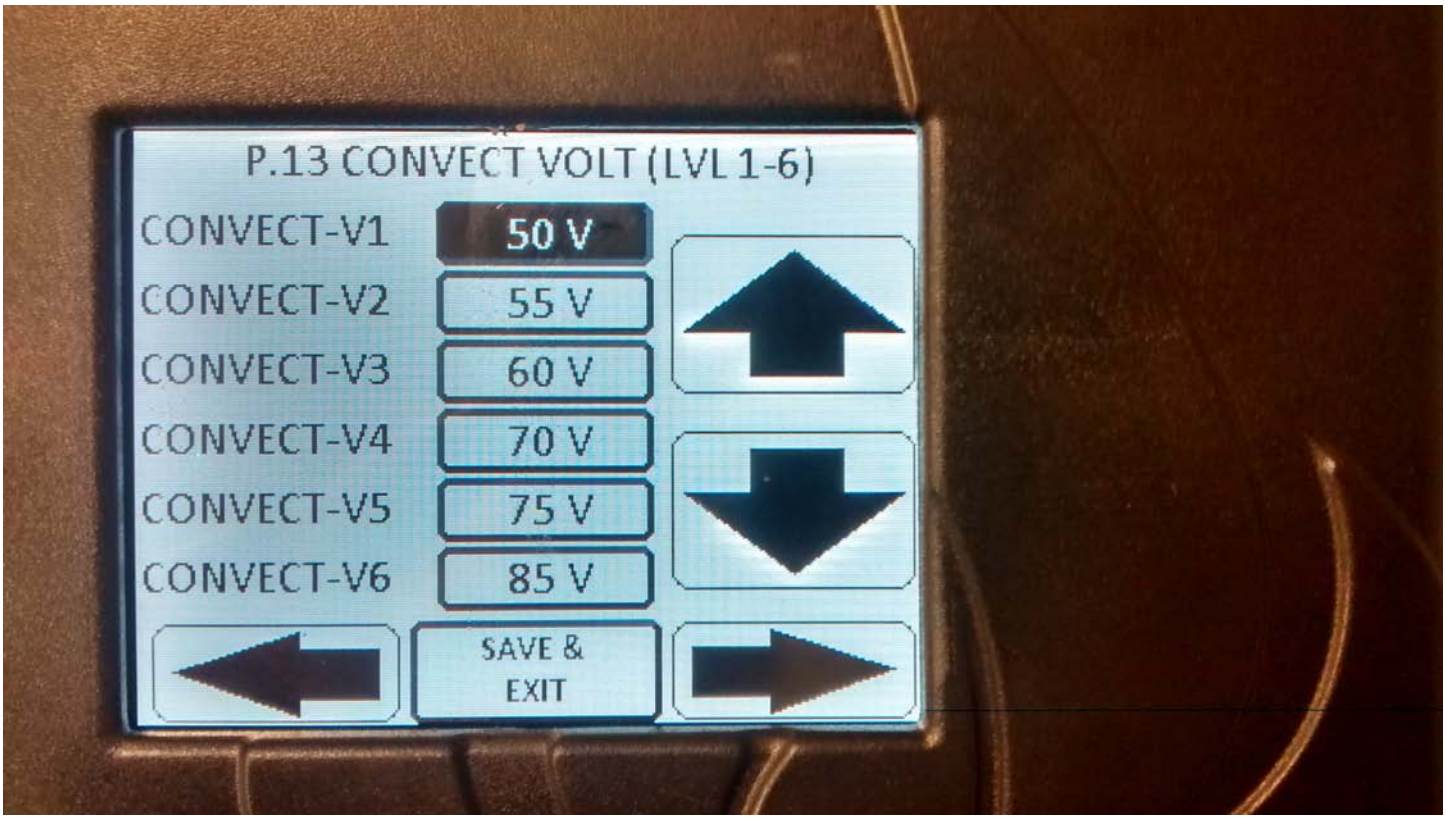


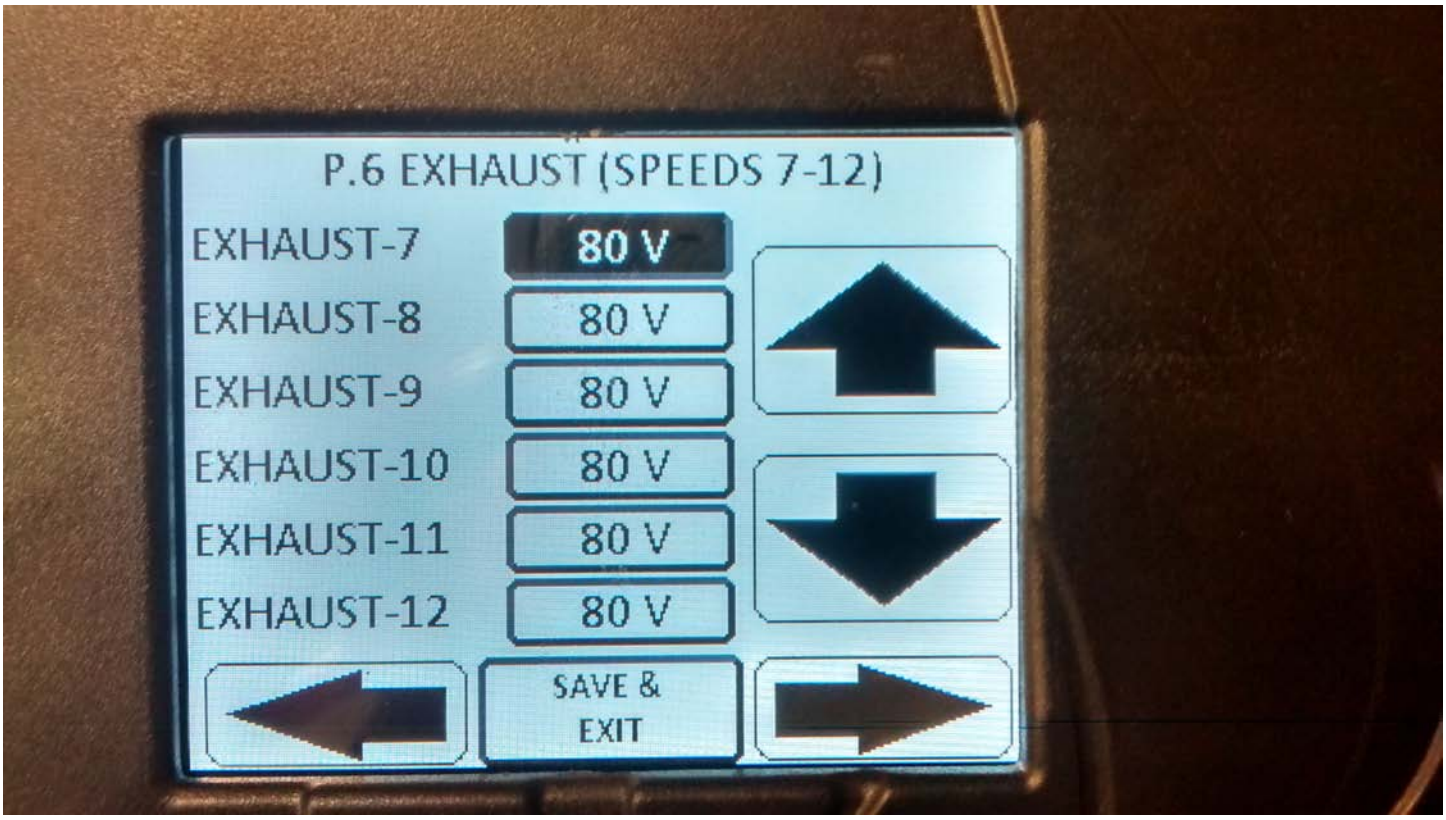


