

TEST REPORT



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EVALUATION CENTER
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22887 NE Townsend Way
Fairview Oregon 97024

RENDERED TO

Lennox Hearth Products
1502 14th Street NW
Auburn Washington 98001

PRODUCT EVALUATED:
MODEL Grand View 300 SOLID FUEL ROOM HEATER

Report of Testing Model Grand View 300 Wood Fuel Room Heater for compliance as an "Affected Facility" with the applicable requirements of the following criteria: EPA Method 28 "Certification and Auditing of Wood Heaters" and EPA Method 5G "Determination of Particulate Matter Emissions from Wood Heaters".

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I. INTRODUCTION

Intertek Testing Services NA (Intertek) has conducted testing for Lennox Hearth Products (Lennox), on model Grand View 300 Solid Fuel Room Heater, to evaluate all applicable performance requirements included in EPA Method 28 "Certification and auditing of wood heaters" and Method 5G "Determination of particulate matter emissions from wood heaters."

I.A. PURPOSE OF TEST

The test was conducted to determine if the unit is in accordance with U.S. EPA requirements under 40 CFR 60 SUBPART AAA, NSPS for Residential Wood Heaters. This evaluation was conducted on May 13 through May 17, 2013.

I.B. LABORATORY

The test on the Grand View 300 Solid Fuel Room Heater was conducted at the client facility located in Auburn Washington. The laboratory elevation is 65 feet above sea level and is accredited by the U.S. EPA, Certificate Number 8. The test was conducted by Bruce Davis.

I.C. DESCRIPTION OF UNIT

The model Grand View 300 is a non-catalytic Solid Fuel Room Heater and is constructed of carbon steel. The outer dimensions are 27.4-inches deep, 23.4-inches high and 26.4 inches wide. The unit has a door located on the front with a viewing glass for loading the fuel. A combustion air slide handle is located on the left side mounted in a vertical position. Combustion air enters the appliance through an outside air source located on the bottom of the appliance. (See product drawings.)

Proprietary drawings and manufacturing methods are on file at Intertek in Portland Oregon.

I.D. REPORT ORGANIZATION

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

II. SUMMARIZATION

II.A PRETEST INFORMATION

A sample was submitted to Intertek directly from the client, tested model was not independently selected for testing. Upon receipt the unit was inspected and found to be in good condition.

Following assembly, the unit was placed on a test stand and instrumented with thermocouples in specified locations. Prior to beginning emission tests the unit was operated for a minimum of 10 hours at high-to-medium burn rate to break in the stove.

Following 10 hours of break in the chimney system and laboratory's dilution tunnel was cleaned using standard wire chimney brush. On May 10, 2013 the unit was set-up for testing.

II.B INFORMATION LOG

TEST STANDARD

From May 13, through May 17, 2013 EPA emissions tests were conducted using EPA Test Methods 28 and 5G3.

Deviation from Standard Method

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

II.C SUMMARY OF TEST RESULTS

RUN #1 May 13, 2013 Air control set at 3" from full open, burn time was 300 minutes with a category 3 burn rate of 1.43 kg/hr. Fuel loading door open for 3 minutes then closed. Combustion air control was fully open for 4 minutes 45 seconds and then set to 3" from full open by 5 minutes. Convection air fan was turned off until 10 minutes and then turned to high.

RUN #2 May 14, 2013 Air control set at 3.5" from full open during pre burn. Burn time was 467 minutes with a category 2 burn rate of 0.94 kg/hr. Fuel loading door open for 4:30 minutes then closed. Combustion air control was fully open for 4 minutes 45 seconds and then set to full closed. Convection air fan was turned off until 25 minutes and then turned to a 5 O-Clock position on the rotating dial.

RUN #3 May 15, 2013 Air control set at 3.5" from full open during pre burn. Burn time was 495 minutes with a category 2 burn rate of 0.85 kg/hr. Fuel loading door open for 4:30 minutes then closed. Combustion air control was fully open for 4 minutes 45 seconds and then set to full closed. Convection air fan was turned off until 25 minutes and then turned to a 5 O-Clock position on the rotating dial.

RUN #4 May 16, 2013 Air control set at 3.5" from full open during pre burn. Burn time was 430 minutes with a category 2 burn rate of 0.99 kg/hr. Fuel loading door open for 4:30 minutes then closed. Combustion air control was fully open for 4 minutes 45 seconds and then set to full closed. Convection air fan was off for the full duration of test and pre burn.

RUN #5 May 17, 2013 Air control set at full open during pre burn. Burn time was 170 minutes with a category 4 burn rate of 2.42 kg/hr. Fuel loading door open for 90 seconds then closed. Combustion air control was fully open for entire 5 minute start up. Convection air fan was turned off until 5 minutes and then turned to high.

II.D SUMMARY OF OTHER DATA

EMISSIONS

Run Number	Test Date	Burn Rate (kg/hr)	Emission Rate (g/hr)	Adjusted Emission Rate (g/hr)	Heating Efficiency (% LHV)	Heating Efficiency (% HHV)
1	5/13/13	1.43	1.76	2.91	80.0	74.0
2	5/14/13	0.94	1.66	2.77	77.8	72.0
3	5/15/13	0.85	1.65	2.76	76.4	70.7
4	5/16/17	0.99	1.88	3.07	78.6	72.7
5	5/17/13	2.42	2.88	4.38	75.2	69.5

Run four is a fan confirmation test.

WEIGHTED AVERAGE CALCULATION

Test No.	Burn Rate	Average Emission Rate g/hr (E)	Heat Output (Btu/hr)	Probability	Weighting Factor (K)	(KXE)
3	0.85	2.76	10,249	0.2540	0.3224	0.8898
2	0.94	2.77	11,335	0.3224	0.4572	1.2664
1	1.43	2.91	17,243	0.7112	0.6348	1.8473
5	2.42	4.38	29,181	0.9572	0.2888	1.2649
Totals:						5.2685
Weighted average emission rate:						3.09

Run four is a fan confirmation and not included in the weighted average.

TEST FACILITY CONDITIONS

Run	Room Temp. °F before	Room Temp. °F after	Baro. Pres. In. Hg before	Baro. Pres. In. Hg after	Air Vel. Ft/min before	Air Vel. Ft/min after
1	73	76	30.00	30.05	<50	<50
2	74	74	30.23	30.15	<50	<50
3	74	72	30.09	30.06	<50	<50
4	76	76	30.00	29.88	<50	<50
5	75	79	30.0	30.0	<50	<50

DILUTION TUNNEL FLOW RATE MEASUREMENTS AND SAMPLING DATA

(5G-3)

Run No.	Burn Time (min)	Velocity (ft/sec)	Volumetric Flow Rate (dscf/min)	Total Temp. (°R)	Volume Sample	Particulate Catch (mg)
1	300	12.99	139.81	557	45.500	45.580
2	467	13.94	142.59	547	70.141	69.615
3	495	11.57	127.66	544	75.070	74.822
4	430	12.14	131.63	551	64.508	64.595
5	170	13.26	134.20	591	24.024	24.267
						9.3
						8.0

DILUTION TUNNEL DUAL TRAIN PRECISION

Run No.	Sample Ratios		Total Emissions (g)		% Deviation	% Deviation of 7.5% of 7.5 grams*
	Train 1	Train 2	Train 1	Train 2		
1	920.673	919.001	8.746	8.822	0.0	0.28
2	948.027	955.163	12.419	13.372	3.07	2.26
3	840.755	843.492	12.779	14.508	5.26	3.87
4	876.298	875.073	13.144	13.739	1.83	1.50
5	948.237	938.883	8.819	7.511	6.65	7.77

* = As described in Method 5G-3 section 16.2.5

Particulate samples are collected from the dilution tunnel similar to the example shown in figure 1. All sample locations were verified to be within specifications described in EPA method 5G. A standard type pitot tube is used to determine tunnel velocity. Sample trains used are similar to examples shown in figure 3, with exception of the sample rotameter. A pressure indicator reading a pressure drop across an orifice on the outlet of the dry gas meter is used to determine constant flow.

IV. SAMPLING SYSTEMS
IV.A. SAMPLING LOCATIONS

Combustion air enters the firebox through an opening at the top left corner of the firebox. This air is controlled by a rotating damper, which covers the inlet hole. The lever is located on the left side of the appliance. All gases exit through the 6" flue

III.B. AIR SUPPLY SYSTEM

A standard 6" diameter single wall pipe and insulated chimney system was installed to 15' above floor level. The unit controls were set to the lowest setting during the test.

III. PROCESS DESCRIPTION
III.A. TEST SET-UP DESCRIPTION

Run No.	Burn Rate (kg/hr)	Change In Surface Temp (°F)	Initial Draft (in/H ₂ O)	Run Time (min)	Average Draft (in/H ₂ O)
1	1.43	75.9	-0.040	300	-0.050
2	0.94	119.6	-0.041	467	-0.036
3	0.85	121.6	-0.045	495	-0.035
4	0.99	73.3	-0.045	430	-0.046
5	2.42	58.4	-0.066	170	-0.074

GENERAL SUMMARY OF RESULTS

Stack gas samples are collected from the steel chimney section 8 feet $\pm$ 6 inches above the scale platform. (See Figure 2.)

