

## **TEST REPORT**

## **SCOPE:** EMISSIONS, EFFICIENCY AND OUTPUT

### FUEL: PELLET

## TEST STANDARD: EPA

## **MODEL:** VOLTA PELLET STOVE



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#### TEST REPORT

#### TEST OF A WOOD BURNING STOVE FOR EMISSIONS AND EFFICIENCY PER EPA METHODS 28 AND 5G-3, FEBRUARY 1988

#### MODEL: VOLTA

Client: Stove Builder International inc. Add1: 250 de Copenhague, St-Augustin-de-Desmaures, Quebec, G3A 2H3 Add2: 798, 8<sup>e</sup> rue, La Guadeloupe, Quebec, G0M 1G0

Attention: Mr. Claude Paré

TESTED BY: Intertek Testing Services NA Ltd. 1829, 32<sup>nd</sup> Avenue Lachine, Québec H8T 3J1

TEST DATES: From April 15, 2015 to April 17, 2015 REPORT DATE: April 29, 2015 Project number: G102038216

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#### 1.0 **INTRODUCTION**

#### 1.1 <u>GENERAL</u>

From April 15, 2015 to April 17, 2015, Intertek, Lachine, Québec, conducted tests on the Model Volta, wood pellet stove from Stove Builder International inc., to determine compliance with U.S. EPA emissions regulations.

Tests were conducted by Claude Pelland, Eng. 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. Tests were conducted to EPA Method 28 and 5G-3 criteria, February 1988.

#### 1.2. <u>TEST UNIT DESCRIPTION</u>

The DC Series Pellet Stove is a freestanding and automatically fed Pellet Stove constructed of carbon HR and CR steel. The outer dimensions are 27 1/2-inches deep, 41-inches high, and 21 3/4-inches wide. The unit has a front door with a viewing glass and a hopper to store the pellet.

(See product drawings.). See also components description in Appendix H.

The DC Series comprises Model "VOLTA" from Osburn Brand and Model "EDISON" from Drolet Brand which differ by minor aesthetic differences.

Proprietary drawings and manufacturing methods are on file at Intertek in Lachine, Quebec.

Tests were conducted using the Volta unit as a reference representative of the DC series.



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#### 1.3. <u>RESULTS</u>

The unit as tested produced a weighted average emissions rate of 2.48 grams/hour and did not exceed any of the emission rate caps specified in the EPA regulations. The unit thus meets EPA certification requirements for 1990.

#### 1.4. PRETEST INFORMATION

The test unit was prepared at client's facility in St-Augustin-de-Desmaures, Quebec, for April 15, 2015 from the client. The unit was inspected upon program start and found to be in good condition. It had been set up, following the manufacturer's instructions.

Following assembly, the unit was placed on the test stand and the instrumented thermocouples were hooked up to the logging system. Prior to emission testing, a ten (10) hours break-in period was performed during which the unit was set to operate at high to medium burn rate. During the break-in period, the unit was found to operate satisfactorily. The 10 plus hours of pre-burning were conducted during several consecutive R & D runs performed by the manufacturer immediately preceding the dates of the testing reflected in this report. The fuel used for the break-in process was wood pellet of premium grade made by LG inc. Proofs of burning are reproduced in appendix G of this report.

Following inspection of the unit, the chimney system and laboratory dilution tunnel were cleaned using standard wire brush chimney cleaning equipment.

On April 10, 2015, the unit was set-up for testing.



#### 1.5. <u>REPORT ORGANIZATION</u>

This report includes summaries of all data necessary to determine compliance with the regulations.

#### 2.0 <u>SUMMARY OF TEST RESULTS</u>

#### 2.1 <u>EMISSIONS</u>

Run Number	Test Date	Burn Rate (kg/hr)	Adjusted Emission Rate (g/hr)	Heating Efficiency (% HHV)	Heating Efficiency (% LHV)
1	2015-04-15	0.549	1.935	67.9	73.2
2	2015-04-16	0.898	2.422	64.1	69.1
3	2015-04-16	1.384	2.333	61.3	66.1
4	2015-04-17	2.113	3.399	58.4	63.0

#### 2.2. WEIGHTED AVERAGE CALCULATION

Run Burn Adjust Number Rate Rate		Adjusted Emission Rate	OHE	Output	Prob	(K) Weighting Factor
	(kg/hr)	(g/nr)	(% Overall)	(BIU/nr)		
1	0.549	1.935	67.89	6619.95	0.0856	0.2982
2	0.898	2.422	64.10	10828.26	0.2982	0.5963
3	1.384	2.333	61.30	16688.55	0.6819	0.6287
4	2.113	3.399	58.40	25478.98	0.9268	0.3181
					Sum:	1.8412

Weighted Average Emissions Rate: 2.48 g/hr



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### 2.3 <u>TEST FACILITY CONDITIONS</u>

	Room Temperature		Baror pres	netric sure	Relati humic	ive lity	Air Ve	locity
Run Number	Before (F)	After (F)	Before (in.Hg)	After (in.Hg)	Before (%)	After (%)	Before (ft/min)	After (ft/min)
1	76	75	30.32	30.32	17	15	0	0
2	73	74	30.56	30.50	16	15	0	0
3	75	75	30.41	30.32	16	15	0	0
4	74	75	29.94	29.85	21	23	0	0

#### 2.4. <u>FUEL QUALITIES</u>

Run	Pre-T	est Load	Test Load			
Number	Loading Weight Wet Basis	Moisture Content Dry Basis	Weight Wet Basis	Moisture Content Dry Basis		
	(lb)	(%)	(lb)	(%)		
1	1.3	7.07	2.6	7.07		
2	2.12	7.07	4.25	7.07		
3	3.27	7.07	6.55	7.07		
4	5	7.07	10.00	7.07		

#### 2.5 <u>DILUTION TUNNEL FLOW RATE MEASUREMENTS</u> <u>AND SAMPLING DATA (5G-3)</u>

Averaç	ge dilu <sup>.</sup>	tion tunnel m	easurements		Sample Data	l	
Run Number	Burn Rate	Volumetric Flow Rate	Total Temperatures	Volume sampled (DSCF)		Partio ca (m	culate tch ng)
	(Min)	(dscf/min)	(°R)	1	2	1	2
1	120	134.25	556	19.49	18.68	2.6	2.5
2	120	133.01	564	19.29	18.47	3.8	2.9
3	120	145.77	585	17.82	15.86	2.8	2.4
4	120	147.67	616	20.48	21.30	5.2	4.8



Run	Sample Rat	tio (no units)	Total Emission (g)				
Number	Train 1	Train 2	Train 1	Train 2	% Deviation		
1	826.60	862.65	2.149	2.157	0.07%		
2	827.24	863.93	3.144	2.505	4.69%		
3	981.51	1103.07	2.748	2.647	0.78%		
4	865.28	831.96	4.499	3.993	2.47%		

#### 2.6 <u>DILUTION TUNNEL DUAL TRAIN PRECISION</u>

#### 2.7 <u>GENERAL SUMMARY OF RESULTS</u>

Run Number	Burn Rate (kg/hr)	Average Surface Temperature (F)	Change in surface Temperature (F)	Initial Draft (in. H <sup>2</sup> O)	Primary Air Setting	Run Time (min)
1	0.549	212	9.4	0.025	N/A	120
2	0.898	263	-4.3	0.040	N/A	120
3	1.384	334	-7.1	0.055	N/A	120
4	2.113	457	-22.9	0.080	N/A	120

#### 3.0 PROCESS DESCRIPTION

#### 3.1 <u>DISCUSSION</u>

During the entire test program, the unit performed well and no hazardous behavior has been noticed.



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#### 3.2 <u>UNIT DIMENSIONS</u>

Unit dimensions are reproduced in appendix E to this report.

Details of unit construction can be found in this appendix.

#### 3.3 <u>AIR SUPPLY SYSTEM</u>

Combustion air enters at the back of the stove through an opening at the middle bottom of the firebox. This air is automatically controlled by an electronic board and a blower which covers the inlet hole. All gases exit through the 4" dia. Flue.

Air supply system of this unit is reproduced in appendix E to this report.

#### 3.4 <u>TEST SET-UP DESCRIPTON</u>

A standard 4" diameter pellet type L vent was installed to 15' above floor level. The unit controls were set in accordance with the manufacturer's instruction to achieve the targeted burn-rate during the test.



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#### 3.5 OPERATION DURING TEST

Run #1 (April 15, 2015) Primary air ventilation system was powered at 75% PWM<sup>1</sup>, Exhaust fan at 40% PWM<sup>1</sup> and Convection Blower at 100% PWM<sup>1</sup> and control board was set at speed 1 of 12. Burn time was 120 minutes. Burn Rate was 0.549 Kg/h. This test led to a 1.935 g/h Adjusted Emission Rate. System so set reached a category I.

Run #2 (April 16, 2015) Primary air ventilation system was powered at 75% PWM<sup>1</sup>, Exhaust fan at 53% PWM<sup>1</sup> and Convection Blower at 100% PWM<sup>1</sup> and control board was set at speed 5 of 12. Burn time was 120 minutes. Burn Rate was 0.898 Kg/h. This test led to a 2.422 g/h Adjusted Emission Rate. System so set reached a category II.

Run #3 (April 16, 2015) Primary air ventilation system was powered at 75% PWM<sup>1</sup>, Exhaust fan at 66% PWM<sup>1</sup> and Convection Blower at 100% PWM<sup>1</sup> and control board was set at speed 8 of 12. Burn time was 120 minutes. Burn Rate was 1.384 Kg/h. This test led to a 2.333 g/h Adjusted Emission Rate. System so set reached a category III.

Run #4 (April 17, 2015) Primary air ventilation system was powered at 100% PWM<sup>1</sup>, Exhaust fan at 100% PWM<sup>1</sup> and Convection Blower at 100% PWM<sup>1</sup> and control board was set at speed 12 of 12. Burn time was 120 minutes. Burn Rate was 2.113 Kg/h. This test led to a 3.399 g/h Adjusted Emission Rate. System so set reached a category IV.



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#### 4.0 <u>SAMPLING SYSTEMS</u>

#### 4.1 <u>SAMPLING LOCATIONS</u>

(Particulate) Samples are collected from the dilution tunnel at a point 20 feet from the tunnel entrance. The tunnel has two elbows and two mixing baffles in the system ahead of the sampling section. The sampling section is a continuous 13-foot section of 6-inch diameter pipe straight over the entire length. A standard pitot tube located 60 inches from the start of the sampling section determines tunnel velocity pressure. Thermocouple is installed on the pilot tube to measure the dry bulb temp. MC is assumed, as allowed, to be 4%. Tunnel samplers are located 60 inches downstream of the pitot tube and 36 inches upstream from the end of this section.

#### 4.2 <u>DRAWINGS</u>

Various drawings of the stack gas sampling train and of dilution tunnel system are found in Appendix I



#### 4.3 <u>EMISSIONS/EFFICIENCY TESTING EQUIPMENT LIST</u>

List of instruments and equipment used during testing: Calibration records are kept in file for future reference. The calibration matrix of all equipment meets the requirement of ISO 17025.

ITEM DESCRIPTION	Equipment #	MANUFACTURER	MODEL	SERIAL #
-Calibration weight	SBI-238	Mettler-Toledo	200 gr	B316238717
-Platform scale	SBI-013	Rice Lake	Roughdeck	B00927396KL
-Manometer	SBI-024	Dwyer	2000-00	W80111CF89
-Manometer	SBI-127	Dwyer	2000-0DC	W11SBH
-DGM Reference	SBI-103	American Meter	DTM 200A	07J264834
-Sampling Train #1	SBI-046	American Meter	DTM 200A	90R054300
-Sampling Train #2	SBI-047	American Meter	DTM 200A	98Z332226
-Analytical scale	SBI-206	Sartorius	TE214S	25851066
-Timer	SBI-235	Sportline	410	
-Gas analyser	SBI-113	Siemens	Ultramat23	7MB2338-8BA10-5AF2
-R H Temperature Meter	SBI-212	Amprobe	TH-3	100906351



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#### 5.0 <u>SAMPLING METHODS</u>

#### 5.1 PARTICULATE SAMPLING

Particulates were sampled in strict accordance with EPA Method 5G-3. This method uses two identical sampling systems with Gelman A/E 61631 binder free, 47 mm diameter filters. The dryers used in the sample systems are filled with "Drierite" before each test run.

#### 6.0 **QUALITY ASSURANCE**

#### 6.1 INSTRUMENT CALIBRATION

6.1.1 Dry Gas Meters

At the conclusion of each test program the dry gas meters are verified using a reference dry gas meter. This process involves sampling the train operation for 1 cubic foot of volume. With readings made to .001 ft<sup>3</sup>, the resolution is .1%, giving accuracy higher than the  $\pm 2\%$  required by the standard.

#### 6.1.2 Stack Sample Rotameter

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 rotameter in series with one of the dry gas meters for 10 minutes with the rotameter at a constant setting. The dry gas meter volume measured is then corrected to standard temperature and pressure conditions.

#### 6.1.3 Gas Analyzers

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



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#### 6.2 <u>TEST METHOD PROCEDURES</u>

#### 6.2.1 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. 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 the vacuum is typically less than 2 inches of mercury. Leakage rates reported are expected to be much higher than actual leakage during the tests.