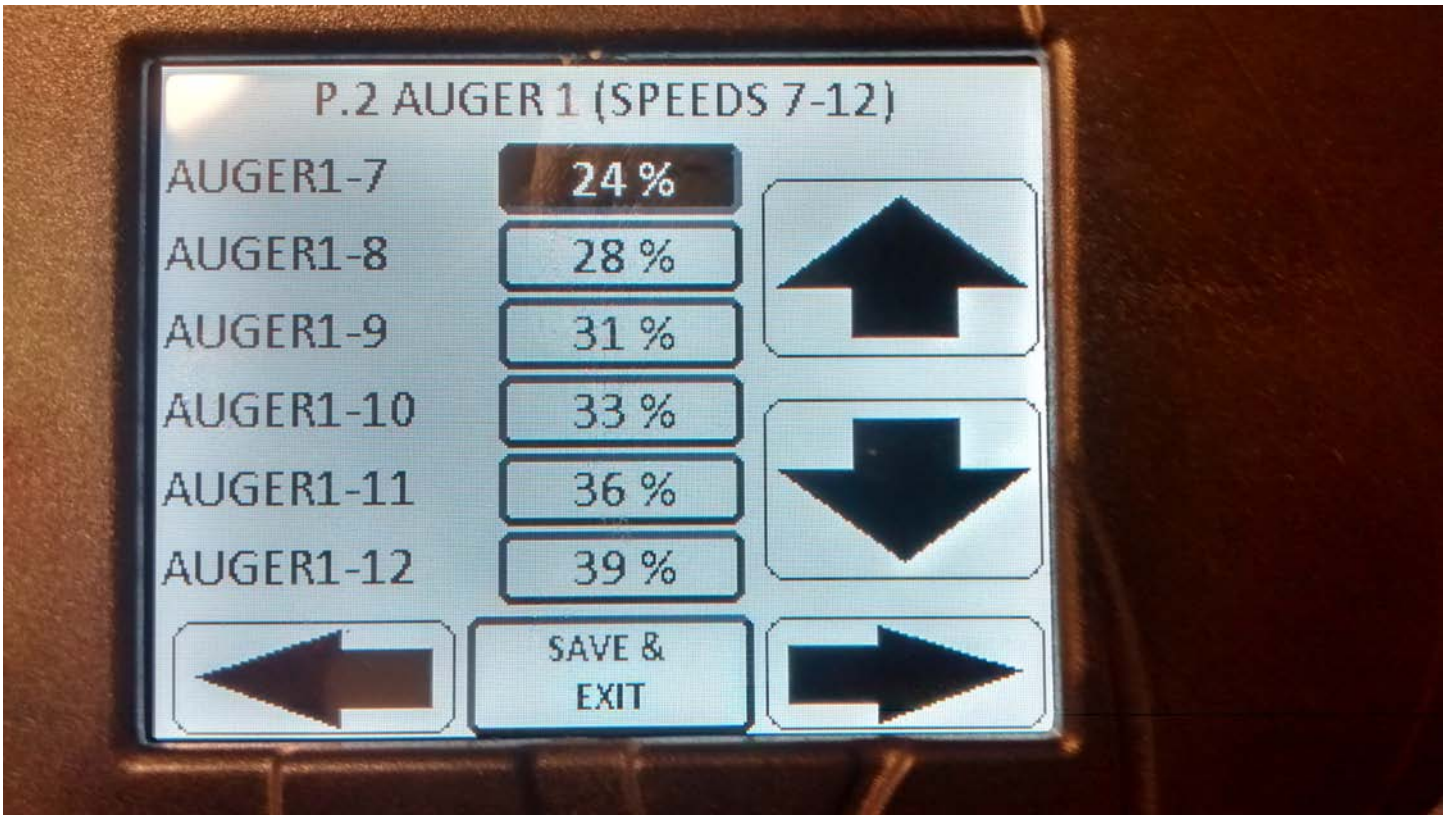


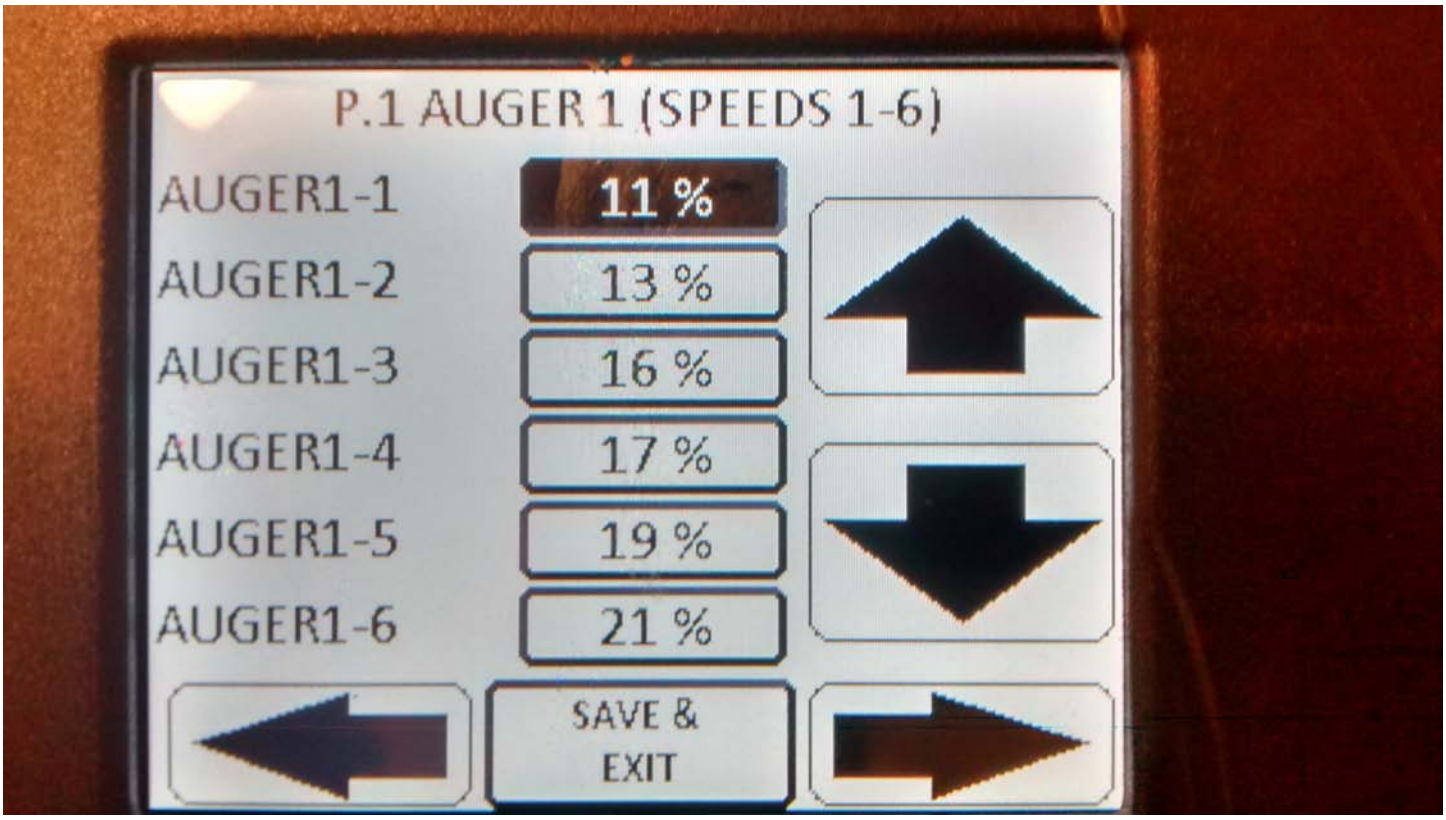

Cambridge
Run #2
2016-06-07