IV.A.(1) DILUTION TUNNEL

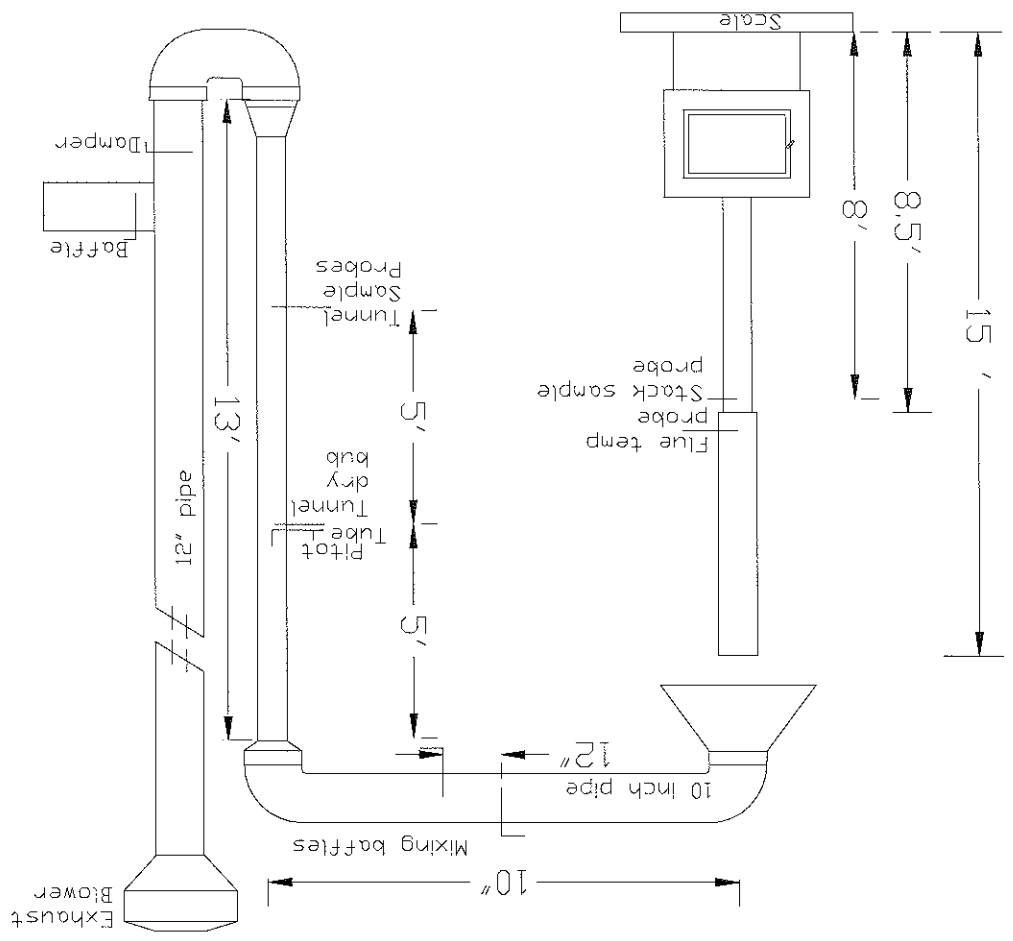
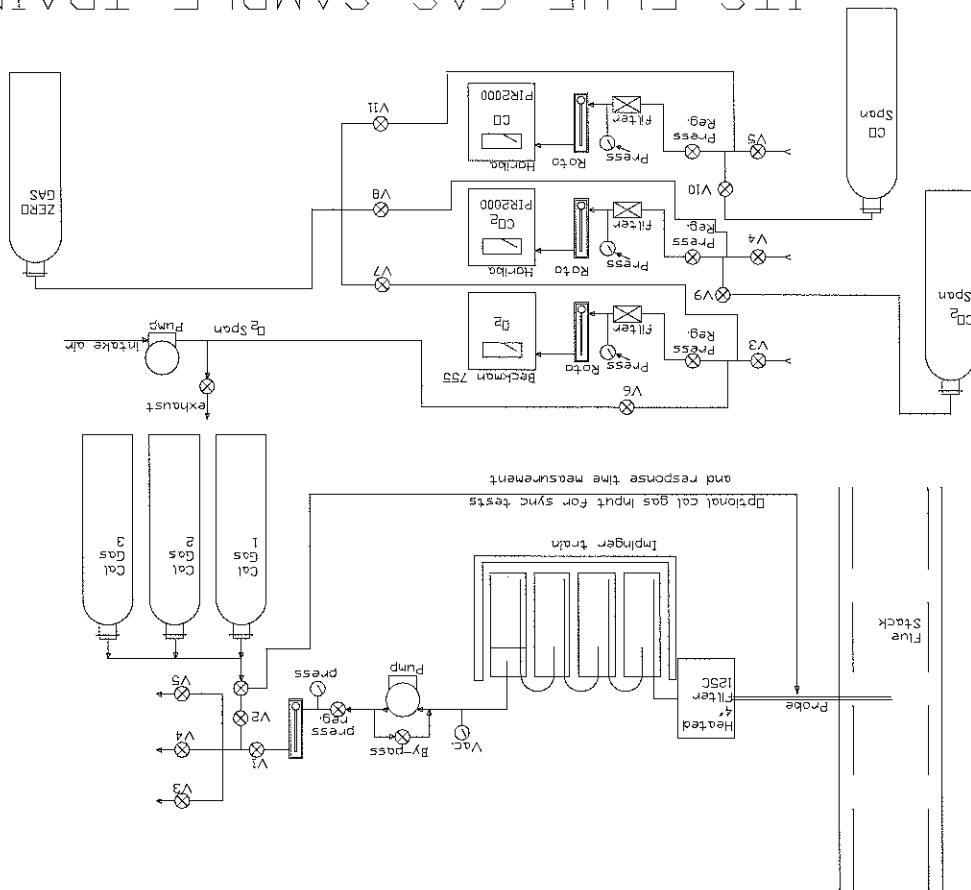


FIGURE 1

IV.B. OPERATIONAL DRAWINGS

IV.B.(1) STACK GAS SAMPLE TRAIN



ITS FLUE GAS SAMPLE TRAIN
FIGURE 2

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

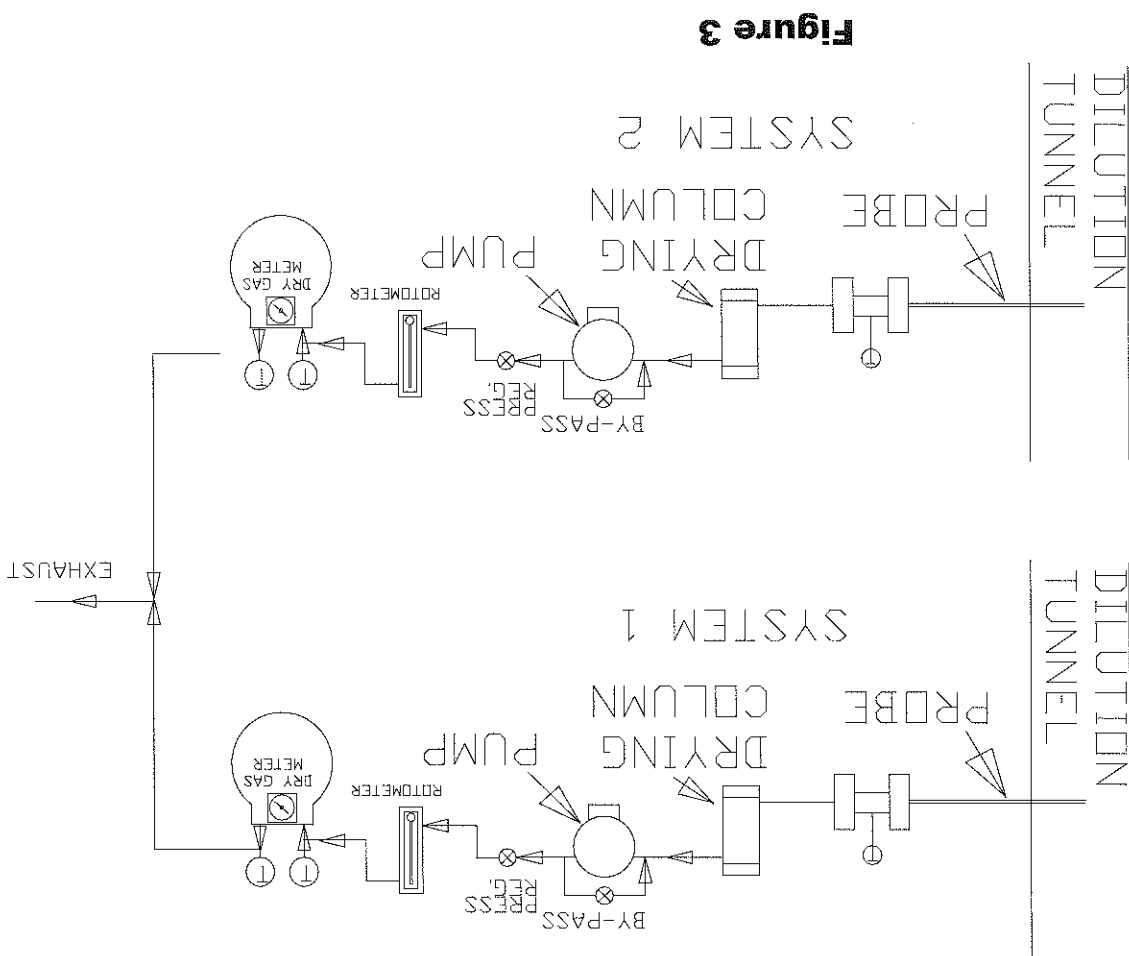


Figure 3

V. SAMPLING METHODS

V.A. PARTICULATE SAMPLING

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

VI. QUALITY ASSURANCE

VI.A. INSTRUMENT CALIBRATION

VI.A. (1). DRY GAS METERS

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

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

The standard dry gas meter is calibrated every 12 months using an accredited outside vendor. All data is verified to be within EPA specifications.

VI.A.(2). STACK SAMPLE ROTAMETER

A stack sample rotometer is not used, a pressure indicator reading a pressure drop across an orifice on the outlet of the dry gas meter is used to determine constant sample flow.

VI.A.(3). GAS ANALYZERS

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

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

VI.B. TEST METHOD PROCEDURES

VI.B.(1). LEAK CHECK PROCEDURES

Before and after each test, each sample train is tested for leaks. Leakage rates are measured and must not exceed 0.02 CFM or 4% of the sampling rate. Leak checks are performed checking the entire sampling train, not just the dry gas meters. Pre-test and post-test leak checks are conducted with a vacuum of 10 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 was typically less than 2 inches of mercury. Thus, leakage rates reported are expected to be much higher than actual leakage during the tests.

VI.B.(2). TUNNEL VELOCITY/FLOW MEASUREMENT

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

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

VI.B.(3). PM SAMPLING PROPORTIONALITY (5G-3)

Proportionality was calculated in accordance with EPA Method 5G-3. The data and results are included in Appendix F.

VII. CONCLUSION

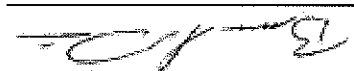
Results of this test show the Grand View 300 when operated following guidelines specified in EPA method 28 does meet emissions limits regulating an affected facility in the EPA New Source Performance Standards.

VII.A RESULTS AND OBSERVATIONS

The Model Grand view 230 Solid Fuel Room Heater has been found to be in compliance with the applicable performance and construction requirements of the following criteria: EPA Method 28 "Certification and auditing of wood heaters" and Method 5G Determination of particulate matter emissions from wood heaters."

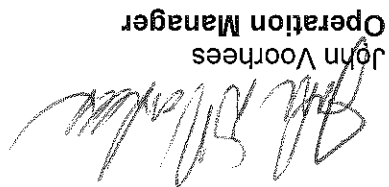
INTERTEK TESTING SERVICES NA

Reported by:



Bruce Davis
Test Engineer

Reviewed by:



John Voorhees
Operation Manager

Appendix C

Sample Analysis

DILUTION TUNNEL WORKSHEET - METHOD 5G3

Client: Lennox Model: Grand View 300 Project #: G101161435 Sample ID #: PNT13052470 P-12-001
Date: 5/13/13 Engineer: B. Davis Run #: 1 Sample Train #: A

Train assembled by: B.D. Balance Equipment #: 19673 Thermo/Hygro meter Equipment #: 19725

Audit weight Equipment #: 19677 (Balance audit mfr. std: 500 ± 0.72 mg)

Front Filter, Rear Filter & Seal Set		Weighing Record	
Filter #	Set Tare	Front Filter Tare	Rear Filter Tare
534	1214	1214	1205
Seal		Preliminary wt.: 1289, 1205	

Date	Time	R/H %	Temp. (F)	Weight (grams)	Audit (grams)	Initials
5/21/13	0845	46.4	67	1202	501	AS
5/22/13	0841	45.9	66	1290	501	AK

Probe		Weighing Record	
Probe #	Tare wt.	Front Filter Tare	Rear Filter Tare
24	125.6711	125.6711	1205
Cleaned by: DA, D/T in desiccator		Preliminary wt.: 125.6919	

Date	Time	R/H %	Temp. (F)	Weight (grams)	Audit (grams)	Initials
5/21/13	0845	46.4	67	125.6920	501	AK
5/22/13	0841	45.9	66	125.6921	501	AK