#### 6.2.2 <u>Tunnel Velocity/Flow Measurement</u>

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.

#### 6.2.3 Pm Sampling Proportionality (5g-3)

Proportionality was calculated in accordance with EPA Method 5G-3. The data and results are kept in file for future reference.

Tested by: Claude Pelland, Eng. Project Engineer, BP Lachine, Qc

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Reviewed by:

Rick Curkeet, PE Chief Engineer-Hearth Products

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### **APPENDIX A**

**Data and Calculation Forms** 

							Type of	
							Stove:	3
					Weighted	Average	1=cat	
						l	2=noncat	
							3=pellet	
N		(E)						
		Ave.		Heat		(K)		
	Burn	Emission		Output		Weighting		
Test No.	Rate	Rate g/hr	(OHE)	(BTU/HR)	Prob.	Factor	(KxE)	KxOHE
1	0.549	1.935		6619.95	0.0856	0.2982	0.5769	0.00
2	0.898	2.422		10828.26	0.2982	0.5963	1.4442	0.00
3	1.384	2.333		16688.55	0.6819	0.6287	1.4667	0.00
4	2.113	3.399		25478.98	0.9268	0.3181	1.0813	0.00
				0.00	1.0000	0.0000	0.0000	0.00
				0.00	1.0000	0.0000	0.0000	0.00
				0.00	1.0000	0.0000	0.0000	0.00
	5			0.00	1.0000	0.0000	0.0000	0.00
				0.00	1.0000	0.0000	0.0000	0.00
				0.00	1.0000	0.0000	0.0000	0.00
4				0.00				
						1.84124	4.5691	0.00
ighted average emiss	ions rate:						2.4816	
	Weighted	Average O	HE				0.00	

INTERTEK TESTING SERVICES NA Ltd.

#### SFBA EPA ADJUSTED EMISSION RESULTS

Manufacturer: Model:	SBI Volta		RESULTS		
Date:	2015-04-15		AVERAGE ADJUSTED EMISSION R	ATE:	1 925
Run:	1				1.500
Project #:	G102038216		Burn Rate (Dry kg/hr):		0.549
Test Duration:	120				
(minutes)			Category I		
PRESSURE FACTOR:		1.01337	BAROMETRIC PRESSURE		
				Average:	30.32
TEMPERATURE FACTO	RS			Start:	30.32
	DGM #1:	0.97939		End:	30.32
	DGM #2:	0.98007	DDV CLO METER MATURA		
VOLUMES SAMDIED			DRI GAS METER VALUES		
VOLUMES SAMPLED	D (1) ( 1)	10 10000	DGM #1	Final:	325.472
	DGM #1:	19.48967		Initial:	305.874
	DGM #2:	18.67513			
			DGM #2	Final:	931.634
TOTAL TUNNEL VOLU	ME (scf):	16110.082		Initial	912.717
SAMPLE RATIOS			TEMPERATURES (DEG. RANKIN)		
Sample Train 1:		826.596		DGM #1:	539.109
Sample Train 2:		862.649		DGM #2:	538.737
TOTAL EMISSIONS			CALIBRATION FACTORS		
Sample Train 1 (g	):	2.1491		DGM #1:	1.0020
Sample Train 2 (g	) #	2,1566		DGM #2:	0 9940
				DGD WZ.	0.0040
EMISSION RATES			TUNNEL FLOW RATE:		134.251
Sample Train 1 (g	/hr):	1.0746			
Sample Train 2 (g	/hr):	1.0783	PARTICULATE CATCH (mg)		
			Sample Train 1:		2.6000
ADJUSTED EMISSION	RATES		Sample Train 2:		2.5000
Sample Train 1 (g	/hr):	1.9320			
Sample Train 2 (g	/hr):	1.9375			

DEVIATION: 0.07%

Manufacturer:	SBI		F	=	С			{EDIT-GOTO	"cc2";;"RA
Model:	Volta		398	=	203.333333				
Date:	04-15-15		С	=	F			{EDIT-GOTO	"a15";;"RA
Run:	1 - precharge		282	=	539.6				
Control #:	G102038216								
Test Duration:	90	)							
	4	Start	L	End	i.	P.Static:	0.0675		
Barometer (in.Hg):	3	30.32		30.32	1				
Wet Bulb (F):	)		4.:		.1				
Dry Bulb (F):	3	79.6	E	79.7	1				
Humidity (%):	1	16.9	t	15	ĵ.				

Average Stove Temperature: 214.103

Average #DIV/0! #DIV/0! #DIV/0! 172.56 75.061 92.66 #DIV/0! 232.43 . . \* \* . \* \* . \* Elapsed Weight Flue Room Tunnel Unit Tunnel Remaining CO C02 02 Gas Temp Dry Bulb Wet bulb Тор 0 8.190 175.8 75.010 92.570 236.500 10 8.190 175.8 75.010 92.570 236.500 20 8.000 170.4 75.060 92.470 234.500 30 7.760 175.2 74.860 92.420 235.000 40 7.590 162.7 74.880 91.900 223.600 50 7.380 168.1 74.990 92.030 225.400 60 7.150 174 75.050 92.480 231.200 70 6.930 177.3 75.130 93.170 238.400 80 7.010 174.3 75.270 92.940 234.200 90 6.550 172 75.350 94.050 229.000

	Pre-I	est Load
NGE"}	weight	Moisture
	(wet lb)	(Dry %)
NGE"}		

	288.56	231.5	222.08	95.945
	*	*	*	*
	Unit	Unit	Unit	Unit
	Back	R.Side	L.Side	Bottom
30	06.800	234.600	226.100	95.490
30	06.800	234.600	226.100	95.490
2	75.800	227.700	221.800	95.850
30	02.100	234.100	225.000	96.010
24	45.500	213,400	211.100	95.950
26	58.000	222.200	217.200	95.820
29	90.900	235.900	224.000	95.740
3:	11.300	241.000	228.800	96.190
29	<del>9</del> 1.300	240.000	222.200	96.460
28	87.100	231.500	218.500	96.450

Manufacturer:	SBI		F		С			(EDIT-GOTO	"cc2";;"RA
Model:	Volta		398		203.333333				
Date:	04-15-15		С	380	F			{EDIT-GOTO	"a15";;"RA
Run:	1		282		539.6				
Control #:	G102038216								
Test Duration:	120								
	I	Start		End	10	P.Static:	0.0675		
Barometer (in.Hg):	L	30.32		30.32	1				
Wet Bulb (F):	ł		Ĩ.		1.				
Dry Bulb (F):	1	79.6	38	79.7	1				
Humidity (%):	T	16.9	1	15	1				

Average Stove Temperature: 212.1929

	Average	0.145385	1.5215385	19.072308	172.376923	75.52384615	96.4861538	#DIV/0!	232.4
34 (	*			2	*		*		*
Elapsed	d Weight				Flue	Room	Tunnel	Tunnel	Unit
	Remaining	CO	C02	02	Gas	Temp	Dry Bulb	Wet bulb	Тор
0	2.600	0.150	1.580	18.990	172.400	75.850	96.400		233.100
10	2.383	0.140	1.300	19.330	168.300	75.480	96.060		227.800
20	2.167	0.150	1.550	19.010	171.700	75.500	96.360		230.300
30	1.950	0.140	1.590	18.960	172.200	75.660	96.410		230.000
40	1.733	0.130	1.390	19.280	169.000	75.570	96.220		228.100
50	1.517	0.160	1.710	18.930	169.600	75.700	95.660		223.400
60	1.300	0.150	1.460	19.140	170.000	75.720	96.100		227.600
70	1.083	0.140	1.390	19.230	181.200	75.740	97.530		246.800
80	0.867	0.160	1.870	18.740	177.000	75.370	97.060		239.400
90	0.650	0.130	1.370	19.260	172.700	75.240	96.640		234.400
100	0.433	0.130	1.310	19.240	168.300	75.330	96.200		228.300
110	0.217	0.150	1.510	19.030	171.800	75.260	96.490		232.700
120	0.000	0.160	1.750	18.800	176.700	75.390	97.190		239.300

	Pre-Test Load			Test Load					
NGE"}	weight	Moisture	Coal Bed	Weight	Loading	Moisture	Piece	Number of	
	(wet lb)	(Dry %)	Weight	(wet lb)	Density	(Dry %)	Length	2x4	$4 \times 4$
NGE"}									

281.76923       228.03077       221.830769       96.9338462       #DIV/0!       #DIV											
*         *	281.7692	3 228.03077	7 221.830769	96.9338462	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	315.7693846
Unit         Unit         Unit         Catalyst         Catalyst         Catalyst         Stack         Train         Gas         Smple         DGM 1           Back         R.Side         L.Side         Bottom         Down         Center Upper         Wet bulb         Temp         Roto.         Reading           278.900         229.200         220.300         96.970         Stack         Temp         Roto.         Reading           263.300         222.300         215.300         96.940         Stack         Stack         Stack         Stack         305.874           280.900         229.000         220.100         96.950         Stack         Stack         Stack         Stack         Stack         309.306           277.800         229.000         219.400         96.860         Stack         Stack         Stack         Stack         310.971           275.600         220.700         213.000         96.640         Stack         Stack         Stack         Stack         Stack         314.225           310.700         244.100         239.500         97.340         Stack         Stack         Stack         Stack         Stack         319.017           283.700         225.70	*	*	×	*	*	*	*				
Back         R.Side         L.Side         Bottom         Down         Center Upper         Wet bulb         Temp         Roto.         Reading           278.900         229.200         220.300         96.970         305.874         307.614         307.614         309.306         309.306         309.306         309.306         309.306         309.306         310.971         312.613         310.971         312.613         314.225         314.225         314.225         314.225         315.822         317.423         317.423         317.423         319.017         319.017         320.583         319.017         320.583         319.017         320.583	Unit	z Unit	Unit	Unit	Catalyst	Catalyst	Catalyst	Stack	Train	Gas Smple	DGM 1
278.900229.200220.30096.970305.874263.300222.300215.30096.940307.614280.900229.000220.10096.950309.306277.800229.700219.40096.860310.971275.600222.000216.60097.010312.613286.900220.700213.10096.640314.225271.600223.500216.30096.530315.822310.700244.100239.50097.110317.423291.200238.100228.50097.340319.017283.700225.700222.60097.230320.583	Bacl	< R.Side	L.Side	Bottom	Down	Center	Upper	Wet bulb	Temp	Roto.	Reading
263.300222.300215.30096.940307.614280.900229.000220.10096.950309.306277.800229.700219.40096.860310.971275.600222.000216.60097.010312.613286.900220.700213.10096.640314.225271.600223.500216.30096.530315.822310.700244.100239.50097.110317.423291.200238.100228.50097.340319.017283.700225.700222.60097.230320.583	278.900	229.200	220.300	96.970							305.874
280.900229.000220.10096.950309.306277.800229.700219.40096.860310.971275.600222.000216.60097.010312.613286.900220.700213.10096.640314.225271.600223.500216.30096.530315.822310.700244.100239.50097.110317.423291.200238.100228.50097.340319.017283.700225.700222.60097.230320.583	263.300	222.300	215.300	96.940							307.614
277.800229.700219.40096.860310.971275.600222.000216.60097.010312.613286.900220.700213.10096.640314.225271.600223.500216.30096.530315.822310.700244.100239.50097.110317.423291.200238.100228.50097.340319.017283.700225.700222.60097.230320.583	280.900	229.000	220.100	96.950							309.306
275.600       222.000       216.600       97.010       312.613         286.900       220.700       213.100       96.640       314.225         271.600       223.500       216.300       96.530       315.822         310.700       244.100       239.500       97.110       317.423         291.200       238.100       228.500       97.340       319.017         283.700       225.700       222.600       97.230       320.583	277.800	229.700	219.400	96.860							310.971
286.900       220.700       213.100       96.640       314.225         271.600       223.500       216.300       96.530       315.822         310.700       244.100       239.500       97.110       317.423         291.200       238.100       228.500       97.340       319.017         283.700       225.700       222.600       97.230       320.583	275.600	222.000	216.600	97.010							312.613
271.600       223.500       216.300       96.530       315.822         310.700       244.100       239.500       97.110       317.423         291.200       238.100       228.500       97.340       319.017         283.700       225.700       222.600       97.230       320.583	286.900	220.700	213.100	96.640							314.225
310.700       244.100       239.500       97.110       317.423         291.200       238.100       228.500       97.340       319.017         283.700       225.700       222.600       97.230       320.583	271.600	223.500	216.300	96.530							315.822
291.200       238.100       228.500       97.340       319.017         283.700       225.700       222.600       97.230       320.583	310.700	244.100	239.500	97.110							317.423
283,700 225,700 222,600 97,230 320 583	291.200	238.100	228.500	97.340							319.017
520.303	283.700	225.700	222.600	97.230							320.583
260.200 220.900 216.200 96.890 <b>322.223</b>	260.200	220.900	216.200	96.890							322.223
277.800 226.200 224.100 96.780 <b>323.859</b>	277.800	226.200	224.100	96.780							323.859
304.400 233.000 231.800 96.890 <b>325.472</b>	304.400	233.000	231.800	96.890							325.472