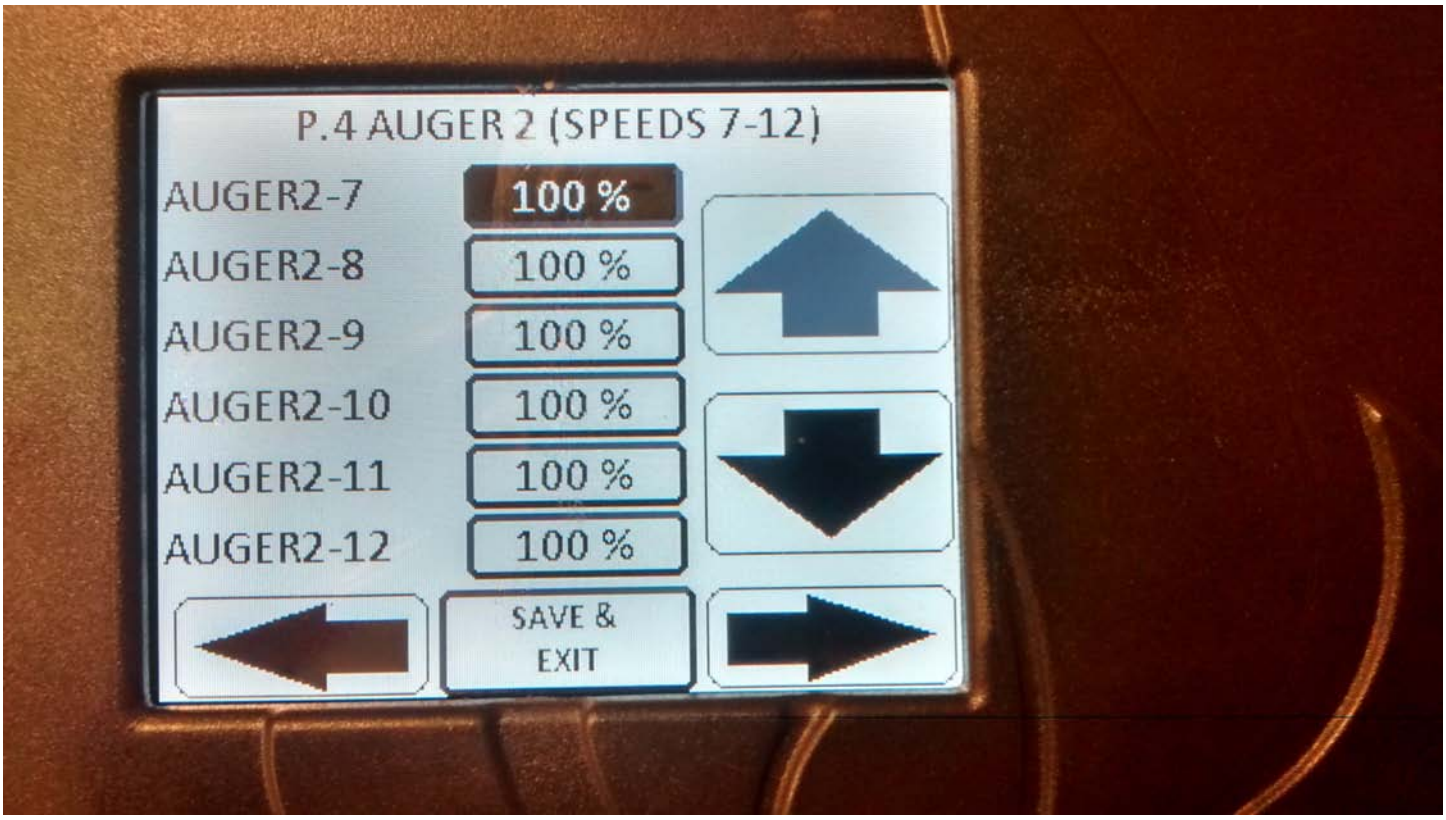

COMBUSTION ADJUSTMENT
AUGER MOTOR 1
+
-
0%
COMBUSTION FAN
+
-
-5%
EXHAUST FAN