Date: 5/22/13

Engineer signature: B. Davis

DILUTION TUNNEL WORKSHEET - METHOD 5G3

Client: Lennox Model: Grand View 300 Project #: G101161435 Sample ID #: 18T150520211-001
 Date: 5/13/13 Engineer: B. Adams Run #: 1 Sample Train #: 3

Train assembled by: 02 Balance Equipment #: 19413 Thermo/Hygro meter Equipment #: 19425
 Audit weight Equipment #: 19417 (Balance audit mfr. std: 500 ± 0.72 mg)

Front Filter, Rear Filter & Seal Set					
Filter #536, 537 Front Filter Tare: 1202, Rear Filter Tare: 1202, Preliminary wt.: 1202, Seal Set Tare: 1202, D/T in desiccator: 5/10			Weighing Record		
Date	Time	R/H %	Temp. (F)	Weight (grams)	Audit (grams)
5/21/13	0845	46.4	67	1213	1202
5/22/13	0845	45.9	66	1210	1202
5/22/13	0832	46.7	66	1245	1202
5/22/13	0832	45.9	66	1285	1202
5/22/13	0832	46.7	66	1245	1202
Probe # 33, Tare wt: 125.7315, Cleaned by: AA, D/T in desiccator: 5/20 or 3/11 Preliminary wt.: 125.7322					
Weighing Record					
Date	Time	R/H %	Temp. (F)	Weight (grams)	Audit (grams)
5/21/13	0845	46.4	67	125.7323	125.7323
5/22/13	0845	45.9	64	125.7325	125.7325

Date: 5/22/13

Engineer signature: B. Adams

DILUTION TUNNEL WORKSHEET - METHOD 5G3

Client: Lennox Model: Grand View 300 Project #: G101161435 Sample ID #: MT1505240714-001
 Date: 5/21/13 Engineer: DN Run #: 2 Sample Train #: 4

Train assembled by: DN Balance Equipment #: 19613 Thermo/Hygro meter Equipment #: 19225
 Audit weight Equipment #: 19614 (Balance audit mfr. std: 500 ± 0.72 mg)

Front Filter, Rear Filter & Seal Set Weighing Record					
Filter #: <u>535</u> Front Filter Tare: <u>1202</u> Seal Set Tare: <u>1337</u> Preliminary wt.: <u>1337</u> 1208					
Date	Time	R/H %	Temp. (F)	Weight (grams)	Audit (grams)
5/21/13	0845	46.4	67	1334	501
5/22/13	0800	45.9	66	1336	501
				1207	72
				1207	

Probe Weighing Record					
Probe #: <u>26</u> Tare wt.: <u>1242655</u> Cleaned by: <u>DN</u> , D/T in desiccator: <u>5/20</u> 0830, Preliminary wt.: <u>1242655</u>					
Date	Time	R/H %	Temp. (F)	Weight (grams)	Audit (grams)
5/21/13	0845	46.4	67	1242655	501
5/22/13	0800	45.9	66	1242656	501
					72

Date: 5/22/13

Engineer signature: DN

DILUTION TUNNEL WORKSHEET - METHOD 5G3

Client: Lennox Model: Grand View 300 Project #: G101161435 Sample ID #: 18913052407-11-001

Date: 5/21/13 Engineer: DL Run #: 2 Sample Train #: B

Train assembled by: DL Balance Equipment #: 19613 Thermo/Hygro meter Equipment #: 19725

Audit weight Equipment #: 19614 (Balance audit mfr. std: 500 ± 0.72 mg)

Front Filter, Rear Filter & Seal Set		Weighing Record	
Filter #: <u>570</u> Front Filter Tare: <u>1212</u> Rear Filter Tare: <u>1194</u> Seal Set Tare: <u>570</u>	Set Tare: <u>570</u>	Probe #: <u>27</u> Tare wt: <u>123.699g</u> Cleaned by: <u>DL</u> , D/T in desiccator: <u>5/20</u>	Probe #: <u>27</u> Preliminary wt: <u>123.3003</u>

Date	Time	R/H %	Temp. (F)	Weight (grams)	Audit (grams)	Initials
5/21/13	0845	46.4	67	1203	1342	DL
5/21/13	0845	46.4	67	1202	1343	DL
5/21/13	0845	46.4	67	1203	1343	DL

Date	Time	R/H %	Temp. (F)	Weight (grams)	Audit (grams)	Initials
5/21/13	0845	46.4	67	123.7003	1341	DL
5/21/13	0845	46.4	67	123.7003	1341	DL
5/21/13	0845	46.4	67	123.7003	1341	DL

Date: 5/21/13

Engineer signature: DL

DILUTION TUNNEL WORKSHEET - METHOD 5G3

Client: Lennox Model: Grand View 300 Project #: G101161435 Sample ID #: MT1305240 H2-001

Date: 5/13/13 Engineer: 012 Run #: 3 Sample Train #: A

Train assembled by: 012 Balance Equipment #: 19613 Thermo/Hygro meter Equipment #: 19725

Audit weight Equipment #: 19611 (Balance audit mfr. std: 500 ± 0.72 mg)

Front Filter, Rear Filter & Seal Set						
Date	Time	R/H %	Temp. (F)	Weight (grams)	Audit (grams)	Initials
5/21/13	0215	46.4	67	1358	1207	012
5/22/13	0211	45.6	66	1360	1207	012
Weighing Record						
Set Tare: 014, D/T in desiccator: 514 Preliminary wt.: 1365, 1205						
Filter #512, 513 Front Filter Tare: 1215, Rear Filter Tare: 1207, Seal						
Date	Time	R/H %	Temp. (F)	Weight (grams)	Audit (grams)	Initials
5/21/13	0215	46.4	67	113.654	561	012
5/22/13	0211	45.6	66	113.658	561	012
Weighing Record						
Probe #: 18, Tare wt.: 113.654, Cleaned by: 012, D/T in desiccator: 012 Preliminary wt.: 113.654						
Date	Time	R/H %	Temp. (F)	Weight (grams)	Audit (grams)	Initials
5/21/13	0215	46.4	67	113.654	561	012
5/22/13	0211	45.6	66	113.658	561	012
Weighing Record						
Probe #: 18, Tare wt.: 113.654, Cleaned by: 012, D/T in desiccator: 012 Preliminary wt.: 113.654						

Date: 5/13/13

Engineer signature: 012

DILUTION TUNNEL WORKSHEET - METHOD 5G3

Client: Lennox Model: Grand View 300 Project #: G101161435 Sample ID #: HT1305240718-001

Date: 5/21/13 Engineer: BR Run #: 3 Sample Train #: 8

Train assembled by: MR Balance Equipment #: 19613 Thermo/Hygro meter Equipment #: 11925

Audit weight Equipment #: 19617 (Balance audit mfr. std: 500 ± 0.72 mg)

Front Filter, Rear Filter & Seal Set		Weighing Record	
Filter #: <u>544, 548</u> Front Filter Tare: <u>1201</u> , Rear Filter Tare: <u>1207</u> , Seal Set Tare: <u>N/A</u> , D/T in desiccator: <u>5/20</u> , Preliminary wt.: <u>1367</u> , 1207			

Date	Time	R/H %	Temp. (F)	Weight (grams)	Audit (grams)	Initials
5/21/13	0245	46.1	67	1206	1500	BR
5/21/13	0245	45.9	66	1205	500	BR

Probe		Weighing Record	
Probe #: <u>21</u> , Tare wt.: <u>113.5734</u> , Cleaned by: <u>BR</u> , D/T in desiccator: <u>5/20</u> , Preliminary wt.: <u>113.5743</u>			

Date	Time	R/H %	Temp. (F)	Weight (grams)	Audit (grams)	Initials
5/21/13	0245	46.4	67	113.5744	1500	BR
5/22/13	0244	45.9	66	113.5744	500	BR

Date: 5/22/13

Engineer signature: BR

DILUTION TUNNEL WORKSHEET - METHOD 5G3

Client: Lennox Model: Grand View 300 Project #: G101161435 Sample ID #: 19T1305240218-001

Date: 5/16/13 Engineer: MD Run #: 4 Sample Train #: A

Train assembled by: MD Balance Equipment #: 19613 Thermo/Hygro meter Equipment #: 19725

Audit weight Equipment #: 19614 (Balance audit mfr. std: 500 ± 0.72 mg)

Front Filter, Rear Filter & Seal Set		Set Tare: <u>MD</u> , D/T in desiccator: <u>5/20</u> , Preliminary wt.: <u>1343</u> , <u>1205</u>	
Filter #: <u>516</u> , Front Filter Tare: <u>1201</u> , Rear Filter Tare: <u>1202</u> , Seal			

Date	Time	R/H %	Temp. (F)	Weight (grams)	Audit (grams)	Initials
5/21/13	0245	46.4	67	1209	5001	MD
5/21/13	0245	45.9	66	1344	5001	MD

Probe # <u>19</u> , Tare wt. <u>14.5337</u> , Cleaned by: <u>MD</u> , D/T in desiccator: <u>5/20</u> , Preliminary wt.: <u>126.5373</u>	
---	--

Date	Time	R/H %	Temp. (F)	Weight (grams)	Audit (grams)	Initials
5/21/13	0245	46.4	67	1245372	5001	MD
5/22/13	0244	45.9	66	126.5371	5001	MD

Date: 5/22/13

Engineer signature: MD

DILUTION TUNNEL WORKSHEET - METHOD 5G3

Client: Lennox Model: Grand View 300 Project #: G101161435 Sample ID #: PET1305240718-01
 Date: 5/16/13 Engineer: DL Run #: 4 Sample Train #: B

Train assembled by: DL Balance Equipment #: 19618 Thermo/Hygro meter Equipment #: 19725

Audit weight Equipment #: 19627 (Balance audit mfr. std: 500 ± 0.72 mg)

Front Filter, Rear Filter & Seal Set		Weighing Record	
Filter #: <u>546, 549</u> , Front Filter Tare: <u>1206</u> , Rear Filter Tare: <u>1196</u> , Seal Set Tare: <u>MT</u> , D/T in desiccator: <u>5/16</u> , Preliminary wt.: <u>1349.1208</u>			

Date	Time	R/H %	Temp. (F)	Weight (grams)	Audit (grams)	Initials
5/21/13	0715	46.4	67	1202	1202	DL
5/22/13	0822	45.9	66	1203	1203	DL

Probe		Weighing Record	
Probe #: <u>28</u> , Tare wt.: <u>124.0524</u> Cleaned by: <u>SA</u> , D/T in desiccator: <u>5/16</u> , Preliminary wt.: <u>124.0527</u>			

Date	Time	R/H %	Temp. (F)	Weight (grams)	Audit (grams)	Initials
5/21/13	0745	46.4	67	124.0526	124.0526	DL
5/22/13	0822	45.9	66	124.0527	124.0527	DL

Date: 5/22/13

Engineer signature: DL

DILUTION TUNNEL WORKSHEET - METHOD 5G3

Client: Lennox Model: Grand View 300 Project #: G101161435 Sample ID #: 96T105240 21R-011

Date: 5/21/13 Engineer: BLM Run #: 5 Sample Train #: 4

Train assembled by: DL Balance Equipment #: 19683 Thermo/Hygro meter Equipment #: 19726

Audit weight Equipment #: 19684 (Balance audit mfr. std: 500 ± 0.72 mg)