#DIV/0!	79.118462	79.0992308	82.4584615	922.29877	#DIV/0!	78.767692	78.705385	81.6053846	0.01	0.0251923	0
	*		1 k -	*		*		*	*	*	
Roto 1	DGM 1	DGM 1	Filter 1	DGM 2	Roto 2	DGM 2	DGM 2	Filter 2	Tunnel		Smoke
Reading	Inlet T	Outlet T	Temp	Reading	Reading	Inlet T	Outlet T	Temp	Velocity	Draft	Observed
	78.490	78.390	78.260	912.717		78.270	77.980	76.930	0.010	0.025	ok
	78.770	78.690	81.830	914.414		78.310	78.200	80.580	0.010	0.025	ok
	79.020	78.850	82.840	916.052		78.610	78.410	81.770	0.010	0.025	ok
	79.120	78.970	83.040	917.660		78.670	78.530	82.130	0.010	0.025	ok
	79.190	79.160	82.950	919.230		78.800	78.620	82.240	0.010	0.025	ok
	79.310	79.240	82.620	920.784		78.990	78.860	82,140	0.010	0.025	ok
	79.240	79.240	82.770	922.309		78.870	78.890	82.120	0.010	0.025	ok
	79.340	79.270	82.960	923.924		78.900	78.900	82.450	0.010	0.025	ok
	79.270	79.300	82.930	925.496		78.900	78.920	82.380	0.010	0.028	ok
	79.070	79.250	82.890	927.040		78.850	78.920	82.180	0.010	0.025	ok
	79.170	79.260	82.890	928.565		78.970	78.980	81.960	0.010	0.025	ok
	79.290	79.330	82.970	930.059		78.890	78.950	81.900	0.010	0.025	ok
	79.260	79.340	83.010	931.634		78.950	79.010	82.090	0.010	0.025	ok

# Intertek

#### **DILUTION TUNNEL WORKSHEET - METHOD 5G3**

Client: <u>SBI</u>	Model: <u>Volta</u>
Project #: <u>G102038216</u>	Sample ID #:
Date: 2015-04-15	Engineer: <u>Claude Pelland</u> Run #: Sample Train #:
Balance Equipment #: <u>SBI-</u>	206 Thermo/Hygrometer Equipment #:

Front Filter #	207	Tare:	0,1192	Preliminary Wt:		
Rear Filter #	217	Tare:	0.1214	Preliminary Wt:		
Seal Set #		Tare:		Preliminary Wt:		
Date/Time ir	Date/Time in dessicator:			Preliminary Wt:		
Date	Time	R/H %	Temp. (F)	Weight (grams)	Audit (grams)	Initials
2015-04-17	16h20		207 217	0.1216		
2015-04-20	7h50		207 217	0.1216	2.4mg 0.0mg	
Probe #:	17	Tare:	139.7462	Preliminary Wt:		
Date/Time in	n dessicator:					
Date	Time	R/H %	Temp. (F)	Weight (grams)	Audit (grams)	Initials
2015-04-17	16h20			139.7464		
2015-04-20	7h50			139.7464	0,2 <i>m</i> g	
					×	

Date:

Engineer Signature: \_\_\_\_\_ RM

# Intertek

#### **DILUTION TUNNEL WORKSHEET - METHOD 5G3**

Client: SBL	Model: <u>Volta</u>	
Project #: <u>G102038216</u>	Sample ID #:	
Date: 2015-04-15	Engineer: Claude Pelland Run #: 1 Sample Train #: 2	
Balance Equipment #: <u>SBI-</u>	-206 Thermo/Hygrometer Equipment #:	

Front Filter #	211	Tare:	0.1214	Preliminary Wt:		
Rear Filter #	216	Tare:	0,1194	Preliminary Wt:		
Seal Set #		Tare:		Preliminary Wt:		
Date/Time ir	n dessicator:			Preliminary Wt:		
Date	Time	R/H %	Temp. (F)	Weight (grams)	Audit (grams)	Initials
2015-04-17	16h20		211	0.1236		
2015-04-20	7h50		211	0.1236	2.2mg	
Probe #:	18	Tare:	147.8827	Preliminary Wt:		
Date/Time in	n dess <mark>ic</mark> ator:					
Date	Time	R/H %	Temp. (F)	Weight (grams)	Audit (grams)	Initials
2015-04-17	16h20			147.8829		
2015-04-20	7h50			147.8829	0.2mg	

Date: \_\_\_\_\_

Engineer Signature: \_\_\_\_\_ RM \_\_\_\_\_

Manufacturer:	SBI		F	=	С			{EDIT-GOTO	"cc2";;"RA
Model:	Volta		398	=	203.333333				
Date:	04-16-15	i	С	=	F			{EDIT-GOTO	"a15";;"RA
Run:		2	282	=	539.6				
Control #:	Control #: G102038216								
Test Duration:	6	0							
	1	Start	1	End	0	P.Static:	0.0575		
Barometer (in.Hg)	1	30.56		30.50	1				
Wet Bulb (F):	1		1						
Dry Bulb (F):	1	74.8	3	75.9					
Humidity (%):	1	16.1	Ť	15.3	L				

Average Stove Temperature: 263.0691

Average	#DIV/0!	#DIV/0!	#DIV/0!	216.6	72.63	104.285714	#DIV/0!	286.15714
*		*		*	3	*		*
Weight				Flue	Room	Tunnel	Tunnel	Unit
Remaining	CO	C02	02	Gas	Temp	Dry Bulb	Wet bulb	Тор
21.840				216.000	72.360	104.100		284.100
21.500				215.400	72.460	103.600		283,300
21.200				214.500	72.630	103.800		285.800
20.840				218.600	72.540	104.700		289.600
20.480				220.500	72.810	104.700		290.400
20.150				216.700	72.900	104.900		286.600
19.770				214.500	72.710	104.200		283.300
	Average * Weight Remaining 21.500 21.200 20.840 20.480 20.150 19.770	Average       #DIV/0!         Weight       CO         Remaining       CO         21.500       21.500         21.200       20.840         20.480       20.150         19.770       Image: Comment of the second of the	Average       #DIV/0!       #DIV/0!         Weight       *         Remaining       CO       CO2         21.840       21.500       21.200         21.200       20.840       20.480         20.150       19.770       19.770	Average #DIV/0! #DIV/0! #DIV/0! * Weight Remaining CO CO2 02 21.840 21.500 20.840 20.480 20.150 19.770	Average #DIV/0!       #DIV/0!       #DIV/0!       #DIV/0!       216.6         *       *       *       *         Weight       *       *       *         Remaining       CO       CO2       O2       Gas         21.840       216.000       215.000       215.400         21.500       21.4.500       214.500       216.000         20.840       218.600       218.600       20.800         20.480       220.500       216.700       216.700         19.770       214.500       214.500       214.500	Average #DIV/0!         #DIV/0!	Average #DIV/0! #DIV/0!       #DIV/0! <t< th=""><th>Average #DIV/0!       #DIV/0!       #DIV/0!       216.6       72.63       104.285714       #DIV/0!         *</th></t<>	Average #DIV/0!       #DIV/0!       #DIV/0!       216.6       72.63       104.285714       #DIV/0!         *

	Pre-Test Load				
NGE"}	weight	Moisture			
	(wet lb)	(Dry %)			
NGE"}					

#### 357.14286 293.94286 276.528571 101.574286

*	*	×.	*
Unit	Unit	Unit	Unit
Back	R.Side	L.Side	Bottom
360.900	296.800	274.100	98.180
387.000	290.400	275.000	99.840
344.000	286.400	279.300	101.800
361.600	298.300	283.600	101.800
357.400	300.100	281.700	101.900
345.500	293.700	273.800	103.400
343.600	291.900	268.200	104.100

INTERTEK TESTING SERVICES NA Ltd.

#### SFBA EPA ADJUSTED EMISSION RESULTS

Manufacturer: Model:	SBI Volca		RESULTS		
Date: Run:	2015-04	-16 2	AVERAGE ADJUSTED EMISSION	RATE	2.422
Project 8:	G102038	216	Burn Rate (Dry kg/hr);		0.898
Test Duration:		120			
(minutes)			Category II		
PRESSURE FACTOR:		1.02039	BAROMETRIC PRESSURE		
TEMPERATURE PACTOR	q			Average:	30.53
THICH HELLOND THETON	DGM #1:	0.98888		Start:	30.56
	DGM #2:	0.98925		End.	20.0
			DRY GAS METER VALUES		
VOLUMES SAMPLED			DGM #1	Final:	344.594
	DGM #1:	19.29407		Initial:	325.511
	DGM #2:	18.47482			
			DGM #2	Final.	950.081
TOTAL TUNNEL VOLUM	E (scf):	15960.873		Initial	931.668
SAMPLE RATIOS			TEMPERATURES (DEG. RANKIN)		
Sample Train 1:		827.242	-	DGM #1:	533,937
Sample Train 2:		863.926		DGM #2:	533.740
TOTAL EMISSIONS			CALIBRATION FACTORS		
Sample Train 1 (g)	1	3.1435		DGM #1:	1.0020
Sample Train 2 (g)	:	2.5054		DGM #2:	0.9940
EMISSION RATES			TUNNEL FLOW RATE:		133.007
Sample Train 1 (g/.	hr):	1.5718			
Sample Train 2 (g/	hr):	1.2527	PARTICULATE CATCH (mg)		
			Sample Train 1:		3.8000
ADJUSTED EMISSION :	RATES		Sample Train 2:		2.9000
Sample Train 1 (g/	hr):	2.6489			
Sample Train 2 (g/	nr):	2.1942			

DEVIATION: 4.69%

Manufacturer:	SBI		F	-	С			{EDIT-GOTO	"cc2";;"RA
Model:	Volta		398	-	203.333333				
Date:	04-16-1	5	С	=	F			{EDIT-GOTO	"a15";;"RA
Run:		2	282	=	539.6				
Control #:	G102038216								
Test Duration:	12	20							
	1	Start	() E	End	1	P.Static:	0.0575		
Barometer (in.Hg):	1	30.56		30.50	Ĭ				
Wet Bulb (F):	Ĩ		10		1				
Dry Bulb (F):		74.8	15	75.9	6				
Humidity (%):	1	16.1	1	15.3	ĩ				

262.9338

Average Stove Temperature:

Average 0.191538 1.9992308 18.528462 218.792308 73.14923077 104.276923 #DIV/0! 288.79231 × . ¥ \* \* . \* \* \* Weight Elapsed Flue Room Tunnel Unit Tunnel Remaining C02 CO 02 Gas Temp Dry Bulb Wet bulb Top 0 4.250 0.200 2.220 18.340 216.900 72.720 104.500 284.100 10 3.896 0.200 2.120 18.440 213.300 72.820 102.800 282.200 20 3.542 0.180 1.640 18.880 216.300 72.690 103.000 285.600 30 3.188 0.190 2.030 18.560 216.200 72.730 103.700 282.800 40 2.833 0.180 1.790 18.750 223.000 72.940 104.200 293.800 50 2.479 0.200 2.300 18.200 218.800 73.050 104.000 290.600 60 2.125 0.180 1.720 18,790 221.200 73.270 104.600 287.900 70 1.771 0.200 2.370 18.000 222.400 73.260 104.500 295.600 80 1.417 0.190 2.100 18.430 216.600 73.410 104.500 290.600 90 1.063 0.210 2.420 18.080 217.900 73.510 104.900 289.400 100 0.708 0.180 1.630 18.930 219.000 73.320 104.400 290.200 110 0.354 0.190 1.710 18.820 222.400 73.520 105.100 290.000 120 0.000 0.190 1.940 18.650 220.300 73.700 105.400 291.500

	Pre-Test Load					Test Load			
NGE"}	weight	Moisture	Coal Bed	Weight	Loading	Moisture	Piece	Number of	
	(wet lb)	(Dry %)	Weight	(wet lb)	Density	(Dry %)	Length	2x4	4x4
NGE"}									

351.49231	298.95385	271.2	104.230769	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	335.1577692
		*	*	*		×				*
Unit	Unit	Unit	Unit	Catalyst	Catalyst	Catalyst	Stack	Train	Gas Smple	DGM 1
Back	R.Side	L.Side	Bottom	Down	Center	Upper	Wet bulb	Temp	Roto.	Reading
370.300	297,900	270.100	104.300							325.511
351.300	292.200	267.600	104.500							327.180
358.600	303.300	271.400	103.800							328.820
331.100	296.400	261.400	103.100							330.430
368.000	306.800	274.200	103.200							332.031
337.900	300.200	268.400	103.300							333.613
366.000	306.500	266.500	103.400							335.173
344.500	305.200	277.300	104.700							336.778
349.800	294.300	273.100	105.000							338.379
351.500	295.000	271.300	106.400							339.958
353.400	295.000	276.200	105.700							341.521
348.600	294.900	275.000	104.000							343.063
338.400	298.700	273.100	103.600							344.594