+
-
-10%
DEFAULT
SAVE+EXIT
MENU

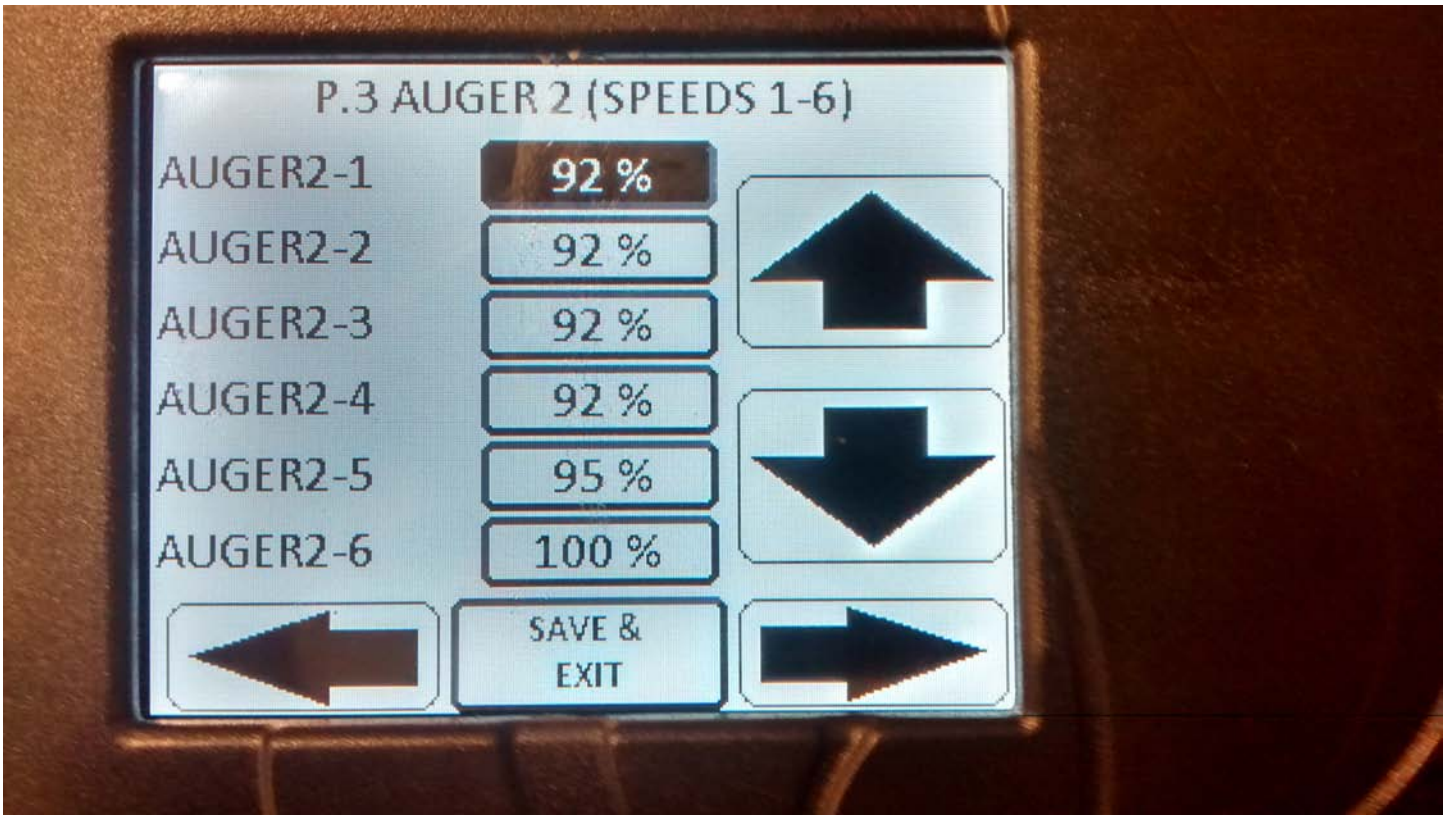

P.13 CONVECT VOLT (LVL 1-6)
CONVECT-V1
50 V
CONVECT-V2
55 V
CONVECT-V3
60 V
CONVECT-V4
70 V
CONVECT-V5
75 V
CONVECT-V6
85 V
SAVE &
EXIT