Front Filter, Rear Filter & Seal Set		Weighing Record		Weighing Record		Probe	
Date	Time	R/H %	Temp. (F)	Weight (grams)	Audit (grams)	Initials	
5/21/13	0845	46.4	67	.1253	.5001	DL	
5/22/13	0900	45.9	66	.1265	.5001	BL	
5/22/13	0930	46.7	67	.1244	.5001	DL	
Set Tare: NR, D/T in desiccator: 5/20, Preliminary wt.: .1295		Filter #: 3233, Front Filter Tare: .1215, Rear Filter Tare: .1207, Seal		Tare wt.: .12435, Cleaned by: DL, D/T in desiccator: 5/20, Preliminary wt.: NR			

Date	Time	R/H %	Temp. (F)	Weight (grams)	Audit (grams)	Initials
5/21/13	0845	46.4	67	.124.8754	.5001	DL
5/22/13	0900	45.9	66	.1248758	.5001	DL

Date: _____

Engineer signature: _____

DILUTION TUNNEL WORKSHEET - METHOD 5G3

Client: Lennox Model: Grand View 300 Project #: G101161435 Sample ID #: RT1305240 214-001
 Date: 5/21/13 Engineer: B/L Run #: 5 Sample Train #: B

Train assembled by: B/L Balance Equipment #: 19613 Thermo/Hygro meter Equipment #: 19225
 Audit weight Equipment #: 19624 (Balance audit mfr. std: 500 ± 0.72 mg)

Front Filter, Rear Filter & Seal Set		Weighing Record		Weighing Record	
Date	Time	R/H %	Temp. (F)	Weight (grams)	Audit (grams)
5/21/13	0245	46.4	67	11275	1231
5/22/13	0300	45.9	66	11267	1229
5/22/13	0930	46.7	67	11265	1226
Seal Set		Set Tare: 1206, Front Filter Tare: 1206, Rear Filter Tare: 1211, Seal Filter #: 520, 531, D/T in desiccator: 5/10, Preliminary wt.: 11260, 1233		Probe # 16A, Tare wt.: 1136523, Cleaned by: NL, D/T in desiccator: 5/10, Preliminary wt.: 1136515	
Date	Time	R/H %	Temp. (F)	Weight (grams)	Audit (grams)
5/21/13	0245	46.4	67	1136515	1231
5/21/13	0245	46.4	67	1136515	1231
5/22/13	0245	45.9	66	1136513	1226
5/22/13	0245	45.9	66	1136513	1226

Date: _____

Engineer signature: _____



Tares

Beaker ☐ Filter ☒ Probe ☐ Seals ☐ Size 47 mm

Date and time in desiccator: 5-1-13 08:55 Thermo/Hygro meter ID# 19725

Balance equipment number: 19623 Engineer: A. Davis

ID #	Date: 5-2-13 Time: 08:56 R/H %: 38.2 T (F): 67 Initial: 52	Date: 5-6-13 Time: 09:25 R/H %: 38.6 T (F): 67 Initial: 52	Date: 5-7-13 Time: 08:30 R/H %: 41.0 T (F): 67 Initial: 52	Date: 5-7-13 Time: 08:30 R/H %: 41.0 T (F): 67 Initial: 52	Run number
534	1209	1210	-	-	534
535	1199	1200	-	-	535
536	1201	1202	-	-	536
537	1202	1207	-	-	537
538	1202	1206	-	-	538
539	1208	1207	-	-	539
540	1213	1212	-	-	540
541	1200	1198	-	-	541
542	1217	1215	-	-	542
543	1207	1207	-	-	543
544	1201	1201	-	-	544
545	1206	1204	-	-	545
546	1201	1201	-	-	546
547	1201	1202	-	-	547
548	1204	1206	-	-	548
549	1196	1196	-	-	549
550	1204	1206	-	-	550
551	1209	1211	-	-	551
552	1212	1215	-	-	552
553	1205	1207	-	-	553



Tares

Beaker ☐ Filter ☐ Probe ☒ Seals ☐ Size 47 mm

Date and time in desiccator: 5-1-13 0955 Thermol/Hygro meter ID# 19725

Balance equipment number: 19675 Engineer: O Davis

ID #	Date: 5-2-13	Time: 0845	R/H %: 38.2	T (F): 67	Initial: 52	Balance	Audit wt.
16A	113.6502	113.6507	113.6581	126.5366	113.4740	113.5434	113.5434
17	113.6573	113.6581	113.6580	126.5367	113.4739	113.5434	113.5434
19	126.5360	126.5366	126.5367	126.5367	113.4739	113.5434	113.5434
20	113.4732	113.4740	113.4739	126.5367	113.4739	113.5434	113.5434
21	113.5434	113.5434	113.5434	126.5367	113.4739	113.5434	113.5434
23	126.4880	126.4883	126.4883	126.4883	113.4739	113.5434	113.5434
24	125.6906	125.6913	125.6911	126.5367	113.4739	113.5434	113.5434
26	124.2652	124.2655	124.2655	126.5367	113.4739	113.5434	113.5434
27	123.6991	123.6997	123.6998	126.5367	113.4739	113.5434	113.5434
28	124.0513	124.0519	124.0520	126.5367	113.4739	113.5434	113.5434
29	124.7838	124.7842	124.7842	126.5367	113.4739	113.5434	113.5434
33	125.7313	125.7315	125.7315	126.5367	113.4739	113.5434	113.5434
34	126.2316	126.2323	126.2323	126.5367	113.4739	113.5434	113.5434
35	124.8748	124.8751	124.8751	126.5367	113.4739	113.5434	113.5434

Appendix D Calibrations

Equipment Used:

Platform Scale: WI-125
10 pound audit weight: 20115
Analytical Balance: 19683
500 mg Audit Weight: 19684
Relative Humidity: 19724
Moisture Meter: 19701
Barometer: 20177
Calibration Dry Gas Meter: 19681
Dwyer Microtector: 19673
Thermocouple Readout: 19752

Service Order Summary: #1162543

Avery Weigh-Tronix

Sold to:

Ship to:

SERVICE CREDIT CARD
1000 ARMSTRONG DRIVE
FAIRMONT, MN 56031

INNOVATIVE HEARTH
1502 14ST NW
AUBURN, WA 98001

bob.wayman@lennoxhp.com
Return docs to: Email

Customer No:	24001	Call Type:	Repair
Contract No:	SERVICE	Requested Date:	03/15/13
Terms:	CREDIT CARD	Freq:	0
Customer PO:	VERBAL	Next Calib Date:	09/19/13
Contact:		Certs Required:	No
Phone:		Location:	Customer location

Summary of Charges

Description	Quantity	Rate	Total \$
Labor JOB LABELLE	1.00	\$98.00	\$98.00
Zone Charge	1.00	\$89.25	\$89.25

Estimated Total: \$187.25

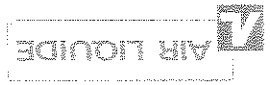
Scales & Parts Used

All AWTX manufactured parts are warranted for 90 days from this date

WTD	Make	Model	Serial	Capacity	Status
		WT112	471713	1000	Completed
No parts					
Part No	Description	Price	Qty	Ext Price	

No parts					
Part No	Description	Price	Qty	Ext Price	

Total All Parts: \$0.00



Air Liquide America
Specialty Gases LLC



CERTIFIED MASTER CLASS

Single-Certified Calibration Standard

500 WEAVER PARK RD, LONGMONT, CO 80501
Phone: 888-253-1635 Fax: 303-772-7673

CERTIFICATE OF ACCURACY: Certified Master Class Calibration Standard

Product Information
Document #: 50101687-002
Item No.: M0006880-P-7AL
P.O. No.: XC 100968

Cylinder Number: CAL7636
Cylinder Size: 7AL

Certification Date: 27Mar2013
Expiration Date: 28Mar2016
Lot Number: LGM0083302

CERTIFIED CONCENTRATION

Component Name

CARBON DIOXIDE
CARBON MONOXIDE
NITROGEN

TRACEABILITY

Traceable To

Scott Reference Standard

Concentration (Moles)	Accuracy (+/-%)
9.01 % PPM	2
196. BALANCE	2

Customer
CENTRAL WELDING SUPPLY CO INC
5401 4TH AVENUE SOUTH
SEATTLE, WA 98108
US

APPROVED BY: 
DATE: 4/1/13
JOHN ROZOF

Certificate of Calibration

Certificate Number: 528511

Lennox Hearth Products
1502 14th Street NW
Auburn, WA 98001



JJ Calibrations, Inc.
7007 SE Lake Rd
Portland, OR 97267-2105
Phone 503.786.3005
FAX 503.786.2994

PO: 12943M
Order Date: 03/19/2013
Authorized By: N/A

Calibrated on: 03/20/2013
Recommended Due: 03/20/2014
Environment: 22 °C 31 %RH
As Received: Within Tolerance
As Returned: Within Tolerance
Action Taken: Calibrated
Technician: 114

Property #: 0016
User: N/A
Department: N/A
Make: Keithley
Model: 2700
Serial #: 1009592
Description: Data Acquisition System
Procedure: DCN 400488
Accuracy: Refer to Manufacturer Specs.

Remarks: * Any number of factors may cause the calibration item to drift out of calibration before the recommended interval has expired
Received and returned with cable and power cord.

Standards Used

Std ID	Manufacturer	Model	Nomenclature	Calibrator	Function Generator, 15MHz	Due Date	Trace ID
283A	Fluke	5700A/EP				10/16/2013	514737
511A	Hewlett-Packard	33120A-JJ				02/04/2014	523847

JJ Calibrations, Inc. certifies that this instrument has been calibrated in accordance with the JJ Calibrations Quality Assurance Manual with the stated procedure using standards that are traceable to the National Institute of Standards and Technology (NIST), or other National Measurement Institutes (NMIs), or by using natural physical constants, intrinsic standards or ratio calibration techniques. The quality system and this certificate are in compliance with ANSI/NCSL Z540-1-1994, ISO/IEC 17025-2005, ISO 10012-1, the ISO 9000 family and QS 9000. The expanded uncertainty of measurements for this calibration are based upon 95% (2 sigma) confidence limits. Unless otherwise stated, a test accuracy ratio (TAR) of 4:1, if achievable, is maintained. The results reported herein apply only to the calibration of the item described above. This report may not be reproduced, except in full, without prior written consent of JJ Calibrations, Inc.