#DIV/0!	74.047692	73.8253846	81.8430769	940.99092	#DIV/0!	73.82	73.66	80.4784615	0.01	0.04	0			
	*	*	*			*	*			*				
Roto 1	DGM 1	DGM 1	Filter 1	DGM 2	Roto 2	DGM 2	DGM 2	Filter 2	Tunnel		Smoke			
Reading	Inlet T	Outlet T	Temp	Reading	Reading	Inlet T	Outlet T	Temp	Velocity	Draft	Observed			
	73.090	73.140	75.950	931.668		73.020	72.960	73.330	0.010	0.040	ok			
	73.190	73.220	79.610	933.311		73.030	72.980	77.670	0.010	0.040	ok			
	73.370	73.270	81.450	934.910		73.270	73.130	80.020	0.010	0.040	ok			
	73.590	73.390	81.990	936.474		73.340	73.220	80.780	0.010	0.040	ok			
	73.880	73.470	82.290	938.017		73.580	73.320	81.140	0.010	0.040	ok			
	74.060	73.690	82.400	939.538		73.810	73.550	81.380	0.010	0.040	ok			
	74.200	73.880	82.530	941.038		73.900	73.690	81.450	0.010	0.040	ok			
	74.400	74.010	82.990	942.507		74.000	73.860	81.560	0.010	0.040	ok			
	74.520	74.130	82.960	944.042		74.230	73.980	81.710	0.010	0.040	ok			
	74.480	74.270	82.840	945.589					74.270	74.140	81.880	0.010	0.040	ok
	74.540	74.350	83.000	947.107		74.310	74.170	81,780	0.010	0.040	ok			
	74.480	74.390	82.920	948.600		74.330	74.230	81.700	0.010	0.040	ok			
	74.820	74.520	83.030	950.081		74.570	74.350	81.820	0.010	0.040	ok			

## Intertek

#### **DILUTION TUNNEL WORKSHEET - METHOD 5G3**

Client: SBI Model: Volta Project #: <u>G102038216</u> Sample ID #: Engineer: <u>Claude Pelland</u> Run #: <u>></u> Sample Train #: \_/\_\_\_ Date: 2015-04-16 Balance Equipment #: SBI-206 Thermo/Hygrometer Equipment #:

Front Filter #	208	Tare:	0.1216	Preliminary Wt:		
Rear Filter #	215	Tare:	0,1219	Preliminary Wt:		
Seal Set #		Tare:		Preliminary Wt:		
Date/Time in	n dessicator:			Preliminary Wt:		
Date	Time	R/H %	Temp. (F)	Weight (grams)	Audit (grams)	Initials
2015-04-17	1145		208 215	0.1220		
2015-04-20	7450		અક્ષ અડ	0.1240	2.4mg O.1mg	
Probe #:	25	Tare:	136.8003	Preliminary Wt:		
Date/Time in	n dessicator:					
Date	Time	R/H %	Temp. (F)	Weight (grams)	Audit (grams)	Initials
2015-04-17	llh45			136.8019		
2015-04-20	7h50			136,8016	1.3mg	

Date: \_\_\_\_\_

Engineer Signature: \_\_\_\_\_ cv\_\_ pv/

# Intertek

#### **DILUTION TUNNEL WORKSHEET - METHOD 5G3**

Client: <u>SBI</u>	Model: <u>Volta</u>
Project #: _G102038216	Sample ID #:
Date: 2015-04-16	Engineer: <u>Claude Pelland</u> Run #: <u>&gt;</u> Sample Train #: <del>&gt;</del>
Balance Equipment #: SBI-	-206 Thermo/Hygrometer Equipment #:

Front Filter #	214	Tare:	0.1212	Preliminary Wt:		
Rear Filter #	213	Tare:	0.1199	Preliminary Wt:		
Seal Set #		Tare:		Preliminary Wt:		
Date/Time in	n dessicator:			Preliminary Wt:		
Date	Time	R/H %	Temp. (F)	Weight (grams)	Audit (grams)	Initials
2015-04-17	llh45		214	0.1232		
2015-04-20	7h50		214 213	0.1234	2.2mg	
Probe #:	26	Tare:	139.7895	Preliminary Wt:		
Date/Time in	n dessicator:					
Date	Time	R/H %	Temp. (F)	Weight (grams)	Audit (grams)	Initials
2015-04-17	llh45			139.7902		
2015-04-20	7h50			139,7902	0.7mg	

Date: \_\_\_\_\_ Engineer Signature: \_\_\_\_\_ RM

Manufacturer:	SBI		F	-	С			{EDIT-GOTO "cc2	";;"RA
Model:	Volta		398	()	203.333333				
Date:	04-16-15		С		F			{EDIT-GOTO "a15	";;"RA
Run:	3	•	282	-	539.6				
Control #:	G102038216								
Test Duration:	70	ł							
	1	Start		End	1	P.Static:	0.12		
Barometer (in.Hg):	1	30.41		30.32	1				
Wet Bulb (F):	L		4		¥5				
Dry Bulb (F):	L	77.5	1	78.8	4				
Humidity (%):	I	16	1	15.3	T.				

Average Stove Temperature: 339.725

		Average	#DIV/0!	#DIV/0!	#DIV/0!	278.3375	74.39125	117.5875	#DIV/0!	374.05
	*				*	*	*	*		×
	Elapsed	Weight				Flue	Room	Tunnel	Tunnel	Unit
		Remaining	CO	C02	02	Gas	Temp	Dry Bulb	Wet bulb	Тор
0		12.030				281.100	73.960	124.900		372.300
10		11.510				273.200	74.010	124.600		371.500
20		10.920				278.000	74.060	118.800		373.800
30		10.390				277.000	74.110	114.100		372.000
40		9.840				280.000	74.460	114.600		376.600
50		9.320				277.500	74.690	114.700		374.800
60		8.800				277.300	74.830	115.000		373.000
70		8.260				282.600	75.010	114.000		378.400

	Pre-	Cest Load		
NGE"}	weight	Moisture		
	(wet lb)	(Dry %)		
NGE"}				

462.65 381.3125 358.175 122.4375 \* \* \* Unit Unit Unit Unit R.Side Back L.Side Bottom 471.700 386.800 351.300 123.100 452.300 374.100 358.200 124.200 462.500 390.600 362.600 124.700 455.500 377.400 351.300 123.300 464.600 376.700 361.200 121.700 464.500 380.000 359.900 121.000 466.300 375.500 120.500 360.500 463.800 389.400 360.400 121.000

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#### SFBA EPA ADJUSTED EMISSION RESULTS

Manufacturer: Model:	SBI Volta		RESULTS						
Date: Run:	2015-04-16 3		AVERAGE ADJUSTED EMISSION I	RATE	2.333				
Project #:	G102038216		Burn Rate (Dry kg/hr):		1.384				
Test Duration:	120				2.003				
(minutes)			Category III						
PRESSURE FACTOR:		1.01487	BAROMETRIC PRESSURE						
				Average:	30.365				
TEMPERATURE FACTOR:	S			Start:	30.41				
	DGM #1	0.98384		End:	30.32				
	DGM #2.+	0.98442	DRY CAS METER VALUES						
VOLUMES SAMPLED			DAI GAS MEIER VALUES		0.00				
CONCELLED OF LEED	DCM #1.	15 00041	DGM #1	Final:	362.435				
	DGM #1;	17.82241		Initial:	344.621				
	DGM #2:	15.85833							
			DGM #2	Final	966.079				
TOTAL TUNNEL VOLUM	E (scf):	17492.920		Initial:	950.110				
SAMPLE RATIOS			TEMPERATURES (DEG. RANKIN)						
Sample Train 1:		981.512		DGM #1:	536.671				
Sample Train 2:		1103.075		DGM #2:	536.355				
TOTAL EMISSIONS			CALIBRATION FACTORS						
Sample Train 1 (g)		2.7482		DGM #1:	1.0020				
Sample Train 2 (g)	B	2.6474		DGM #2:	0.9940				
EMISSION RATES			TUNNEL FLOW RATE:		145.774				
Sample Train 1 (g/H	nr):	1.3741							
Sample Train 2 (g/b	ir):	1.3237	PARTICULATE CATCH (mg)						
			Sample Train 1:		2.8000				
ADJUSTED EMISSION F	RATES		Sample Train 2:		2,4000				
Sample Train 1 (g/h	ır):	2.3694							
Sample Train 2 (g/)	ır):	2.2970							
DE	EVIATION:	0.78%							
Manufacturer:	SBI		F	=	С			{EDIT-GOTO	"cc2";;"RA
--------------------	------------	-------	-----	-------	------------	-----------	------	------------	------------
Model:	Volta		398	=	203.333333				
Date:	04-16-15		С	=	F			{EDIT-GOTO	"a15";;"RA
Run:	3		282	=	539.6				
Control #:	G102038216								
Test Duration:	120								
	1	Start		End	Ē.	P.Static:	0.12		
Barometer (in.Hg):	T	30.41		30.32	Ŭ				
Wet Bulb (F):	U.		3		£.				
Dry Bulb (F):	¥:	77.5	1	78.8	£.				
Humidity (%):	Ĩ	16	- Ĵ	15.3	1				

334.3585

0.250

3.230

Average Stove Temperature:

120

0.000

17.84 280.715385 74.78769231 Average 0.226923 2.5715385 124.5 #DIV/0! 374.67692 . \* \* \* ٠ \* \* \* \* Elapsed Weight Flue Room Tunnel Unit Tunnel Remaining CO C02 02 Gas Temp Dry Bulb Wet bulb Тор 0 6.550 0.230 2.660 17.750 282.900 75.010 115.700 378.600 10 6.004 0.250 3.280 17.010 280.600 74.590 115.700 376.200 20 5.458 0.220 2.400 18.010 283.400 74.410 118.200 380.800 30 4.913 0.210 1.890 18.580 282.900 74.380 117.200 373.900 40 4.367 0.220 2.470 18.010 278.500 74.510 121.400 370.100 50 3.821 0.230 2.820 17.620 277.600 74.750 126.300 367.400 60 3.275 0.210 2.270 18.190 286.900 74.630 125.900 380.300 70 2.729 0.210 2.050 18.440 281.100 74.940 129.600 373.300 80 2.183 0.240 2.960 17.360 282.900 74.980 129.700 377.300 90 1.638 0.230 2.740 17.670 281.100 74.810 129.800 373.700 100 1.092 0.220 2.330 18.070 279.200 74.980 129.000 372.800 110 0.546 0.230 2.330 18.150 274.000 75.160 129.800 370.000

17.060

278.200

75.090

130.200

376.400

	Pre-	Test Load				Test Load			
NGE"}	weight	Moisture	Coal Bed	Weight	Loading	Moisture	Piece	Number of	
	(wet lb)	(Dry %)	Weight	(wet lb)	Density	(Dry %)	Length	2x4	$4 \times 4$
NGE"}									

434 01530	276 06022		100 104615							
434.01338	370.90923.	330.140154	129.184615	#DIV/U!	#DIV/U:	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	354.1050769
*			*	*	*	*				1.2
Unit	Unit	Unit	Unit	Catalyst	Catalyst	Catalyst	Stack	Train	Gas Smple	DGM 1
Back	R.Side	L.Side	Bottom	Down	Center	Upper	Wet bulb	Temp	Roto.	Reading
454.400	386.100	359.000	121.600							344.621
443.100	380.500	359.900	121.500							346.411
443.500	381.600	366.100	123.100							348.158
451.200	379.300	352.600	123.000							349.870
428.400	368.500	349.700	126.000							351.535
423.300	369.200	344.900	128.200							353.080
465.600	383.600	360.000	135.100							354.525
435.000	377.500	357.300	136.300							355.893
429.900	380.500	357.100	133.900							357.237
440.000	378.700	356.800	133.100							358.566
421.600	377.200	352.600	131.900							359.870
398.500	363.100	351.500	133.300							361.165
418.100	374.800	362.400	132.400							362.435

.....