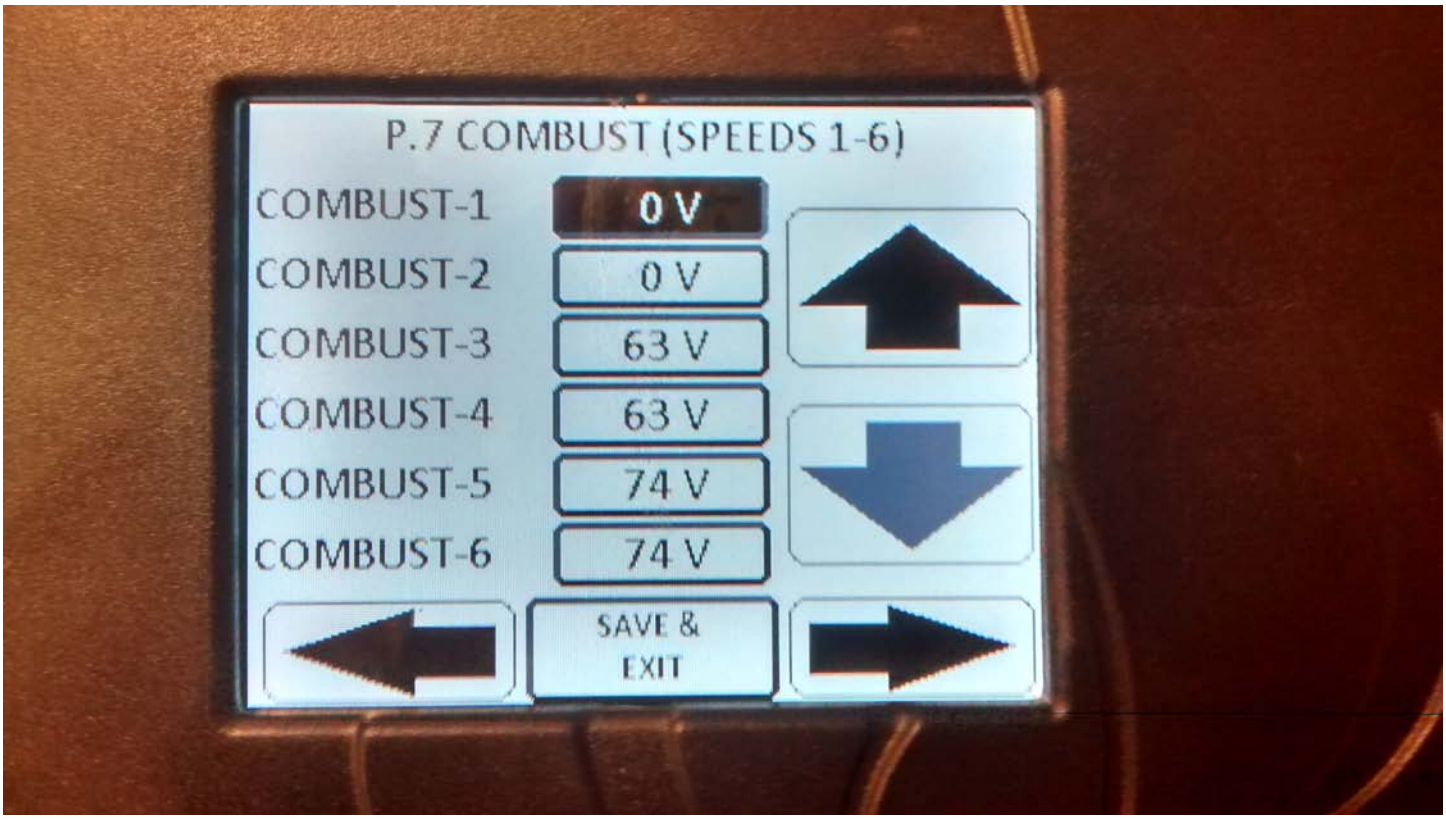

P.6 EXHAUST (SPEEDS 7-12)
EXHAUST-7
80 V
EXHAUST-8
80 V
EXHAUST-9
80 V
EXHAUST-10
80 V
EXHAUST-11
80 V
EXHAUST-12
80 V
SAVE &
EXIT