Reviewer

[Signature]

Issued 03/21/2013

Rev # 14

Inspector

[Signature]

Certificate: 528511



CERTIFICATE OF CALIBRATION

CUSTOMER: LENNOX HEARTH PRODUCTS AUBURN WA
PO NUMBER: 12942M
INST. MANUFACTURER: APEX INSTRUMENTS
INST. DESCRIPTION: AIR SAMPLER
MODEL NUMBER: XC-60-EP
SERIAL NUMBER: 0608003
RATED UNCERTAINTY: +/-1% RD.
UNCERTAINTY GIVEN: FLOW measurement uncertainty: +/- .199 % RD. K=2
NOTES: AS RECEIVED/ AS LEFT WITHIN SPECS. REFERENCE CONDITIONS ARE: 760 mm HGA 70 F

CALIBRATION DATE: 04/03/13
CALIBRATION DUE: 04/03/14
PROCEDURE: NAVAIR 17-20MG-02
CALIBRATION FLUID: AIR @ 14.7 PSIA 70 F
STANDARD(S) USED: A1-A4, A24, A321 DUE 02-2014
NIST TRACE #: 1361269184, 1360578741, 1360586185
AMBIENT CONDITIONS: 761 mm HGA 54 % RH 72 F
CERTIFICATE FILE #: 452450.13

TEST POINT	UUT	DM.STD.	NUMBER	INDICATED	ACTUAL	CORRECTION	DM.METER	PD.METER	FACTOR
1	0.0502	0.050	0.9960	GAUGE	GAUGE				
2	0.1007	0.100	0.9930	"HG VAC.	"HG VAC.	0-30			
3	0.2515	0.250	0.9940	TEMPERATURE	TEMPERATURE	0-30			
4	0.5027	0.500	0.9946	F DEG.	F DEG.	72.95			
5	1.0042	1.000	0.9958						
6	1.5059	1.500	0.9961						
7	2.0071	2.000	0.9965						
8	2.5099	2.500	0.9961						
			0.99527	AVERAGE					

All instruments used in the performance of the shown calibration have traceability to the National Institute of Standards and Technology (NIST). The uncertainty ratio between the calibration standards (DM.STD.) used and the unit under test (UUT) is a minimum of 4:1, unless otherwise noted. Calibration has been performed per the shown procedure number, in accordance with ISO 10012:2003, ISO 17025:2005, ANSI/NCSL-Z-540.3, and/or MIL-STD-45662A. Test methods: API2530-92 & ASME MFC-3M-1989.

Dick Munns Company • 10572 Calle Lee #138 • Los Alamitos, CA 90720
 Phone (714) 827-1215 • Fax (714) 827-0823

This Calibration Certificate shall not be reproduced except in full, without approval by DICK MUNN'S COMPANY. The data shown applies only to the instrument being calibrated and under the stated conditions of calibration.

Calibration Technician:

Approved By:

Date:



CL-12

CERTIFICATE OF CALIBRATION

CUSTOMER: LENNOX HEARTH PRODUCTS AUBURN WA
PO NUMBER: 12942M
INST. MANUFACTURER: APEX INSTRUMENTS
INST. DESCRIPTION: AIR SAMPLER
MODEL NUMBER: XC-60-EP
SERIAL NUMBER: 0608004
RATED UNCERTAINTY: +/-1% RD.
UNCERTAINTY GIVEN: FLOW measurement uncertainty: +/- .19% RD, K=2
NOTES: AS RECEIVED/ AS LEFT WITHIN SPECS. REFERENCE CONDITIONS ARE: 760 mm HGA 70 F

CALIBRATION DATE: 04/03/13
CALIBRATION DUE: 04/03/14
PROCEDURE: NAVAIR 17-20MG-02
CALIBRATION FLUID: AIR @ 14.7 PSIA 70 F
STANDARD(S) USED: A1-A4, A24, A321 DUE 02-2014
NIST TRACE #: 1361269184, 1360578741, 1360586185
AMBIENT CONDITIONS: 761 mm HGA 54 % RH 72 F
CERTIFICATE FILE #: 452449.13

TEST POINT	UUT	DM,STD.	NUMBER	INDICATED	ACTUAL	CORRECTION	FACTORS	PD.METER	PD.METER
1	0.0503	0.050	0.9940	GAUGE	GAUGE				
2	0.1008	0.100	0.9921	"HG VAC.	"HG VAC.	0-30			
3	0.2514	0.250	0.9944	TEMPERATURE	TEMPERATURE	0-30			
4	0.5028	0.500	0.9944	TEMPERATURE	TEMPERATURE				
5	1.0039	1.000	0.9961	F DEG.	F DEG.				
6	1.5056	1.500	0.9963	72	72.06				
7	2.0073	2.000	0.9964						
8	2.5094	2.500	0.9963						
				AVERAGE					
				0.99500					

All instruments used in the performance of the shown calibration have traceability to the National Institute of Standards and Technology (NIST). The uncertainty ratio between the calibration standards (DM,STD.) used and the unit under test (UUT) is a minimum of 4:1, unless otherwise noted. Calibration has been performed per the shown procedure number, in accordance with ISO 10012:2003, ISO 17025:2005, ANSI/NCSL-Z-540.3, and/or MIL-STD-45662A. Test methods: API2530-92 & ASME MFC-3M-1989.

Dick Munns Company • 10572 Calle Lee #138 • Los Alamitos, CA 90720
 Phone (714) 827-1215 • Fax (714) 827-0823

This Calibration Certificate shall not be reproduced except, in full, without approval by DICK MUNN COMPANY. The data shown applies only to the instrument being calibrated and under the stated conditions of calibration.

Calibration Technician:

Approved By:

Date:

Dry Gas Meter Verification

Equipment Number:

Lennox Box B

Engineer:

B. Davis

Equipment Manufacture:

APEX

Calibration Date:

31-May-2013

Model:

XC-60-EP

Barometric Pressure:

30

Type of verification:

Post Test:

X GV300

Six Month:

Standard Dry Gas Meter Equipment Number

19681

Dry Gas Meter Previous Calibration Factor

0.995

Standard Dry Gas Meter Calibration Factor

0.9978

Average Current Calibration Factor:

0.9872

Standard Dry Gas Meter Cal Due Date

3/20/2014

Deviation Previous to Current Factor:

0.78%

Acceptable limit is 5%

Trial Number

1

2

3

Pressure Drop	0.31	0.31	0.31
Reference Meter start	997.7	1002.707	1009.093
Reference Meter end	1002.707	1009.093	1014.134
Dry Gas Meter start	0	0	0
Dry Gas Meter end	5.17	6.569	5.16
Reference Temperature	74	74	75
Dry Gas Meter Temperature	85	84	83
Total volume reference	5.007	6.386	5.041
Total volume Dry Gas Meter	5.17	6.569	5.16
Gas Meter calibration factor	0.985	0.987	0.989
Deviation from average	0.002	0.000	0.001

Calibration factor deviation from average

Acceptable limit is .020

0.002

Engineer:

B. Davis



Dry Gas Meter Verification

Equipment Number:

Lennox Box A

Equipment Manufacture:

APEX

Model:

XC-60-EP

Type of verification:

Post Test:

X GV300

Standard Dry Gas Meter Equipment Number

19681

Standard Dry Gas Meter Calibration Factor

0.9978

Standard Dry Gas Meter Cal Due Date

3/20/2014

Engineer:

B. Davis

Calibration Date:

31-May-2013

Barometric Pressure:

30

Six Month:

Dry Gas Meter Previous Calibration Factor

0.995

Average Current Calibration Factor:

0.9804

Deviation Previous to Current Factor:

1.46%

Acceptable limit is 5%

Trial Number

1

2

3

Pressure Drop	0.34	0.34	0.34
Reference Meter start	21.582	27.167	32.455
Reference Meter end	27.167	32.455	43.055
Dry Gas Meter start	0	0	0
Dry Gas Meter end	5.686	5.385	10.793
Reference Temperature	70	70	70
Dry Gas Meter Temperature	71	71	70
Total volume reference	5.585	5.288	10.6
Total volume Dry Gas Meter	5.686	5.385	10.793
Gas Meter calibration factor	0.981	0.981	0.979
Deviation from average	0.001	0.000	0.001

Calibration factor deviation from average

Acceptable limit is .020

0.001

Engineer:

B. Davis

Intertek



Certificate of Compliance

It is hereby certified that this article has been tested for functionality. If the article has no testable function it has been inspected and is certified to be the article as described.

Customer: INTERTEK
2595 SOUTHWEST 153RD DRIVE
BRAVETON, OR 97006
PO Box: USA20-0000202108
Customer Nbr: 1-556813-000
Date Received: December 13, 2010

CertSO Nbr: 2-A94VT-88-1
Manufacturer: Troemner
Model Nbr: UNKNOWN (PM0104)
Date Complete: February 03, 2011
Due Date: January 21, 2012

Part Nbr: Unknown (PM0104)
Description: 10 lb Weight, Single
Serial Nbr: NONE
ID Nbr: NONE
Unit Barcode: 901B0008371

TRANSCAT Calibration Laboratories have been audited and found in compliance with ISO/IEC 17025:2005. Accredited calibration performed within the Lab Scope of Accreditation are indicated by the presence of the Accrediting Body's Logo and Certificate Number on this Certificate of Calibration. Any measurements on an accredited calibration not covered by this Lab Scope are noted below. This report must not be used to claim product certification, approval, or endorsement by NIST, A2LA, NIST, or any agency of the Federal Government.

TRANSCAT calibrations are performed in compliance with the requirements of ISO/IEC 17025:2005, ISO 9001:2000, ISO 13169:1999, ANSI/NCSL Z540-1994, Q9000 and ISO 10012:1992. When specified continually the requirements of 10CFR21, 10CFR50 App. B and NQA-1 are also covered.

TRANSCAT will maintain and document the traceability of all its standards to the National Institute of Standards and Technology (NIST) or the National Research Council of Canada (NRC), or to other recognized national or international standard bodies (BIPM, etc.) or to measurable conditions created in our laboratory or accepted fundamental and/or natural physical constants ratio type of calibration, or by comparison to consensus standards. The specific path of traceability for the reported measurement results is maintained at the TRANSCAT facility and is available there for review.

Complete records of work performed are maintained by TRANSCAT and are available for inspection. Laboratory standards used in the performance of this calibration are shown below.

The results in this report relate only to the item calibrated or tested and the determination of in or out of tolerance is specific to the model and no reference is made to the manufacturer's published specifications. All calibrations have been performed using processes having a test uncertainty ratio of four or more times greater than the unit calibration uncertainty otherwise noted on the Supplemental Report. Uncertainties have been estimated as a 95 percent confidence level (k=2). Calibration at a 4:1 TUR provides reasonable confidence that the instrument is within the manufacturer's published specifications. Limitations on the uses of this instrument are detailed in the manufacturer's operating instructions. Any number of factors can cause a unit to drift out of tolerance at any time following its calibration. The reported uncertainty is the uncertainty of the calibration process. For measuring instruments and O.G. of the test significant digit to the reported uncertainty to obtain the measurement uncertainty of the unit under test at the specific point. For mass calibrations conventional mass referenced to 8.0 g/cm³. For single added tolerances no TUR will be provided.

Notes: This device was certified by Troemner on 21 Jan 2011, (see attached certificate 591491B), as reviewed by TRANSCAT policy P0902R2

Checked for compliance
14058 SW Millon Ct
Portland, OR 97224
By: Greg Guile
Digitally Signed On 2/3/2011

Facility Representative
14058 SW Millon Ct
Portland, OR 97224
503-598-8700

Tony Kutch
Lab Manager

Date: 2/3/2011

Digitally Signed By Drake Dunning for

Reprinted on 02/08/2011

Revision 0

This certificate may not be reproduced except in full without the written approval of TRANSCAT. Additional information if applicable may be included on separate reports.