#DIV/0!	76.820769	76.5215385	87.1730769	958,66985	#DIV/0!	76.444615	76.265385	83.5861538 (	0.01346154	0.055	0
	*	2.90	*	*		000	:¥	*	*		
Roto 1	DGM 1	DGM 1	Filter 1	DGM 2	Roto 2	DGM 2	DGM 2	Filter 2	Tunnel		Smoke
Reading	Inlet T	Outlet T	Temp	Reading	Reading	Inlet T	Outlet T	Temp	Velocity	Draft	Observed
	75.920	75.720	75.210	950.110		75.540	75.380	74.020	0.020	0.055	ok
	76.110	75.740	80.550	951.750		75.760	75.430	77.990	0.020	0.055	ok
	76.090	75.990	86.190	953.368		75.810	75.670	83.090	0.018	0.055	ok
	76.720	76.160	88.350	954.944		76.210	75.900	85.020	0.018	0.055	ok
	76.740	76.280	89.040	956.460		76.430	76.120	85.580	0.015	0.055	ok
	76.990	76.480	89.160	957.831		76.420	76.230	85.540	0.013	0.055	ok
	77.000	76.610	89.480	959.126		76.720	76.450	85.790	0.013	0.055	ok
	76.930	76.690	89.130	960.332		76.480	76.370	85.360	0.010	0.055	ok
	77.160	76.830	89.320	961.462		76.700	76.590	85.010	0.010	0.055	ok
	77.190	76.980	89.260	962.580		76.860	76.720	84.600	0.010	0.055	ok
	77.320	77.030	89.310	963.747		76.910	76.790	84.510	0.010	0.055	ok
	77.150	77.080	89.180	964.919		76.880	76.830	84.960	0.010	0.055	ok
	77.350	77.190	89.070	966.079		77.060	76.970	85.150	0.010	0.055	ok

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#### **DILUTION TUNNEL WORKSHEET - METHOD 5G3**

 Client: SBI
 Model: Volta

 Project #: G102038216
 Sample ID #:

 Date: Jol5-04-16
 Engineer: Claude Pelland Run #: 3 Sample Train #:

 Balance Equipment #: SBI-206
 Thermo/Hygrometer Equipment #:

Front Filter #	223	Tare:	0.1202	Preliminary Wt:		
Rear Filter #	221	Tare:	0.1222	Preliminary Wt:		
Seal Set #		Tare:		Preliminary Wt:		
Date/Time in	n dessicator:			Preliminary Wt:		
Date	Time	R/H %	Temp. (F)	Weight (grams)	Audit (grams)	Initials
2015-04-17	16h30		222	0.1227		
2015-04-20	7h50		223 221	0.1228	2 Loung O, Img	
Probe #:	19	Tare:	140.1099	Preliminary Wt:		
Date/Time in	n dessicator:		-			
Date	Time	R/H %	Temp. (F)	Weight (grams)	Audit (grams)	Initials
2015-04-17	16430		33	140.1100		
2015-04-20	7hso			140.1100	0.1mg	

Date: \_\_\_\_\_

Engineer Signature: \_\_\_\_\_\_ RM

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#### **DILUTION TUNNEL WORKSHEET - METHOD 5G3**

Client: SBI Model: Volta Project #: <u>G102038216</u> Sample ID #: Engineer: <u>Claude Pelland</u> Run #: <u>3</u> Sample Train #: <u>2</u> Date: 2015-04-16 Balance Equipment #: \_SBI-206 Thermo/Hygrometer Equipment #:

Front Filter #	220	Tare:	0.1210	Preliminary Wt:		
Rear Filter #	212	Tare:	0.1217	Preliminary Wt:		
Seal Set #		Tare:		Preliminary Wt:		
Date/Time ir	n dessicator:			Preliminary Wt:		
Date	Time	R/H %	Temp. (F)	Weight (grams)	Audit (grams)	Initials
2015-04-17	16430		220 212	0.1233		
2015-04-20	7h50		220	0.1233	2.3mg	
Probe #:	20	Tare:	139,0579	Preliminary Wt:		
Date/Time in	n dessicator:					
Date	Time	R/H %	Temp. (F)	Weight (grams)	Audit (grams)	Initials
2015-04-17	16h30			139.0580		
2015-04-20	7h50			139.0580	0,1mg	

Date:

Engineer Signature: \_\_\_\_\_ RM

Manufacturer:	SBI		F	-	С		{ED	IT-GOTO "cc2";;"F
Model:	Volta		398		203.333333	3		
Date:	04-17-15		С		F		{ED	IT-GOTO "a15";;"F
Run:	4	4	282	-	539.6			
Control #:	G102038216							
Test Duration:	60	)						
	3	Start	0	End	4	P.Static:	0.1025	
Barometer (in.Hg):	Ť.	29.94		29.85	Ĩ			
Wet Bulb (F):	Д				1			
Dry Bulb (F):	31	76.1	1	77.5	Ť			
Humidity (%):	1	21	1	22.7	1			

463.84

Average Stove Temperature:

		Average	#DIV/0!	#DIV/0!	#DIV/0!	362,842857	73.35	153.314286	#DIV/0!	479.44286
	*	*	*		•	*	*			*
	Elapsed	Weight				Flue	Room	Tunnel	Tunnel	Unit
		Remaining	CO	CO2	02	Gas	Temp	Dry Bulb	Wet bulb	Тор
0		19.040				359.100	72.660	159.400		462.700
10		18.170				359.700	72.650	161.500		470.500
20		17.290				356.000	73.080	154.300		473.300
30		16.410				363.700	73.570	149.000		484.400
40		15.510				365.100	73.780	149.700		487.000
50		14.710				364.300	73.870	148.700		482.700
60		13.860				372.000	73.840	150.600		495.500

	Pre-1	est Load
NGE"}	weight	Moisture
	(wet lb)	(Dry %)
NGE"}		

681.47143	505.4	506.1	146.785714
*	*	*	*
Unit	Unit	Unit	Unit
Back	R.Side	L.Side	Bottom
686.000	501.300	495.500	132.700
684.200	501.300	495.500	141.800
667.000	502.700	504.700	147.000
684.300	498.800	507.800	150.300
680.600	500.800	507.300	152.100
683.800	506.000	507.400	151.500
684.400	526.900	524.500	152.100

INTERTEK TESTING SERVICES NA Ltd.

#### SFBA EPA ADJUSTED EMISSION RESULTS

Manufacturer: Model:	SBI Volta		RESULTS		
Date: Run:	2015-04-17 4		AVERAGE ADJUSTED EMISSION R	ATE:	3.399
Project #:	G102038216		Burn Rate (Dry kg/hr):		2.113
Test Duration:	120				
(minutes)			Category IV		
PRESSURE FACTOR:		0.99916	BAROMETRIC PRESSURE		
				Average:	29.895
TEMPERATURE FACTOR:	S			Start:	29.94
	DGM #1:	0.98636		End:	29.85
	DGM #2:	0.98672	DDV CAO MEMOD MATTICA		
VOLIMES SAMPLED			DRI GAS METER VALUES		
VODOMES SMAFEED	D.014   1	0.0 10000	DGM #1	Final:	383.201
	DGM #1:	20.47886		Initial:	362.463
	DGM #2:	21.29892			
			DGM #2	Final:	987.846
TOTAL TUNNEL VOLUM	E (scf):	17719.952		Initial:	966.112
SAMPLE RATIOS			TEMPERATURES (DEG. RANKIN)		
Sample Train 1:		865.280		DGM #1:	535.303
Sample Train 2:		831.965		DGM #2:	535.105
TOTAL EMISSIONS			CALIBRATION FACTORS		
Sample Train 1 (g)	р 4	4.4995		DGM #1:	1.0020
Sample Train 2 (g)		3.9934		DGM #2:	0.9940
EMISSION RATES			TUNNEL FLOW RATE:		147.666
Sample Train 1 (g/)	nr):	2.2497			
Sample Train 2 (g/H	ır):	1.9967	PARTICULATE CATCH (mg)		
			Sample Train 1:		5.2000
ADJUSTED EMISSION H	RATES		Sample Train 2:		4.8000
Sample Train 1 (g/)	nr):	3.5673			
Sample Train 2 (g/)	nr):	3.2310			
DI	EVIATION:	2.478			

Manufacturer:	SBI		F	=	С		{EDIT-GOTO "cc2";;"RA
Model:	Volta		398	=	203.333333		
Date:	04-17-15		С	21	F		{EDIT-GOTO "a15";;"RA
Run:	4	ŀ	282	=	539.6		
Control #:	G102038216						
Test Duration:	120	)					
	1	Start	I.	End		P.Static: 0.1025	
Barometer (in.Hg):	3	29.94		29.85	Ť		
Wet Bulb (F):	I		1		1		
Dry Bulb (F):	4	76.1	9	77.5			
Humidity (%):	36	21	3	22.7	<u>1</u>		

Average Stove Temperature: 456.7662

	Average	0.236154	3.1861538	17.196923	362.546154	74.27076923	155,715385	#DIV/0!	487.45385
*	*	*	*	*	*	<b>3</b>			*
Elapsed	Weight				Flue	Room	Tunnel	Tunnel	Unit
	Remaining	CO	C02	02	Gas	Temp	Dry Bulb	Wet bulb	Тор
0	10.000	0.250	3.250	17.160	367.300	73.990	149.200		488.800
10	9.167	0.24	3.44	16.96	368.900	74.050	158.500		495.000
20	8.333	0.24	3.5	16.8	363.200	73.970	158.200		485.000
30	7.500	0.24	3.22	17.26	360.600	74.050	155.800		486.600
40	6.667	0.25	3.34	16.99	361.100	74.200	157.500		481.800
50	5.834	0.23	3.39	16.99	360.500	74.230	157.400		486.300
60	5.000	0.22	2.66	17.76	364.600	74.290	155.400		485.200
70	4.167	0.23	3.41	16.96	363.000	74.290	154.700		491.900
80	3.334	0.23	3.16	17.21	361.600	74.490	156.200		493.800
90	2.500	0.23	2.81	17.62	360.900	74.430	155.300		487.600
100	1.667	0.23	2.64	17.79	359.900	74.450	153.500		483.500
110	0.834	0.24	3.4	16.97	360.200	74.440	156.200		482.900
120	0.000	0.24	3.2	17.09	361.300	74.640	156.400		488.500

	Pre-	Test Load				Test Load			
NGE"}	weight	Moisture	Coal Bed	Weight	Loading	Moisture	Piece	Number of	
	(wet lb)	(Dry %)	Weight	(wet lb)	Density	(Dry %)	Length	2x4	4 x 4
NCE									

646.41538	502.64615	499,084615	148.230769	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	372.8935385
*	*	*	*	*	*	*				*
Unit	Unit	Unit	Unit	Catalyst	Catalyst	Catalyst	Stack	Train	Gas Smple	DGM 1
Back	R.Side	L.Side	Bottom	Down	Center	Upper	Wet bulb	Temp	Roto.	Reading
695.000	517.000	510.900	152.200							362.463
693.300	515.000	520.000	152.300							364.271
649.000	508.600	500.200	152.100							366.038
633.900	505.700	499.200	151.400							367.780
637.000	496.300	490.300	150.100							369.507
640.500	506.900	499.000	150.100							371.207
656.700	511.300	499.000	148.600							372.892
644.800	505.600	506.200	146.600							374.568
640.900	492.500	503.100	145.500							376.320
653.600	495.100	493.400	145.400							378.067
618.000	490.200	489.100	144.500							379.794
617.300	489.500	485.900	143.400							381.508
623.400	500.700	491.800	144.800							383.201

#DIV/0!	75.507692	75.0984615	84.5746154	977.01985	#DIV/0!	75.206154	75.004615	85.0176923	0.0125	0.08	0
	*	3 <b>6</b> 2	36 C	*		*		•	*	*	
Roto l	DGM 1	DGM 1	Filter 1	DGM 2	Roto 2	DGM 2	DGM 2	Filter 2	Tunnel		Smoke
Reading	Inlet T	Outlet T	Temp	Reading	Reading	Inlet T	Outlet T	Temp	Velocity	Draft	Observed
	74.360	74.300	76.210	966.112		74.130	74.200	74.470	0.013	0.080	ok
	74.670	74.310	80.490	968.039		74.410	74.170	79.150	0.013	0.080	ok
	74.950	74.510	83.370	969.778		74.770	74.460	81.370	0.013	0.080	ok
	75.210	74.630	85.480	971.621		74.850	74.580	85.530	0.013	0.080	ok
	75.450	74.830	85.790	973.456		75.160	74.760	86.670	0.013	0.080	ok
	75.530	74.950	86.030	975.255		75.170	74.930	87.270	0.013	0.080	ok
	75.700	75.160	85.830	977.021		75.320	75.150	87.100	0.013	0.080	ok
	75.750	75.290	85.710	978.766		75.490	75.260	86.830	0.013	0.080	ok
	75.960	75.520	86.060	980.595		75.630	75.420	87.250	0.013	0.080	ok
	75.970	75.580	86.330	982.441		75.710	75.500	87.580	0.013	0.080	ok
	75.940	75.620	86.180	984.262		75.700	75.510	87.500	0.013	0.080	ok
	76.080	75.780	85.970	986.066		75.650	75.570	87.240	0.013	0.080	ok
	76.030	75.800	86.020	987.846		75.690	75.550	87.270	0.013	0.080	ok

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#### **DILUTION TUNNEL WORKSHEET - METHOD 5G3**

Client: SBI Model: Volta Project #: \_G102038216 Date: 2015-04-17 Balance Equipment #: SBI-206

Sample ID #: \_\_\_\_

Engineer: Claude Pelland Run #: 4 Sample Train #: \_ ( Thermo/Hygrometer Equipment #:

Front Filter #	222	Tare:	0.1204	Preliminary Wt:		
Rear Filter #	218	Tare:	0.1222	Preliminary Wt:		
Seal Set #		Tare:		Preliminary Wt:		
Date/Time in	n dessicator:			Preliminary Wt:		
Date	Time	R/H %	Temp. (F)	Weight (grams)	Audit (grams)	Initials
2015-04-20	7450		222 218	0.1243		
2015-04-21	11445		222 218	0.1243	3.9mg	
Probe #:	2	Tare:	136.0330	Preliminary Wt:		
Date/Time ir	n dessicator:					
Date	Time	R/H %	Temp. (F)	Weight (grams)	Audit (grams)	Initials
2015-04-20	7450			136:0342		
2015-04-21	11445			136.0342	1.2mg	

Date:

Engineer Signature: \_\_\_\_\_ RM

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# **DILUTION TUNNEL WORKSHEET - METHOD 5G3**

Front Filter #	225	Tare:	0.1180	Preliminary Wt:		
Rear Filter #	224	Tare:	0.1219	Preliminary Wt:		
Seal Set #		Tare:		Preliminary Wt:		
Date/Time in	n dessicator:			Preliminary Wt:		
Date	Time	R/H %	Temp. (F)	Weight (grams)	Audit (grams)	Initials
2015-04-20	7450		225 224	0.1220		
2015-04-21	11h 45		225 224	0,1221	4. Ing	
Probe #:	22	Tare:	139.5680	Preliminary Wt:		
Date/Time in	n dessicator:					
Date	Time	R/H %	Temp. (F)	Weight (grams)	Audit (grams)	Initials
2015-04-20	7450			139.5689	2	
2015-04-21	1145			139.5687	o.7mg	

Date:

Engineer Signature: \_\_\_\_\_ RM

15 april 2015	
Run #1 Before	
Train #1: Train #2:	No leaks
πam #2.	NO LEAKS
Run #1 After	
Train #1: Train #2:	No leaks No Leaks
10 . 11 2015 -	<b>#2</b>
16 April 2015 Run	#2
Run #2 Before	No. Toolo
Train #1: Train #2:	NO TEAKS 0.001 cu ft
Run #2 After	
Train #1	No leaks
Train #2:	No Leaks
16- April 2015	
Run #3	
Run #3 Before	
Train #1: Train #2:	No leaks No leaks
Pun #3 After	
Train #1.	No leaks
Train #2:	No Leaks
17- April 2015	
Run #4	
Run #4 Before	
Train #1:	No leaks
11 d 111 #2:	NU TEAKS
_	

#### ESSAIS DE FUITE.txt

Train #1: No leaks Train #2: No Leaks

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Issued date: April 29, 2015

**APPENDIX B** Laboratory Operating Procedures



Issued date: April 29, 2015

## 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<sub>2</sub>SO<sub>4</sub> Impinger #2: 100 ml distilled water and 5 ml H<sub>2</sub>SO<sub>4</sub> Impinger #3: Empty Impinger #4: 200 – 300 grams silica gel (dry)



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- 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.
  - 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.