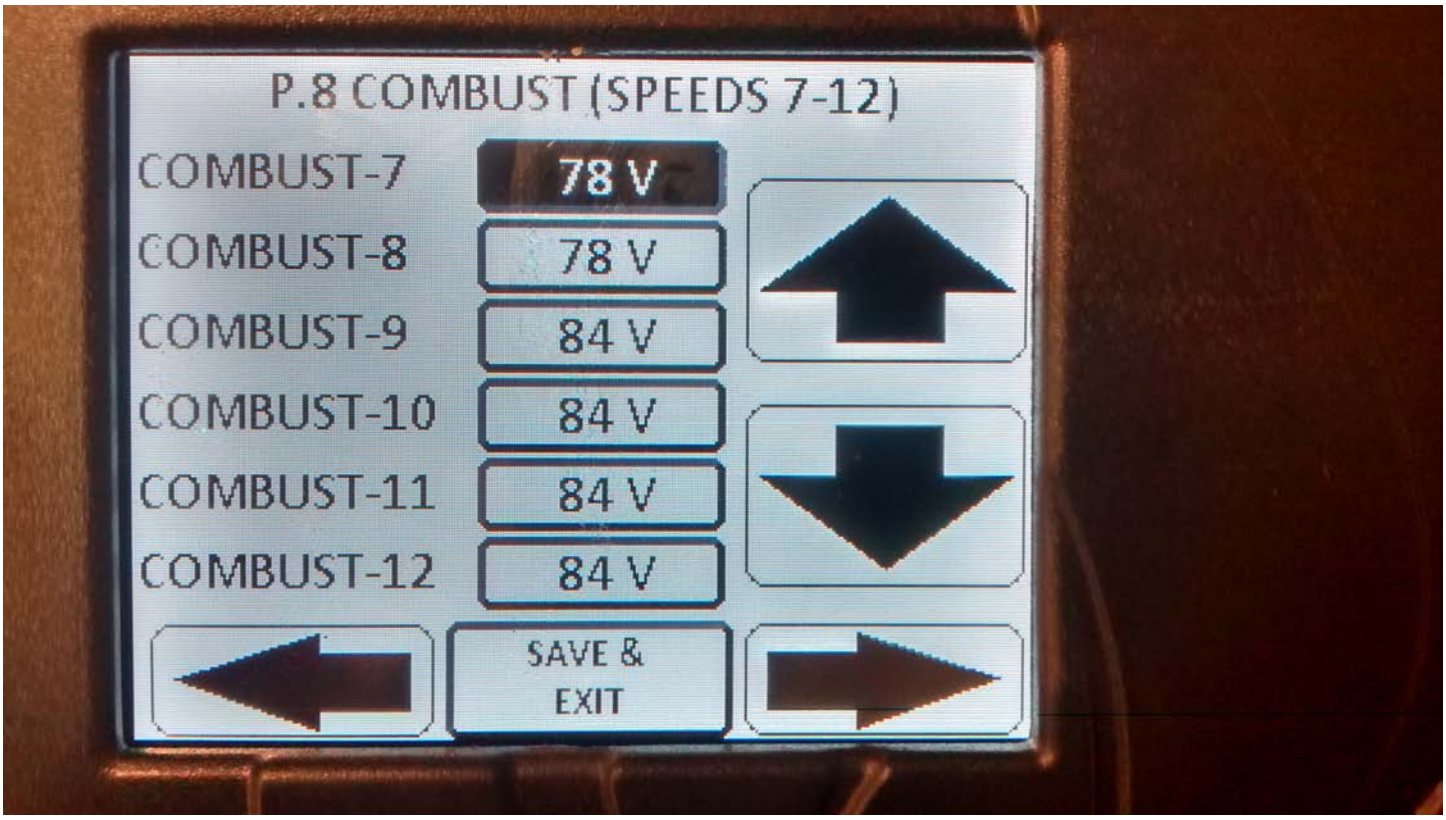

P.2 AUGER 1 (SPEEDS 7-12)
AUGER1-7
24 %
AUGER1-8
28 %
AUGER1-9
31 %
AUGER1-10
33 %
AUGER1-11
36 %
AUGER1-12
39 %
SAVE &
EXIT


P.1 AUGER 1 (SPEEDS 1-6)
AUGER1-1
11 %
AUGER1-2
13 %
AUGER1-3
16 %
AUGER1-4
17 %
AUGER1-5
19 %
AUGER1-6
21 %
SAVE &
EXIT


P.4 AUGER 2 (SPEEDS 7-12)
AUGER2-7
100 %
AUGER2-8
100 %
AUGER2-9
100 %
AUGER2-10
100 %
AUGER2-11
100 %
AUGER2-12
100 %
SAVE &
EXIT


P.3 AUGER 2 (SPEEDS 1-6)
AUGER2-1
92 %
AUGER2-2
92 %
AUGER2-3
92 %
AUGER2-4
92 %
AUGER2-5
95 %
AUGER2-6
100 %
SAVE &
EXIT


P.7 COMBUST (SPEEDS 1-6)
COMBUST-1
0 V
COMBUST-2
0 V
COMBUST-3
63 V
COMBUST-4
63 V
COMBUST-5
74 V
COMBUST-6
74 V
SAVE &
EXIT


P.8 COMBUST (SPEEDS 7-12)
COMBUST-7
78 V
COMBUST-8
78 V
COMBUST-9
84 V
COMBUST-10
84 V
COMBUST-11
84 V
COMBUST-12
84 V
SAVE &
EXIT

EPA Correspondence
Appendix I

Fabricant de poêles international inc.
Stove Builder International Inc.

Notre passion devient source d'énergie
We Turn passion Into Energy

April 21st, 2016

Air Branch/Wood Heater Program Lead
Monitoring, Assistance, and Media Programs Division
Office of Compliance
U.S. EPA
1200 Pennsylvania Ave., NW
MS:2227A
Washington, DC 20004
Attn: Rafael Sanchez

Subject: 30 days notice for certification of model line name **Cambridge**

Dear Mr. Sanchez

The model line **Cambridge** and equivalent model **Osburn 3000** are affected wood heaters under the amended U.S. Environmental Protection Agency 40 CFR Part 60 Standards of Performance for New Residential Wood Heaters, New Residential Hydronic Heaters and Forced-Air Furnaces; Final Rule, Subpart AAA §60.530.

Under section §60.534 (g), Stove Builder International Inc. ("SBI") is required to provide a 30 days' notice before the date of certification testing to begin. We would therefore like to notify you that we intend to start a certification program on the model line stated above on June 6th, 2016. This certification program is planned to end on June 7th, 2016.

The model line **Cambridge** is a pellet stove as defined in section §60.530 and will be sold in SBI's Enerzone brand. The **Osburn 3000** is an equivalent model sharing the same features except the aesthetic look and will be sold in the Osburn brand. In accordance with the regulations, it will be tested using ASTM E2779-10 in conjunction with ASTM 2515-11 and CSA B415.1-10.

The accredited laboratory performing the test will be a division of **Intertek Testing NA Ltd** located at:

1829, 32nd Avenue, Lachine
Quebec, Canada, H8T 3J1

And contact information at Intertek will be the following:

Claude Pelland, Eng
claude.pelland@intertek.com

Current address of Stove Builder International Inc. can be found at the bottom of this document and contact information at SBI will be:

Vincent Pelletier, Jr. Eng.
vpelletier@sbi-international.com

Should you need additional documents, please let us know.

Sincerely,

Vincent Pelletier, Jr. Eng.
Chemical Engineer
Stove Builder International Inc.