TRANSCAT[®] CALIBRATION SERVICES

SUPPLEMENTAL REPORT FOR A94VT-88-1

CALIBRATION LAB DATA AS FOUND / AS LEFT

Service Order Nbr: A94VT-88-1		Mfr: Troemner	
Description: 10 Lb Weight, Single		Model: UNKNOWN (PM0104)	
Serial: NONE		PO Nbr: USA20-0000202108	
Customer: INTERTEK		ID Nbr: NONE	
Calibrated: 2/3/2011		Calibration Proc: 1-ACI0001-1	
Date Due: 1/21/2012			
Service Type: V9			

Description	Setpoints	Accuracy	Low Limit	High Limit	As Found / As Left	8 1	Uncertainty (k=2, ±)	TUR
Function Check								
Documentation Verification								

As Found and As Left Data recorded on 2/3/2011

Temperature 67.5°F / 19.7°C Relative Humidity: 42% Temp/RH Asset 1013W

Asset	Manufacturer	Model	Description	Cal Date	Due Date	Traceability Numbers
None - 02	None - Only for Lab Use	NONE	Only for lab use	1/23/2009	1/23/2009	N/A

Remarks: This device was certified by Troemner on 21 Jan 2011, (see attached certificate 591491B), as reviewed by Transcat policy P0902R2



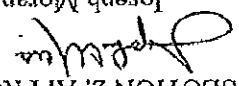
Calibration Certificate

201 Wolf Drive • P.O. Box 87 • Thorofore, NJ 08086-0087 • Phone: 856-686-1600 • Fax: 856-686-1601 • WWW.TROEMNER.COM • e-mail: troemner@troemner.com

Page 1 of 7 Pages
Weight

SECTION 1: NAME AND ADDRESS OF CUSTOMER
Certificate Number 591491B-1
Date of Calibration 21-JAN-2011

End user
Transcat Inc
14058 SW Milton Ct
Portland OR 97224-8025
Client
Transcat (Rochester)
35 Vantage Point Drive
Rochester NY 14624

SECTION 2: APPROVED SIGNATORY

Joseph Moran, Metrology Manager

SECTION 3: PERSON PERFORMING WORK
Daniel Foglio

SECTION 4: CERTIFICATE INFORMATION
Description of Masses: Cast Iron

Accuracy Class	: NIST 105-1 Class F
Order Number	: 304744
Construction	: Two Piece
Material	: Cast Iron
Date Received	: 11-JAN-2011
Date of Calibration	: 21-JAN-2011
Date of Issue	: 21-JAN-2011
Weight Range	: 10 lb

SECTION 5: ENVIRONMENTAL CONDITIONS DURING TEST

Temperature: 21.73°C
Pressure: 752.79 mm Hg
Relative Humidity: 45%

SECTION 6: PERTINENT INFORMATION

The Weights listed on this calibration report have been compared to reference mass standards that are directly traceable to the National Institute of Standards and Technology under Test No. 822/272103-05. Reference standards and balances used to perform the calibration are listed in Section 10.

The weights calibrated for this report have been calibrated in accordance with Troemner's calibration process. The calibration performed meets Level III criteria as described in the NIST/NVLAP Technical Guide 150-2.

This calibration also meets specifications as outlined in ISO 9001, ISO/IEC 17025, ANSI/NCSL Z540-1-1994, NRC Document 10CFR50 Appendix B, and applicable documents.

This certificate of calibration shall not be reproduced except in full, without the written approval of Troemner, LLC. This certificate of calibration must not be used by the customer to claim product endorsement by NIST, NVLAP or any agency of the U.S. government.



Calibration Certificate



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Page 2 of 7 Pages
Weight

Certificate Number 591491B-1
Date of Calibration 21-JAN-2011

NAME AND ADDRESS OF CUSTOMER

End user
Transcat Inc
14058 SW Milton Ct
Portland OR 97224-8025
Client
Transcat (Rochester)
35 Vantage Point Drive
Rochester NY 14624

SECTION 7: TRUE MASS (MASS IN VACUUM) CALIBRATION DATA

Nominal Mass Value	Serial Number	As Found	True Mass	As Left	Density ¹ of Weight	Uncertainty (+ or -)
10 lb		4536.2786 g	4536.2786 g	4536.2786 g	7.2000 g/cm ³	50.0 mg

¹ Density is assumed unless otherwise stated



Henry Troemner LLC

Calibration Certificate



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Page 3 of 7 Pages
Weight

Certificate Number 591491B-1
Date of Calibration 21-JAN-2011

NAME AND ADDRESS OF CUSTOMER

End user
Transcat Inc
14058 SW Millon Ct
Portland OR 97224-8025
Client
Transcat (Rochester)
35 Vantage Point Drive
Rochester NY 14624

SECTION 8: MASS IN AIR CALIBRATION VALUE VS. REFERENCE DENSITY 8000 kg m⁻³

Nominal Mass Value	Serial Number	Conventional Mass Value ----- As Found	As Left	Uncertainty (+ or -)	Tolerance (+ or -)
10 lb		4536.2030 g	4536.2030 g	50.0 mg	450.0000 mg



Henry Troemner LLC

Calibration Certificate



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Page 4 of 7 Pages
Weight

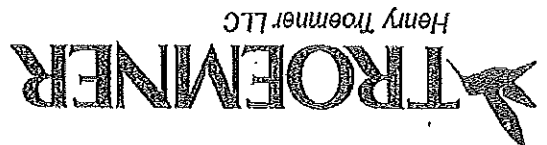
Certificate Number 591491B-1
Date of Calibration 21-JAN-2011

NAME AND ADDRESS OF CUSTOMER

End user
Transcat Inc
14058 SW Millon Ct
Portland OR 97224-8025
Client
Transcat (Rochester)
35 Vantage Point Drive
Rochester NY 14624

SECTION 9: MASS IN AIR CALIBRATION DATA VS. REFERENCE DENSITY 8000 kg m⁻³

Nominal Mass Value	Serial Number	-- Conventional Mass Correction --	As Found	As Left	Uncertainty (+ or -)	Tolerance (+ or -)
10 lb			279.3 mg	279.3 mg	50.0 mg	450.0000 mg



Calibration Certificate



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Page 5 of 7 Pages
Weight

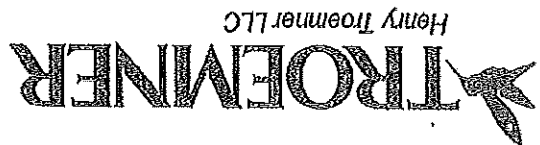
Certificate Number 591491B-1
Date of Calibration 21-JAN-2011

NAME AND ADDRESS OF CUSTOMER

End user
Transcat Inc
14058 SW Milton Ct
Portland OR 97224-8025
Client
Transcat (Rochester)
35 Vantage Point Drive
Rochester NY 14624

SECTION 10: CALIBRATION PROCEDURE DATA

Nominal	Serial	Standard	Cal	Balance	Cal	Due	Used	Procedure	Cal	Due	Used
10 lb	S1104	02/28/11	XP64003E-A01	11/30/11	Multi A-B						



Henry Troemner LLC

Calibration Certificate



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Page 6 of 7 Pages

Certificate Number 591491B-1
Date Of Calibration 21-JAN-2011

NAME AND ADDRESS OF CUSTOMER

Client
Transcat, Inc. (Rochester)
35 Vantage Point Drive
Rochester NY 14624

End user
Transcat Inc
14058 SW Millon Ct
Portland OR 97224-8025

SECTION 1: GENERAL INFORMATION

This calibration was performed in Troemner's High Precision Level 1 Mass Metrology Laboratory at 201 Wolf Drive, Thorofare, New Jersey 08086 unless otherwise noted on page one. The internal procedures used are CAL-CLASSI, CAL-MMAP, and NIST HB 145.

SECTION 12: DEFINITIONS AND TERMS

MASS IN A VACUUM - The mass of a weight as if it were measured in a vacuum. Also known as True Mass.
MASS IN AIR - The conventional value of the result of weighing in air, in accordance to International Recommendation OIML D 28. For a weight taken at 20° C, the conventional mass is the mass of a reference weight of 8000 kg·m⁻³ which it balances in air of a density of 1.2 kg·m⁻³.

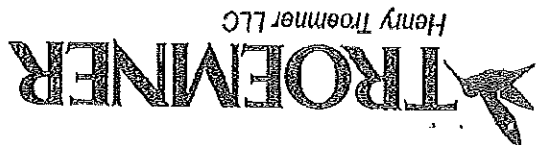
AS FOUND MASS IN A VACUUM - The measured value of the mass(es) as they were received by Troemner.
AS LEFT MASS IN A VACUUM - The measured value of the mass(es) after they were adjusted, repaired or replaced when necessary. The As Found Mass in a Vacuum will equal the As Left Mass in a Vacuum if the mass(es) did not require adjustment, repair or replacement.

NOMINAL MASS - The mass value as marked on the weight.

CORRECTION - The difference between the mass value of a weight and its nominal value. A positive correction indicates that the mass value is greater than the nominal value by the amount of the correction.
AS FOUND CONVENTIONAL MASS CORRECTION - The conventional correction of the result, as it was received by Troemner, of weighing in air in accordance to International Recommendation D 28. For a weight taken at 20° C, the conventional mass is the mass of a reference weight of density 8000 kg·m⁻³ which it balances in air density of 1.2 kg·m⁻³. If the customer requires cleaning prior to calibration, the after cleaning correction would be reported.

AS LEFT CONVENTIONAL MASS CORRECTION - The conventional correction of the result, after adjustment, repair, or replacement of weighing in air in accordance to International Recommendation D 28. For a weight taken at 20° C, the conventional mass is the mass of a reference weight of density 8000 kg·m⁻³ which it balances in air density of 1.2 kg·m⁻³. The As Found will equal the As Left Conventional Mass Correction if the mass(es) did not require adjustment, repair or replacement.

(continued on next page)



Henry Troemner LLC

Calibration Certificate



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Page 7 of 7 Pages

Weight

Certificate Number 591491B-1

Date of Calibration 21-JAN-2011

NAME AND ADDRESS OF CUSTOMER

End user

Troemner Inc
14058 SW Millon Ct
Portland OR 97224-8025

Client
Troemner (Rochester)
35 Vantage Point Drive
Rochester NY 14624

SECTION 12: DEFINITIONS AND TERMS (continued)

UNCERTAINTY - The standard deviation associated with the result of the measurement that characterizes the dispersion of the values that could reasonably be attributed to the measurand. The uncertainty is calculated in accordance with NIST TechNote 1297 / UKAS M3003 using a coverage factor of $k = 2$ ($k = 2$ defines an interval having a level of confidence of approximately 95 percent). The uncertainty does not include possible effects of magnetism.

TOLERANCE - Defines the limits in which the correction value and the uncertainty must fall to meet the tolerance specification for the given Class.

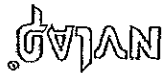
AS FOUND CONVENTIONAL MASS VALUE - The measured value of the mass(es) as they were received by Troemner, of weighing in air in accordance to International Recommendation OIML D 28. For a weight taken at 20° C, the conventional mass is the mass of a reference weight of density 8000 kg·m⁻³ which it balances in air density of 1.2 kg·m⁻³. If the customer requires cleaning prior to calibration, the after cleaning value would be reported. F denotes Out of Tolerance Weight.

AS LEFT CONVENTIONAL MASS VALUE - The measured value of the mass(es) after they were adjusted, repaired or replaced when necessary, of weighing in air in accordance to International Recommendation OIML D 28. For a weight taken at 20° C, the Conventional Mass is the mass of a reference weight of density 8000 kg·m⁻³ which it balances in air density of 1.2 kg·m⁻³. The As Found will equal the As Left Conventional Mass Value if the mass(es) did not require adjustment, repair or replacement.