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- 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<sub>1</sub>) and (DGM<sub>2</sub>) meter readings. Wait ten (10) minutes and record dry gas meter readings again (DGM<sub>3</sub>, DGM<sub>4</sub>). NOTE: If mark, system is leaking too much and all seals should be checked.
- d) Calculate leakage rate as follows.

2) System 2: <u>(DGM<sub>4</sub> – DGM<sub>2</sub>)</u> = CFM<sub>2</sub> 10

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

If CFM<sub>1</sub> or CFM<sub>2</sub> 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.



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#### TEST CONDUCT

#### A. FUEL LOAD

- Determine optimum load weight by multiplying firebox volume in cubic feet by
   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.



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#### 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<sub>2</sub> 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.



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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.



Issued date: April 29, 2015

# **APPENDIX C** Sampling Proportionality Results

Manufacturer:	SBI
Model:	Volta
Date:	2015-04-15
Run:	1

		#1	#2	
		dDGM	dDGM	
		Vol.Std.	Vol.Std.	
PR1	PR2	(ft3)	(ft3)	Time
				0
106.59	107.71	1.731	1.676	10
103.63	103.95	1.683	1.617	20
101.96	102.03	1.656	1.587	30
100.51	99.58	1.632	1.550	40
98.61	98.48	1.602	1.533	50
97.74	96.69	1.587	1.505	60
98.10	102.52	1.591	1.593	70
97.63	99.75	1.584	1.551	80
95.90	97.94	1.557	1.523	90
100.38	96.68	1.630	1.504	100
100.15	94.75	1.626	1.474	110
98.80	99.94	1.603	1.554	120

Manufacturer:	SBI
Model:	Volta
Date:	2015-04-16
Run:	2

		#1	#2	
		dDGM	dDGM	
		Vol.Std.	Vol.Std.	
PR1	PR2	(ft3)	(ft3)	Time
				0
104.97	107.09	1.689	1.650	10
103.14	104.21	1.660	1.606	20
101.29	101.97	1.629	1.570	30
100.73	100.62	1.619	1.549	40
99.48	99.12	1.599	1.526	50
98.12	97.78	1.577	1.504	60
100.91	95.73	1.622	1.473	70
100.63	100.00	1.617	1.539	80
99.28	100.80	1.595	1.550	90
98.21	98.86	1.578	1.521	100
96.96	97.28	1.557	1.496	110
96.25	96.49	1.545	1.484	120

Manufacturer:	SBI
Model:	Volta
Date:	2015-04-16
Run:	3

		#1	#2	
		dDGM	dDGM	
		Vol.Std.	Vol.Std.	
PR1	PR2	(ft3)	(ft3)	Time
				0
97.28	99.43	1.793	1.631	10
101.70	105.07	1.750	1.608	20
99.50	1 <b>02.19</b>	1.713	1.566	30
104.89	106.52	1.666	1.506	40
107.02	105.96	1.545	1.361	50
100.05	100.00	1.445	1.285	60
106.23	104.48	1.368	1.197	70
104.34	97.87	1.344	1.121	80
103.17	96.81	1.328	1.109	90
101.14	100.97	1.303	1.158	100
100.52	101.47	1.294	1.163	110
98.59	100.44	1.269	1.150	120

Manufacturer:	SBI
Model:	Volta
Date:	2015-04-17
Run:	4

		#1	#2	
		dDGM	dDGM	
		Vol.Std.	Vol.Std.	
PR1	PR2	(ft3)	(ft3)	Time
				0
105.03	106.81	1.788	1.891	10
102.58	96.31	1.747	1.705	20
100.89	101.85	1.721	1.807	30
100.12	101.50	1.706	1.798	40
98.53	99.49	1.679	1.763	50
97.47	97.47	1.663	1.730	60
96.88	96.23	1.654	1.709	70
101.35	100.96	1.728	1.791	80
100.98	101.81	1.723	1.807	90
99.68	100.28	1.704	1.783	100
99.12	99.56	1.690	1.766	110
97.92	98.25	1.670	1.742	120



Issued date: April 29, 2015

**APPENDIX D Calibration Data** 

**METTLER TOLEDO** 

**METTLER-TOLEDO, LLC** .900 Polaris Pkwy Columbus, OH 43240 1-800-METTLER



# Mass Calibration Certificate

# **Customer Information**

Customer Name: Address:	Sbi 250 Rue Copenhague	City: State / Province:	Saint-Augustin-De-Dema QC
Purchase Order:	34985	Zip / Postal Code:	G3A 2H3
Serial Number: Manufacturer: Asset number: ) Environmental Co	B316238717 Mettler-Toledo nditions	Date Received: Condition: Tolerance Class:	4/16/2013 <i>Excellent</i> OIML F1, F2
Temperature: Barometric Pressure:	20.365 °C 981.2060 <i>hPa</i>	Relative Humidity: Air Density:	47.865 <i>%RH</i> 1.1599 <i>kg/m</i> <sup>3</sup>

The standards used to perform this calibration are traceable to NIST through METTLER TOLEDO traceability number: MT5061

This certificate is issued in accordance with the conditions granted by A2LA under Certificate number 1788.01, which is based on ISO/IEC17025. A2LA has assessed the measurement capability of the laboratory and its traceability to recognized national standards. All uncertainties in this certificate are reported at a 95% (k=2) confidence factor.

This certificate may not be partially reproduced, except with prior written permission of the issuing laboratory and A2LA.

 Calibration Date:
 04/09/2013
 Next Calibration Due:
 04/15/2014
 2018
 GF 2014-06-23

 Calibration Technician:
 Kathy Weatherbie
 Signature
 Arcluse
 04/16/2013

 Metrology Specialist
 Date

Page 1 of 5

## As Found Data

Nominal Value&Suffix	Serial Number	True Mass (g)	Conv. Mass (g)	Uncertainty (mg, k = 2)	Tolerance (mg)	Density (g/cm³)
200 g	(B316238717)	200.001163	200.000974	0.035	3.0	7.95
10 g	(B316238717)	10.0000725	10.0000630	0.0078	0.20	7.95



7

### As Left Data

Nominal Value&Suffix	Serial Number	True Mass (g)	Conv. Mass (g)	Uncertainty (mg, k = 2)	Tolerance (mg)	Density (g/cm³)
200 g	(B316238717)	200.001163	200.000974	0.035	3.0	7.95
10 g	(B316238717)	10.0000725	10.0000630	0.0078	0.20	7.95



# **Comparators Used**

#		Equipment Used	Serial Number	Equipment Type	Calibration Due
#11	:	a200XL	B010016733	Automated Mass Comparator	08/31/2013

## Comments

# No Remarks

#### Definitions

**Nominal Value** - The value as labeled on the weight or defined by shape in accordance with OIML R111 for milligram weights. The number within the parentheses after the nominal value is the serial number of the set to which the weight belongs.

True Mass - The mass value of the weight if measured in a vacuum.

**Conventional Mass** - For a mass at 20 °C, "Conventional Mass" is the mass of a reference standard of density 8000 kg/m<sup>3</sup> which it balances in air with a density of 1.2 kg/m<sup>3</sup>. This value should be referenced when testing the accuracy of a weighing device using any of the nominal values contained in this certificate. The As Found results will equal the As Left in cases where no adjustment or replacement was required.

**Uncertainty** - All Uncertainty values are reported at 95% confidence level (k=2). The uncertainty value does not include a component for the affects due to magnetism.

**Tolerance** - The acceptable range of deviation (positive and negative) from the nominal value, including the uncertainty, as defined by ASTM and OIML for the respective classes.

Density - The assumed density of the material used by the manufacturer.

**Falibration Process** - The METTLER TOLEDO procedure used to obtain the measurement results. All procedures are based on SOPs as defined in NIST Handbook 145. The same process is used to obtain the As Found and As Left results.

**OOT** - The As Found measurement result combined with the uncertainty exceeded the tolerance for the specified weight class.

A - Weight was adjusted after As Found testing to within the appropriate tolerance class.

**R** - The received weight was replaced due to an out of tolerance condition and the weight was not adjustable or the weight for this nominal value was missing.

Rapport d'étalonnage No. ca0003-944-030515 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 Etat/Province : Quebec Code postal : G3A 2H3 Astea Customer ID: 300276257 Instrument RICE LAKE Constructeur : Modèle de terminal : IND560 Modèle : Roughdeck # série du terminal: 00927396KL No de série : B00927396KL # série de l'imprimant N/A Capacité : 625 kg Lab Résolution : 0,02 kg Nbre de Divisions: 31250 Classe : 111 Procédure utilisée : NIST Handbook 44 No,/ID d'inventaire: SBI-013 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 : 5-mars-2015 Date, prochaine Cal. 31-mars-2016 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		
BE16	M14-0106	M1	29-mai-2014	29-mai-2015		
Q200	1401292	M1	12-mars-2014	12-mars-2015		

Version Logiciel : 4.6.0.3

Rapport d'étalonnage No. ca0003-944-030515

# **METTLER TOLEDO**

# Résultats de mesure

La température :

23 °C

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

## Test de variation



1		Avant Réglage	Après Réglage
Poids Appliqués	Position	Valeur lue	Valeur lue
1: 100 kg	Position 1	99,98 kg	99,96 kg
2: 100 kg	Position 2	100,04 kg	100,02 kg
3: 100 kg	Position 3	100,02 kg	100,00 kg
4: 100 kg	Position 4	100,02 kg	100,00 kg
Erreur maximum :		0,06 kg	0,06 kg
Max Erreur Admissible :		0,10 kg	0,1 kg

## Linéarité

	Avant réglage						
	Poids Appliqués	Valeur lue	Erre	ur	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	200,02 kg	0,02 kg	1 d	5 d	OUI	

Méthode de substitution utilisée

Version Logiciel : 4.6.0.3

#### Rapport d'étalonnage No. ca0003-944-030515

# **METTLER TOLEDO**

	Après réglage					
	Poids Appliqués	Valeur lue	Erre	əur	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.

#### Répétabilité

Poid	s appliqués : 100,00 kg	1	
	Chargé	Vide	Différence
1	100,00 kg	0,00 kg	100 kg
_2	100,00 kg	0,00 kg	100 kg
З	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.

Version Logiciel : 4.6.0.3

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District de Québec

1550, avenue d'Estimauville

Québec, Québec, G1J 0C4

Measurement Canada

An Agency of

Industry Canada

Un organisme d'Industrie Canada 
 Numéro du jeu de poids
 Émis le (AAAA-MMA-JU)
 Date d'expiration (AAAA-MMA-JU)

 SÉRIE Q2XX
 2014-03-12
 2015-03-12

 Propriétaire
 METTLER TOLEDO

 Adresse
 2915, ARGENTIA ROAD, UNIT 6, MISSISSAUGA,

 ONTARIO, L5N 8G6

 Personne ressource

## **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,

 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	Va	leur Nominale	Numéro d'identification	Vi	aleur Nominale	Numéro d'identification	v	aleur Nominale	Numero d'identification	Va	aleur Nominale
Q201	20	kg	Q214	20	kg	Q227	20	kg	Q240	20	kg
Q202	20	kg	Q215	20	kg	Q228	20	kg	Q241	20	kg
Q203	20	kg	Q216	20	kg	Q229	20	kg	Q242	20	kg
Q204	20	kg	Q217	20	kg	Q230	20	kg	Q243	20	kg
Q205	20	kg	Q218	20	kg	Q231	20	kg	Q244	20	kg
Q206	20	kg	Q219	20	kg	Q232	20	kg	Q245	20	kg
Q207	20	kg	Q220	20	kg	Q233	20	kg	Q246	20	kg
Q208	20	kg	Q221	20	kg	Q234	20	kg	Q247	20	kg
Q209	20	kg	Q222	20	kg	Q235	20	kg	Q248	20	kg
Q210	20	kg	Q223	20	kg	Q236	20	kg	Q249	20	kg
Q211	20	kg	Q224	20	kg	Q237	20	kg	Q250	20	kg
Q212	20	kg	Q225	20	kg	Q238	20	kg			
Q213	20	kg	Q226	20	kg	Q239	20	kg			

Certifié par	Désigné par : (Lettres moulées)	Titre du poste
Sandra Gravel	Guy Tessier	Gestionnaire de
		district /
Numéro du certificat d'étalonnage	(Signature)	District manager
1401292	16 B. (19)	
	Certifié par Sandra Gravel Numéro du certificat d'étalonnage 1401292	Certifié par     Désigné par : (Lettres moulées)       Sandra Gravel     Guy Tessier       Numéro du certificat d'étalonnage     (Signature)       1401292

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As Found / As Left



## Procedure: Low Pressure: CAL VER /Ruska 7250LP: Revision: 1.2.A

Page 1 of 2

<u>UUT</u> Made by: Model: Serial No.: ID No.: Description:	Dwyer 2000-00 W80111CF89 SBI-024 Pressure Gauge	Calibration Report No.: Adjusted: Condition: Calibration Date: Calibration Due:	AC14051066-W80111CF89 No In Tolerance 9-May-2014 9-May-2015
<u>Customer</u>	STOVE BUILDER INTERNATIONAL INC. 250 RUE DE COPENHAGUE ST-AUSTIN-DE-DESMAURES, QC G3A 2H3	<u>Environment</u> Temperature: Humidity:	25.1℃ 42%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.

This report shall not be reproduced except in full without written approval of Alpha Controls and Instrumentation Inc.

## STANDARDS

Instrument	Model	ID No./Serial No.	Traceability No.	Recall Date
Low Pressure Calibrator	Ruska 7250LP	PRE-CAL-06	1500153193/1500153194	29-Aug-2014

#### REMARKS:

Calibrated in vertical position.

Performed by:

Radomishelsky

Reviewed by:

Slava Peciurov

Quality Management System is assessed and registered by Intertek as conforming to the requirements of ISO9001:2008



As Found / As Left



Page 2 of 2

## Procedure: Low Pressure: CAL VER /Ruska 7250LP: Revision: 1.2.A

<u>UUT</u> Made by: Model: Serial No.: ID No.: Description:	Dwyer 2000-00 W80111CF89 SBI-024 Pressure Gauge			Calibration Report No.: Adjusted: Condition: Calibration Date: Calibration Due:	AC140510 No In Tolerand 9-May-201 9-May-201	066-W8011 ce 4 5	1CF89	
Test Descript	ion	STD	UUT	Error	Tolerance	<u>Units</u>	<u>P/F</u>	Uncertainty
LOW PRESSU	RE TEST							
0.000 inH2	20	0.000	0.00	0.00000	±0.010	inH2O	Pass	5.78e-003
0.051 inH2	20	0.051	0.05	-0.00100	±0.010	inH2O	Pass	5.78e-003
0.101 inH	20	0.101	0.10	-0.00100	±0.010	inH2O	Pass	5.78e-003
0.150 inH2	20	0.150	0.15	0.00000	±0.010	inH2O	Pass	5.78e-003
0.201 inH2	20	0.201	0.20	-0.00100	±0.010	inH2O	Pass	5.78e-003
0.254 inH2	20	0.254	0.25	-0.00400	±0.010	inH2O	Pass	5.78e-003
0.200 inH2	20	0.200	0.20	0.00000	±0.010	inH2O	Pass	5.78e-003
0.148 inH	20	0.148	0.15	0.00200	±0.010	inH2O	Pass	5.78e-003
0.098 inH	20	0.098	0.10	0.00200	±0.010	inH2O	Pass	5.78e-003
0.048 inH	20	0.048	0.05	0.00200	±0.010	inH2O	Pass	5.78e-003
-0.001 inl-	120	-0.001	0.00	0.00100	±0.010	inH2O	Pass	5.78e-003
END OF REPOR	RT							

Quality Management System is assessed and registered by Intertek as conforming to the requirements of ISO9001:2008

Alpha Controls & Instrumentation Inc., Suite 6, 361 Steelcase Road West, Markham, Ontario L3R 3V8 www.alphacontrols.com (800) 567-8686 Form: ROC101 Rev 8



As Found / As Left



## Procedure: Low Pressure: CAL VER /Ruska 7250LP: Revision: 1.2.A

Page 1 of 2

<u>UUT</u> Made by: Model: Serial No.: ID No.: Description:	Dwyer 2000-0DC W11SBH SBI-127 Pressure Gauge	<u>Calibration</u> Report No.: Adjusted: Condition: Calibration Date: Calibration Due:	AC14051066-W11SBH No As Tested 9-May-2014 9-May-2015	
<u>Customer</u>	STOVE BUILDER INTERNATIONAL INC. 250 RUE DE COPENHAGUE ST-AUSTIN-DE-DESMAURES, QC G3A 2H3	Environment Temperature: Humidity:	24.4ºC 39%RH	n

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.

This report shall not be reproduced except in full without written approval of Alpha Controls and Instrumentation Inc.

#### STANDARDS

Instrument	Model	ID No./Serial No.	Traceability No.	Recall Date
Low Pressure Calibrator	Ruska 7250LP	PRE-CAL-06	1500153193/1500153194	29-Aug-2014

#### **REMARKS:**

Performed by:

Calibrated in vertical position.

Only zero adjustment available,

Radomishelsky

Reviewed by:

Slava Peciurov

Quality Management System is assessed and registered by Intertek as conforming to the requirements of ISO9001:2008



As Found / As Left



Page 2 of 2

## Procedure: Low Pressure: CAL VER /Ruska 7250LP: Revision: 1.2.A

<u>UUT</u> Made by: Model: Serial No.: ID No.: Description:	Dwyer 2000-0DC W11SBH SBI-127 Pressure Gauge			<u>Calibration</u> Report No.: Adjusted: Condition: Calibration Date: Calibration Due:	AC14051066-W11SBH No As Tested 9-May-2014 9-May-2015	
Test Descript	ion	STD	UUT	Error	Units	Uncertainty
LOW PRESSU	RE TEST					
0.00 inH20	c	0.00	0.0	0.00000	inH2O	5.77e-002
0.11 inH20	C	0.11	0.1	-0.01000	inH2O	5.77e-002
0.215 inH2	20	0.215	0.2	-0.01500	inH2O	5.77e-002
0.32 inH20	C	0.32	0.3	-0.02000	inH2O	5.77e-002
0.415 inH2	20	0.415	0.4	-0.01500	inH2O	5.77e-002
0.521 inH2	20	0.521	0.5	-0.02100	inH2O	5.77e-002
0.41 inH20	C	0.41	0.4	-0.01000	inH2O	5.77e-002
0.306 inH2	20	0.306	0.3	-0.00600	inH2O	5.77e-002
0.201 inH2	20	0.201	0.2	-0.00100	inH2O	5.77e-002
0.0902 inF	120	0.0902	0.1	0.00980	inH2O	5.77e-002
-0.013 inH	120	-0.013	0.0	0.01300	inH2O	5.77e-002

END OF REPORT

Quality Management System is assessed and registered by Intertek as conforming to the requirements of ISO9001:2008

# **CERTIFICATE OF NIST TRACEABLE CALIBRATION**

# Calibration Certificate No: 44493

**Customer Information** 

Customer: SBI St-Augustin

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

Customer PO #: 41183

## **Calibration Procedure Information**

Procedure ID: GTP FLOW\_INDI

Revision #: 7

Revision Date: 1/6/2013

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Certificate # L2115-1 Calibration ISO 17025-2005 ACCREDITED

<u>Graftel ID</u>	Manufacturer	Model #	Description	CAL Due
10074	Meriam	50MJ10-14	Laminar Flowmeter	3/3/2015
10075	Meriam	50MJ10-9	Laminar Flowmeter	6/20/2015
51202	Paroscientific	760-100A	Pressure, 100 Psia	8/22/2015
10062	Graftel	9202	5-Channel Temperature Sensor	8/24/2015
10128	Furness	FCO352	Diff Pressure	1/14/2016
60030	Paroscientific	760-100A	Pressure, 100 psia	11/21/2014
10159	HOBO	U12-011	Environment Monitor System	11/28/2014

<u>Sensor</u>	<u>Information</u>

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 cfh	Condition: Functional
Serial #: 07J264834		

Comments: Calibration Date: 09-09-2014

The instruments(s) listed on this certificate have been calibrated against standards traceable to the National Institue of Standards and 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 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:

L. Chan Calibration Technician

Date: 09/09/2014

Page 1 of 2

# ATTACHMENT TO CALIBRATION CERTIFICATE 44493 AS FOUND DATA



Page 2 of 2



NIST Traceable Calibration Data Sheet Graftel, LLC. 870 Cambridge Drive, Elk Grave Village, IL. 80007 P. 847-364-2600 F. 847-364-2839

www.graftel.com

# Thermal Metering System Calibration Y factor for Method 5G sampling

Manufacturer:	American Meter Company				
Model:	DTM-200A				
Serial Number:	90R054300				
	Average Gas Meter y Factor <b>0.998</b>				
Calibration Date:	04-21-15				
Calibrated by:	Claude Paré				
Calibration Frequency:	Post Test				
Next Calibration Due:					
Instrument Range:	1.000 cfm				
Standard Temp.:	73 oF				
Standard Press.:	29.92 "Hg				
Barometric Press .:	29.7 "Hg				
Signature/Date:	Varla - 2015-04-21				

## Previous Calibration Comparision

Date	Acceptable		
	Deviation (5%)	Deviation	
y Factor	0	0.998	
Acceptance			

Current Calibration				
Acceptable y Deviation				
Maximum y Deviation	0.002			
Acceptance				

Reference Standard *					
Standard	Model Standard Test Meter				
Calibrator	S/N 07J264834				
	Calib. Date	Sept: 09, 2014			
	Calib. Value	0.9920	y factor (ref)		

Calibration Parameters	Run l	Run 2	Run 3	
Vacuum ("Hg)	0.00	0.00	0.00	
dH ("H2O)	0.00	0,00	0,00	
Initial Reference Meter	230.9	236.6	242.3	
Final Reference Meter	236.268	241.938	249,127	
Initial DGM	405.724	411.426	417.118	
Final DGM	411.093	416.752	423.911	
Temp. Ref. Meter (°F), Tr	73.5	74.5	74.8	
Temperature DGM (°F), Td	76.0	76.2	76.0	
Time (Minutes)	29.0	29.0	37.0	
Net Volume Ref. Meter, Vr	5.368	5.338	6.827	
Net Volume DGM, Vd	5.369	5.326	6.793	
Gas Meter y Factor =	0.996	0.997	0.999	
Gas Meter y Factor Deviation (from avg.)	0.001	0.000	0.002	
Orifice dH@	0.00	0.00	0.00	
Orifice dH@ Deviation (from avg.)	0.000	0.000	0.000	

where:

0.185137931

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:	98Z332226			
	Average Gas Meter y Factor 0.997			
Calibration Date:	04-21-15			
Calibrated by:	Claude Paré			
Calibration Frequency:	Post Test			
Next Calibration Due:				
Instrument Range:	1.000 cfm			
Standard Temp.:	73 oF			
Standard Press.:	29.92 "Hg			
Barometric Press .:	29.64 "Hg			
Signature/Date:	Clarka - 2015-04-21			

## Previous Calibration Comparision

Date	Acceptable			
	Deviation (5%)	Deviation		
y Factor	0	0.997		
Acceptance				

Current Calibration				
Acceptable y Deviation				
Maximum y Deviation	0.003			
Acceptance				
Receptance				

	Reference	Standard *			
Standard	Model Standard Test Meter				
Calibrator	S/N 07J264834				
	Calib. Date	Sept. 09, 2014			
	Calib. Value	0.9920	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	250.2	255.7	261,1	
Final Reference Meter	255.261	260.761	266.276	
Initial DGM	8,688	14.17	19.561	
Final DGM	13.716	19.224	24.708	
Temp. Ref. Meter (°F), Tr	74.9	74.6	74.3	
Temperature DGM (°F), Td	75.3	75.0	74.8	
Time (Minutes)	33.0	29.0	30.0	
Net Volume Ref. Meter, Vr	5.061	5.061	5.176	
Net Volume DGM, Vd	5.028	5.054	5.147	
Gas Meter y Factor =	0.999	0.994	0.999	
Gas Meter y Factor Deviation (from avg.)	0.002	0.003	0.001	
Orifice dH@	0.00	0.00	0.00	
Orifice dH@ Deviation (from avg.)	0.000	0.000	0.000	

where:

0.152363636

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

Rapport d'étalonnage No. ca0003-939-030515 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



Client

Accrédité par l'American Association for Laboratory Accreditation (A2LA) CERT.CALIBRATION #1902.02

# Certificat d'étalonnage

#### Société : SBI Fabricant De Poeles Adresse : 250 Rue de Copenhague Ville : Saint-Augustin-De-Desmaures Etat/Province : Quebec Code postal : G3A 2H3 Astea Customer ID: 300276257 Instrument Constructeur : SARTORIUS Modèle de terminal : N/A Modèle : **TE214S** N/A # série du terminal: No de série : 25851066 # série de l'imprimant N/A Capacité : 210 g Lab Résolution : 0,0001 g Nbre de Divisions: 2100000 Classe : 1 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 : 5-mars-2015 Date, prochaine Cal. 31-mars-2016 Signataire autorisé (A2LA): Dany Careau Signature: ELECTRONIC SIGNATURE Etalons 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 142 MT00997 F1 7-mai-2014 30-avr-2016

Version Logiciel : 4.6.0.3

Rapport d'étalonnage No. ca0003-939-030515

# **METTLER TOLEDO**

# Résultats de mesure

La température :

ature : 23 °C

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

# Test de variation



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

# Linéarité

	Avant réglage					
	Poids Appliqués	Valeur lue	Erre	eur	Erreur admissible	Dans la Tolérance
Zero 1,00	0,0000 g	0,0000 g	0,0000 g	0 d	1 d	OUI
2,00	1,0000 g	1,0000 g	0,0000 g	0 d	1 d	OUI
3,00	10,0000 g	10,0001 g	0,0001 g	1 d	2 d	OUI
4,00	50,0000 g	50,0003 g	0,0003 g	3 d	3 d	OUI
5,00	100,0000 g	100,0005 g	0,0005 g	5 d	3 d	NON
Max 6,00	200,0000 g	200,0008 g	0,0008 g	8 d	3 d	NON

Méthode de substitution utilisée

Version Logiciel : 4.6.0.3

Toute reproduction partielle du certificat est interdite, sous réserve du consentement écrit préalable du laboratoire émetteur.