ASTM B617-97 - Weights meet the tolerance specification for ASTM B617-97. Weights 2kg - 1g screened for magnetism using a Gaussmeter.

SECTION 13: ADDENDUM

Weight(s) Pass Visual Inspection



NVLAP LAB CODE

200886-0



CERTIFICATE OF CALIBRATION

Customer: INTERTEK
22887 NE TOWNSEND WAY
FAIRVIEW, OR 97024
Cerv80 Nbr: 2-B461Y-660001-1
Manufacturer: Ohaus
Model Nbr: AV264C
Date Completed: April 04, 2013
Due Date: April 04, 2014
Customer Nbr: 1-556813-000
P.O. Nbr: USA20-0000208799
Date Received: April 04, 2013

Calibrated To: Manufacturer Specification
Calibration Proc: 1-AC3428340
Item Received: Out of Tolerance
Item Returned: In Tolerance

Description: Digital Balance
Serial Nbr: 8031051017
ID Nbr: 19683
Unit Barcode: 402A0002607

For calibration data, see Supplemental Report for SO Nbr 2-B461Y-660001-1

TRANSCAT Calibration Laboratories have been audited and found in compliance with ISO/IEC 17025:2005. Accredited calibrations performed within the Lab's Scope of Accreditation are indicated by the presence of the report must not be used to claim product certification, approval, or endorsement by NIST, NIST, or any agency of the Federal Government. Any measurement results on an accredited calibration not covered by that Lab's Scope are listed in the notes section of the certificate. This report may not be used to claim product certification, approval, or endorsement by NIST, NIST, or any agency of the Federal Government.

TRANSCAT calibrations, as applicable, are performed in compliance with the requirements of ISO 9001:2005, ISO TS16949, ANSI/ISO Z540-1:1994, and ISO 10012:1992. When specified contractually, the requirements of ISO/IEC 17025, ISO/IEC 17025:2005, and ISO 9001:2005 are also covered.

The facility includes no less than: An unbroken chain of comparison, realization of SI units, measurement uncertainty, documentation, competence, periodic recertification, and measurement assurance. TRANSCAT documents the traceability of measurements to the SI units through the National Institute of Standards and Technology (NIST) or the National Research Council of Canada (NRC), or other recognized national measurement institutes (NMIs) or international standards bodies, or to measurement conditions created in our laboratory, or accepted fundamental and/or national physical constants, ratio type of calibration, or by comparison to consensus standards. The specific path of traceability for the reported measurement results is maintained at the TRANSCAT facility and is available there for review.

Complete records of work performed are maintained by TRANSCAT and are available for inspection. Laboratory standards used in the performance of this calibration are shown on the Supplemental Report.

report, these tolerances are either the original equipment manufacturer's (OEM's) warranted specification or the client's requested specification. The model/serial no. referenced above based on the tolerances shown on the supplemental report, these tolerances are either the original equipment manufacturer's (OEM's) warranted specification or the client's requested specification.

The applied uncertainty is the uncertainty of the calibration process. The Test Uncertainty Ratio (TUR) is calculated as per NIST, International RP-9, section 8.2. All calibrations have been performed using processes having a TUR of 4:1 or better, unless otherwise noted on the Supplemental Report. Uncertainties have been estimated at a 95 percent confidence level (k=2). Calibration at a 4:1 TUR (for greater) provides reasonable confidence that the instrument is within the stated tolerances. For measuring instruments, in order to consider the contribution to the uncertainty from reproducibility of the unit under test (UUT), add 0.5 of the UUT's least significant digit to the reported uncertainty. For mass calibrations, conventional mass referenced to 8.0 g/m³.

Any number of factors can cause a unit to drift out of tolerance at any time following its calibration. Limitations on the uses of this instrument are detailed in the OEM's operating instructions.

Notes: TURs of <1:1 approved by Dmitry Moskovkin Quality Mgr 503-626-2311. The OOT readings were verified.

Calibrated At:
22887 NE TOWNSEND WAY
FAIRVIEW, OR 97024
By: Drake Dunning
Digitally Signed On April 04, 2013

Facility Representative
14058 SW Millon Ct
Portland, OR 97224
503-598-8700

Lab Manager
Marc Jaso

CALIBRATION LAB DATA AS FOUND

Service Order Nbr: 2-B461Y-660001-1

Description: Digital Balance

Serial: 8031051017

Customer: INTERTEK

Calibrated: 4/4/2013

Date Due: 4/4/2014

Service Type: N6

Mfg: Ohaus

Model: AV264C

PO Nbr: USA20-0000208799

ID Nbr: 19683

Calibration Proc: 1-AC34283-0

Description	Setpoints	Accuracy	Low Limit	High Limit	As Found	$\frac{Q}{P}$	Uncertainty ($k=2$; $\pm$)	TUR
Weight Measurement								
Linearity	10.0000g	$\pm(0.0003\text{ g})$	5.9997	10.0003	10.0004 g	*	1.2e-004 g	2.5:1
	50.0000g	$\pm(0.0003\text{ g})$	49.9997	50.0003	50.0004 g	*	1.2e-004 g	2.5:1
	100.0000g	$\pm(0.0003\text{ g})$	99.9997	100.0003	100.0005 g	*	1.2e-004 g	1.2:1
	150.0000g	$\pm(0.0003\text{ g})$	149.9997	150.0003	150.0008 g	*	5.0e-004 g	0.6:1
	200.0000g	$\pm(0.0003\text{ g})$	199.9997	200.0003	200.0007 g	*	5.0e-004 g	0.6:1
	260.0000g	$\pm(0.0003\text{ g})$	259.9997	260.0003	260.0007 g	*	1.2e-003 g	0.2:1
Repeatability (Std. Deviation)		$\pm(0.0001\text{ g})$	-0.00010	0.00010	0.00000 g			

As Found Data recorded on 4/4/2013

Temperature: 70.0°F / 21.1°C

Relative Humidity: 48%

Temp/RH Asset: 793W

The reported uncertainty is the uncertainty of the calibration process. For measuring instruments, add 0.6 of the least significant digit to the reported uncertainty to obtain the measurement uncertainty of the unit under test at the specific test point.

Reported resolution of the UUT does not represent calibration uncertainty or accuracy of the UUT.

Field not applicable.

CALIBRATION LAB DATA AS FOUND

Description	Setpoints	Accuracy	Low Limit	High Limit	As Found	8	Uncertainty ($k=2; \pm$)	TUR
-------------	-----------	----------	-----------	------------	----------	---	----------------------------	-----

Asset

Manufacturer

Model

Description

Cal Date

Date Date

Traceability Numbers

19-P014

Rice Lake Weighing Systems

1mg to 5kg

Weight Set, Class 1

4/30/2012

4/30/2013

03242-12

Remarks:

TURs of <1:1, approved by Dmitry Moskovskii Quality Mgr 503-626-2311. The OOT readings were verified.

The reported uncertainty is the uncertainty of the calibration process. For measuring instruments, add 0.5 of the least significant digit to the reported uncertainty to obtain the measurement uncertainty of the unit under test at the specific test point.

Reported resolution of the UTR does not represent calibration uncertainty or accuracy of the UTR.

Field not applicable.

CALIBRATION LAB DATA AS LEFT

Service Order Nbr: 2-B461Y-660001-1

Description: Digital Balance

Serial: 8031051017

Customer: INTERTEK

Calibrated: 4/4/2013

Date Due: 4/4/2014

Service Type: N6

Mfg: Ohaus

Model: AV264C

PO Nbr: USA20-0000208799

ID Nbr: 19683

Calibration Proc: 1-AC34283-0

Description	Setpoints	Accuracy	Low Limit	High Limit	As Left	Q	Uncertainty (k=2; ±)	TUR
Weight Measurement								
Linearity	10.0000g	±(0.0003 g)	9.9997	10.0003	10.0000 g			
	50.0000g	±(0.0003 g)	49.9997	50.0003	50.0000 g		1.2e-004 g	2.5:1
	100.0000g	±(0.0003 g)	99.9997	100.0003	100.0000 g		2.4e-004 g	1.2:1
	150.0000g	±(0.0003 g)	149.9997	150.0003	150.0001 g		5.0e-004 g	0.6:1
	200.0000g	±(0.0003 g)	199.9997	200.0003	199.9999 g		5.0e-004 g	0.6:1
	250.0000g	±(0.0003 g)	249.9997	250.0003	250.0000 g		1.2e-003 g	0.2:1
Repeatability (Std. Deviation)		±(0.0001 g)	-0.00010	0.00010	0.00000 g			

As Left Data recorded on 4/4/2013

Temperature: 70.0°F / 21.1°C

Relative Humidity: 48%

Temp/RH Asset: 795W

The reported uncertainty is the uncertainty of the calibration process. For measuring instruments, add 0.6 of the least significant digit to the reported uncertainty to obtain the measurement uncertainty of the unit under test at the specific test point.

Reported resolution of the UUT does not represent calibration uncertainty or accuracy of the UUT.

Field not applicable.

CALIBRATION LAB DATA AS LEFT

Description	Setpoints	Accuracy	Low Limit	High Limit	As Left	Q	Uncertainty ($k=2$, $\pm$)	TUR
Asset 19-P014	Manufacturer Rice Lake Weighing Systems	Model Ingr to 5kg	Description Weight Set, Class 1		Cal Date 4/30/2012	Due Date 4/30/2013	Traceability Numbers 05242-12	
Remarks: TURS of <1.1, approved by Dmitry Moskovkin Quality Mgr 503-626-2311. The OOT readings were verified.								

The reported uncertainty is the uncertainty of the calibration process. For measuring instruments, add 0.5 of the least significant digit to the reported uncertainty to obtain the measurement uncertainty of the unit under test at the specific test point.

Field not applicable.

Reported resolution of the UUT does not represent calibration uncertainty or accuracy of the UUT.

Calibration Lab Data Report (Preliminary Data) - Page 2 of 2

Service Order Nbr 2-B461Y-660001-1



Certificate of Compliance

It is hereby certified that this article has been tested for functionality. If the article has no testable function it has been inspected and is certified to be the article as described.

Customer: INTERTEK
22887 NB TOWNSEND WAY
FAIRVIEW, OR 97024
PO Box USA20-0000208799
Customer Nbr: 1-55613-000
Date Received: March 13, 2013
Date Completed: April 04, 2013
Due Date: March 26, 2014
Manufacturer: Troemner
Model Nbr: Unknown (RM0101)

Description: Weight, Single 500 milligram Ultra Class
Serial Nbr: 1000013130
ID Nbr: 19684
Unit Barcode: 900B0019546

For calibration data, see Supplemental Report for SO Nbr 2-B63YB-29-1

Transcat Calibration Laboratories have been audited and found in compliance with ISO/IEC 17025:2005. Accredited calibrations performed within the Lab Scope of Accreditation are listed in the notes section of the certificate. This report must not be used to claim product certification approval, or endorsement by NIST, or any agency of the Federal Government.

Transcat calibrations are applicable as performed in compliance with the requirements of ISO/IEC 17025:2005, ISO TS16949, ANSI/NCSL Z540-1:1994, and ISO 10012-1:1992. When specified contractual requirements for the requirements of ISO/IEC 17025:2005, ISO TS16949, ANSI/NCSL Z540-1:1994, and ISO 10012-1:1992 are also covered.