#### Rapport d'étalonnage No. ca0003-939-030515

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# **METTLER TOLEDO**

		4	Après réglag	je		
	Poids Appliqués Valeur lue Erreur		ur	Erreur admissible	Dans la Tolérance	
Zero 1,00	0,0000 g	0,0000 g	0,0000 g	0 d	1 d	OUI
2,00	1,0000 g	1,0000 g	0,0000 g	0 d	1 d	OUI
3,00	10,0000 g	10,0001 g	0,0001 g	1 d	2 d	OUI
4,00	50,0000 g	50,0000 g	0,0000 g	0 d	3 d	OUI
5,00	100,0000 g	100,0000 g	0,0000 g	0 d	3 d	OUI
Max 6,00	200,0000 g	199,9999 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

# Répétabilité

Poid	s appliqués : 50,0000	) g	
	Chargé	Vide	Différence
1	50,0000 g	0,0000 g	50 g
2	49,9999 g	0,0000 g	49,9999 g
3	50,0000 g	0,0000 g	50 g
	Erreur maximale :	0,0001 g	1,0 d
	Tolérance :	0,0003 g	3 d

# Incertitude

Mesure de l'incertitude = 0,00023 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.

Version Logiciel : 4.6.0.3

Toute reproduction partielle du certificat est interdite, sous réserve du consentement écrit préalable du laboratoire émetteur.

Date: 2015-01-18

Equipment:SBI-235Temperature:74 FAccuracy:0.01R.H.:38%Reference:Horloge parlante

S.D.	0.00	%	
R.M.U.	0.00	%	
0.M.U	0.00	%	
	Ave A.D.	0.00	%
Standard	Reading	A.D.	
81900.0	81901.0	0.00	

Vincent Pellet

Engineer:

Vincent Pelletier

	Calibration gas	Reading
CO	1.82%	2.04%
CO2	17.30%	15.56%
02	21.40%	21.40%

	Nitrogen	Reading
СО	0.00%	0.00%
CO2	0.00%	0.00%
02	0.00%	0.00%

Clarka -

	Calibration gas	Reading
CO	0.996%	0.93%
CO2	7.05%	6.69%

	Nitrogen	Reading
СО	0.00%	0.00%
CO2	0.00%	0.00%
02	0.00%	0.00%

Clarker -



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

 Date d'analyse:
 20/09/2011

 Code de produit:
 SPG-4MX0016589

 Qualité:
 CERTIFIE

 Taille:
 7AL

 Raccord de sortie du robinet:CGA 590

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

No de série:	S970148E
No d'ordre de fabrication:	11-SGM-2925
Pression:	9625 kPa (15°C)
-	1425 psi (21°C)
Volume:	0,7 m3
Date d'expiration:	20/09/2014

COMPOSANTS	CONCENTRATION	RÉSULTAT D'ANALYSE
MONOXYDE DE CARBONE	1,7 % molaire	1,82 % molaire
DIOXYDE DE CARBONE	17 % molaire	17.3 % molaire
OXYGÈNE	21,25 % molaire	21,4 % 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.

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### 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:

> Page 1 de 1 C11-SGM-2925-1 26/01/2012



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

Date d'anaiyse: 25/11/2010 Code de produit: SPG-2MX0000729 Qualité: CERTIFIE Taille: 7 Raccord de sortie du robinet:CGA 350

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

No de série:	C0010195A
No d'ordre de fabrication:	10-SGM-3862
Pression:	10125 kPa (15°C)
	1500 psi (21°C)
Volume:	0,739 m3
Date d'expiration:	25/11/2013

COMPOSANTS	CONCENTRATION NOMINALE	RÉSULTAT D'ANALYSE
MONOXYDE DE CARBONE	1 % molaire	0.996 % molaire
AZOTE	BALANCE	BALANCE

Analyse réalisée par:

820

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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 capiliaire 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.

Page 1 de 1 C10-SGM-3862-1 08/04/2011

# www.airliquide.ca

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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:	26/11/2010
Code de produit:	SPG-2MX0013437
Qualité:	CERTIFIE
Taille:	7
Raccord de sortie du ro	binet:CGA 580

 No de série:
 C-880162-A

 No d`ordre de fabrication:
 10-SGM-3912

 Pression:
 13500 kPa (15°C)

 2000 psi (21°C)
 2000 psi (21°C)

 Volume:
 0,97 m3

 Date d'expiration:
 26/11/2013

REAL PROPERTY.

365

COMPOSANTS	CONCENTRATION	RÉSULTAT D'ANALYSE
DIOXYDE DE CARBONE	7 % molaire -	7.05 % molaire
AZOTE	BALANCE	BALANCE

112 e réalisée par GAGNON B.Sc. DER n

4.

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.

> Page 1 de 1 C10-SGM-3912-1 08/04/2011



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

 Date d'analyse:
 27/09/2011

 Code de produit:
 SPG-2MX0017105

 Qualité:
 CERTIFIE

 Taille:
 7AL

 Raccord de sortie du robinet:CGA 350

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

No de série:	SG-090193-A
No d'ordre de fabrication:	11-SGM-3257
Pression:	9788 kPa (15°C)
3	1450 psi (21°C)
Volume:	0,596 m3
Date d'expiration:	27/09/2014

COMPOSANTS	CONCENTRATION	RÉSULTAT D'ANALYSE	
MONOXYDE DE CARBONE	20 % molaire	20,2 % molaire	
AZOTE	BALANCE	BALANCE	

réalisée p Analys FREDERIC GAGNON B

#### 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.

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AIR LIQUIDE

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

Date d'analyse:19/09/2013Code de produit:SPG-2MX0008101Qualité:CERTIFIETaille:7ALRaccord de sortie du robinet:CGA 580

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

 No de série:
 FF-33551

 No d'ordre de fabrication:
 13-SGM-3199

 Pression:
 13500 kPa (15°C)

 2000 psi (21°C)
 2000 psi (21°C)

 Volume:
 1,0 m3

 Date d'expiration:
 19/09/2016

COMPOSANTS	CONCENTRATION NOMINALE	RÉSULTAT D'ANALYSE
DIOXYDE DE CARBONE	20 % motaire	19,9 % molaire
AZOTE	BALANCE	BALANCE

Analyse ceelisee pa FRÉDERIC GAGNON B.Sc.

#### METHODE 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 préférantiellement un détecteur FID ou TCD avec une colonne capitiaire ou une colonne remptie.

#### 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 valeure pouvent changer en fonction de la nature, du nombre et de la concentration des constituants du mélange.

> Page 1 de 1 C13-SGM-3199-1 24/09/2013



Uirich Métrologie inc. Uirich Metrology inc. 9912, Côte-de-Liesse Montréal (Québec) H&T 1A1 Tél. (514) 631-6653 Fax (514) 631-6122 info@ulrich.ca www.ulrich.ca

ССБЕНГАТІ S O 1702

# CALIBRATION CERTIFICATE

Certificate no.: Identification: Description: Manufacturer: Model no.: Serial no.:

414979 SBI-212 THERMO-HYGROMETER, AMPROBE TH-3 AMPROBE TH-3 100906351

Calibration date:	May 12, 2014
Certificate issued:	May 12, 2014
Interval:	12 months
Due date:	May 12, 2015
Procedure no.:	MET/CAL
Environment:	CLAS Type 2 Laboratory
Temperature:	23 ± 2°C
Humidity:	35 - 55% RH
Metrologist:	MIC

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:

9 volts square battery replaced.



Ulrich Métrologie Inc. Ulrich Metrology Inc. 9912. Côte-de-Liesse Motriéal (Québeo) H8T 1Ai Tél. (514) 631-6653 Fax (514) 631-6122 info@uktich.ca trans.uktich.ca

# CALIBRATION DATA

Certificate no.:	414979
Identification:	SBI-212
Description:	THERMO-HYGROMETER
Serial no.:	100906351
Procedure:	Amprobe TH-3: 2500ST-LT-M

Result: PASS Condition: FOUND-LEFT .

9

## CALIBRATION STANDARDS

Identification	Description	Manufacturer	Model no.	Cal. Date	Due Date
1304953	HUMIDITY GENERATOR	THUNDER SCIENTIFIC	2500ST-LT	2014/04/30	2015/04/30

## MEASUREMENT RESULTS (Per MET/CAL)

	TRUE	TEST	ACCEPTANCE	LIMITS	PASS/	
PARAMETER	VALUE	RESULT	LOW	HIGH	FAIL	TUR
TEMPERATURE CALIBRATION						
23°C						
22.98degC		22.80	22.18	23.78	PASS	
RELATIVE HUMIDITY CALIBRATION AT	23°C					
20% RH						
20.03%		19.30	17.03	23 03	DAGG	
50% RH			2,100	23.03	IADD	
50.01%		48.00	47.01	53 01	DAGG	
80% RH				55.01	ERDD	
80.01%		77 20	77 01	02 01	53.99	

End of Test Data



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

**APPENDIX G Unit Aging Documentation** 

		Temp. (°F)		
Elapsed	Fuel Weight	Flue	Room	
Time (min)	Remaining (lb)	Gas	Temp	
0	3.04	284.2	71.5	
10	2.51	288.5	71.7	
20	2.02	281.5	71.5	
30	1.53	276.5	71.8	
40	1.04	277.4	71.8	
50	0.52	277.4	71.7	
60	0.00	285.1	71.6	
70	5.24	383.5	71.7	
80	4.38	383.4	71.7	
90	3.52	378.7	72.0	
100	2.64	386.8	71.8	
110	1.73	398.2	72.1	
120	0.88	387.7	72.2	
130	0.00	390.3	72.5	
140	5.00	372.4	71.1	
150	4.17	372.6	71.3	
160	3.37	366.3	71.5	
170	2.52	369.7	71.4	
180	1.64	379.9	71.5	
190	0.80	379.2	71.7	
200	0.00	370.5	71.9	
210	5.00	372.4	71.1	
220	4.17	372.6	71.3	
230	3.37	366.3	71.5	
240	2.52	369.7	71.4	
250	1.64	379.9	71.5	
260	0.80	379.2	71.7	
270	0.00	370.5	71.9	
280	2.85	276.6	73.0	
290	2.40	273.4	73.0	
300	1.91	276.2	72.9	
310	1.45	275.7	73.5	
320	0.95	280.3	73,3	
330	0.46	277.3	73.5	
000	0.10			
340	0.00	286.5	73.9	
350	14 80	395.9	72.5	
000	14.00	000.0	12.0	

		Temp	o. (°F)
Elapsed	Fuel Weight	Flue	Room
Time (min)	Remaining (lb)	Gas	Temp
360	13.94	399.4	72.0
370	13.08	404.4	72.2
380	12.20	400.1	72.0
390	11.29	404.0	72.4
400	10.44	400.4	72.5
410	9.56	407.6	72.4
420	8.71	331.0	72.5
430	7.96	278.2	72.6
440	7.31	259.3	72.5
450	6.78	256.1	72.6
460	6.29	246.1	72.4
470	5.80	243.7	71.9
480	5.31	244.7	72.2
490	4.79	244.6	71.87
500	4.27	247.8	71.79
510	3.77	246.6	71.8
520	3.24	243.1	72.21
530	2.73	245	72.12
540	5.24	383.5	71.73
550	4.38	383.4	71.74
560	3.52	378.7	71.95
570	2.64	386.8	71.83
580	1.73	398.2	72.07
590	0.88	387.7	72.15
600	0.00	390.3	72.46



Front of unit "Volta"



Rear side "Volta"



\*

Issued date: April 29, 2015

Report Number: G102038216 Client: Stove Builder International inc.

# APPENDIX I Drawings of stack gas sampling train and dilution tunnel system



# IV.B.(2). DILUTION TUNNEL SAMPLE SYSTEMS



# **IANUT NOITUJIO** (1).A.VI