The traceability of measurements to the SI units through the National Institute of Standards and Technology (NIST) or the National Research Council of Canada (NRC), or other recognized national measurement institutes (NMI) is the specific path of traceability for the reported measurement results. It is maintained at the Transcat facility and is available here for review.

Complete records of work performed are maintained by Transcat and are available for inspection. Laboratory standards used in the performance of this calibration are shown on the Supplemental Report.

The results in this report relate only to the item calibrated or tested and the determination of the accuracy of the tolerance is specific to the measurement. The tolerance shown on the Supplemental Report, these tolerances are either the original equipment manufacturer (OEM) or the client's requested specifications or the client's requested specifications.

The applied uncertainty is the uncertainty of the calibration process. The Test Uncertainty Ratio (TUR) is calculated as per NCSL International B99, section 8.2. All calibrations have been performed using processes having a TUR of 4:1 or better, unless otherwise noted on the Supplemental Report. Uncertainties have been estimated at a 95 percent confidence level (k=2). Calibration at a 4:1 TUR (or greater) provides reasonable confidence that the instrument is within the stated tolerances. For measuring instruments in order to consider the contribution to the uncertainty from reproducibility of the unit under test (UUT), add 0.6 of the UUT's least significant digit to the reported uncertainty. For mass calibrations, Coordinated Mass referenced 100.0 g/cm³.

Any number of factors can cause a unit to drift out of tolerance at any time following its calibration. Limitations on the use of this instrument are detailed in the OEM's operating instructions.

Notes: This unit was calibrated by Troemner 3/26/13 (Certificate No. 712777-1 attached).

Checked for compliance by:
14058 SW Millon Ct
Portland, OR 97224
By: Greg Guile
Digitally Signed On April 04, 2013

Facility Representative
14058 SW Millon Ct
Portland, OR 97224
503-598-8700

Digitally Signed By Marc Jaso
Date: April 04, 2013
Marc Jaso
Lab Manager



SUPPLEMENTAL REPORT FOR 2-B63YB-29-1

CALIBRATION LAB DATA AS FOUND / AS LEFT

Service Order Nbr: 2-B63YB-29-1		Mfr: Troemner	
Description: Weight, Single 500 milligram Ultra Class		Model: Unknown (RM0101)	
Serial: 1000013130		PO Nbr: USA20-0000208799	
Customer: INTERTEK		ID Nbr: 19684	
Calibrated: 4/4/2013		Calibration Proc: 1-AC10001-3	
Date Due: 3/26/2014			
Service Type: V6			

Description	Setpoints	Accuracy	Low Limit	High Limit	As Found / As Left	Uncertainty (k=2; ±)	TUR
Function Check/Documentation Verification							
Meets MFG Tolerance			P	P	P		

As Found and As Left Data recorded on 4/4/2013

Temperature: 68.8°F / 20.4°C Relative Humidity: 55% Temp/RH Asset: 1015W

Asset	Manufacturer	Model	Description	Cal Date	Due Date	Traceability Numbers
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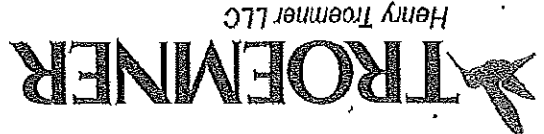
Remarks

This unit was calibrated by Troemner 3/26/13 (Certificate No. 712777-1 attached).

The reported uncertainty is the uncertainty of the calibration process. For measuring instruments used 0.5 of the least significant digit to the reported uncertainty to obtain the measurement uncertainty of the unit under test at the specified point.

Reported resolution of the UUT does not represent calibration uncertainty or accuracy of the UUT

Field not applicable.



Henry Troemner LLC

Calibration Certificate



201 Wolf Drive, P.O. Box 87, Thorofare, NJ 08086-0087, Phone: 856-686-1600, Fax: 856-686-1601, www.troemner.com, e-mail: troemner@troemner.com

Page 1 of 7 Pages

Weight : 19684
ID Number : 712777-1
Certificate Number : 26-MAR-2013
Date of Calibration : 26-MAR-2013

End user :
Transcat Inc.
14058 SW Milton Ct
Portland OR 97224-8025
Client :
Transcat (Rochester)
35 Vantage Point Drive
Rochester NY 14624

SECTION 2: APPROVED SIGNATORY

Lynn Dickerson, Metrologist

SECTION 3: PERSON PERFORMING WORK

Annamarie Love

SECTION 4: CERTIFICATE INFORMATION

Description of Masses: Analytical Weight

Accuracy Class : Troemner Ultra Class *
Order Number : 340836
Construction : One Piece
Material : Stainless Steel
Date Received : 20-MAR-2013
Date of Calibration : 26-MAR-2013
Date of Issue : 26-MAR-2013
Weight Range : 500mg

SECTION 5: ENVIRONMENTAL CONDITIONS DURING TEST

Temperature: 21.55°C
Pressure: 754.89 mm Hg
Relative Humidity: 47%

SECTION 6: PERTINENT INFORMATION

The Weights listed on this calibration report have been compared to reference mass standards that are directly traceable to the National Institute of Standards and Technology under Test No. 822-275872-11. Reference standards and balances used to perform the calibration are listed in Section 10. The weights calibrated for this report have been calibrated in accordance with Troemner's calibration process. The calibration performed meets Level I criteria as described in the NIST/NVLAP Technical Guide 150-2.

This calibration also meets specifications as outlined in ISO 9001, ISO/IEC 17025, ANSI/NCSL Z540-1-1994, NRC Document 10CPR50 Appendix B, and applicable documents.

* Troemner's Ultra Class is an enhanced group of weight tolerances which are 40-50% closer to nominal than ASTM E617-97 Class 1

This certificate of calibration shall not be reproduced except in full, without the written approval of Troemner, LLC. This certificate of calibration must not be used by the customer to claim product endorsement by NIST, NVLAP or any agency of the U.S. government.



Henry Troemner LLC

Calibration Certificate



201 Wolf Drive, P.O. Box 87, Thorofare, NJ 08066-0087, Phone: 856-886-1600, Fax: 856-886-1601, www.troemner.com, e-mail: troemner@troemner.com

Page 2 of 7 Pages
Weight

ID Number 19684
Certificate Number 712777-1
Date of Calibration 26-MAR-2013

NAME AND ADDRESS OF CUSTOMER

End user
Transcat Inc.
14058 SW Milton Ct
Portland OR 97224-8025
Client
Transcat (Rochester)
35 Vantage Point Drive
Rochester NY 14624

SECTION 7: TRUE MASS (MASS IN VACUUM) CALIBRATION DATA

Nominal Mass Value	Notes	Serial Number	As Found True Mass	As Left Density	Uncertainty (+ or -)
500 mg		1000013130	0.5000005 g	7.9500 g/cm ³	0.0016 mg
			0.5000005 g		

1 Density is assumed unless otherwise stated

1 As Found / 1 Total



Calibration Certificate

201 Wolf Drive, P.O. Box 87, Thorofare, NJ 08086-0087, Phone: 856-686-1600, Fax: 856-686-1601, www.troemner.com, e-mail: troemner@troemner.com

Page 3 of 7 Pages

Weight
ID Number 19684
Certificate Number 712777-I
Date of Calibration 26-MAR-2013

NAME AND ADDRESS OF CUSTOMER

End user
Transcat Inc.
14058 SW Millon Ct
Portland OR 97224-8025
Client
Transcat (Rochester)
35 Vantage Point Drive
Rochester NY 14624

SECTION 8: MASS IN AIR CALIBRATION VALUE VS. REFERENCE DENSITY 8000 kg m⁻³

Nominal Mass Value	Serial Number	---- Conventional Mass Value ----	As Found	As Left	Uncertainty (+ or -)	Tolerance (+ or -)
500 mg	1000013130	0.5000000 g	0.5000000 g	0.5000000 g	0.0016 mg	0.0050 mg





Henry Troemner LLC

Calibration Certificate

201 Wolf Drive, P.O. Box 87, Thorofare, NJ 08086-0087, Phone: 856-688-1600, Fax: 856-688-1601, www.troemner.com, e-mail: troemner@troemner.com

Page 4 of 7 Pages

Weight
ID Number 19684
Certificate Number 712777-1
Date of Calibration 26-MAR-2013

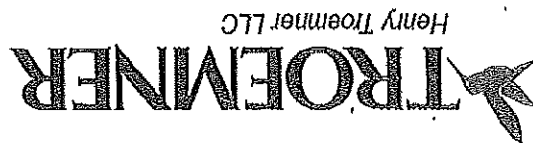
NAME AND ADDRESS OF CUSTOMER

End user
Transcat Inc.
14058 SW Milton Ct
Portland OR 97224-8025

Client
Transcat (Rochester)
35 Vantage Point Drive
Rochester NY 14624

SECTION 9: MASS IN AIR CALIBRATION DATA VS. REFERENCE DENSITY 8000 kg m⁻³

Nominal Mass Value	Notes	Serial Number	-- Conventional Mass Correction --	As Found	As Left	Uncertainty (+ or -)	Tolerance (+ or -)
500 mg		1000013130		0.0000 mg	0.0000 mg	0.0016 mg	0.0050 mg



Henry Troemner LLC

Calibration Certificate

201 Wolf Drive, P.O. Box 87, Thorofare, NJ 08086-0087, Phone: 856-686-1600, Fax: 856-686-1601, www.troemner.com, e-mail: troemner@troemner.com

Page 5 of 7 Pages

Weight
ID Number 19684
Certificate Number 712777-1
Date of Calibration 26-MAR-2013

Client

Transcat (Rochester)
35 Vantage Point Drive
Rochester NY 14624

NAME AND ADDRESS OF CUSTOMER

End user

Transcat Inc.
14058 SW Millon Ct
Portland OR 97224-8025

SECTION 10: CALIBRATION PROCEDURE DATA

Nominal Mass Value	Serial Number	Standard Set No.	Cal Due	Balance Used	Cal Due	Procedure Used
500 mg	1000013130	A031	06/30/13	A5XL-131	12/31/13	Multit A-B



Calibration Certificate



201 Wolf Drive, P.O. Box 87, Thorofare, NJ 08086-0087, Phone: 856-686-1600, Fax: 856-686-1601, www.troemner.com, e-mail: troemner@troemner.com

Page 6 of 7 Pages
Weight
Certificate Number 712777-1
Date Of Calibration 26-MAR-2013

NAME AND ADDRESS OF CUSTOMER

Client
Transcat (Rochester)
35 Vanlance Point Drive
Rochester NY 14624

End user
Transcat Inc.
14058 SW Millon Ct
Portland OR 97224-8025

SECTION 1: GENERAL INFORMATION

This calibration was performed in Troemner's High Precision Level 1 Mass Metrology Laboratory at 201 Wolf Drive, Thorofare, New Jersey 08086 unless otherwise noted on page one. The internal procedures used are CAL-CLASS1 and NIST HB145.

SECTION 12: DEFINITIONS AND TERMS

MASS IN A VACUUM - The mass of a weight as if it were measured in a vacuum. Also known as True Mass.
MASS IN AIR - The conventional value of the result of weighing in air, in accordance to International Recommendation OIML D 28. For a weight taken at 20° C, the conventional mass is the mass of a reference weight of 8000 kgm⁻³ which it balances in air of a density of 1.2 kgm⁻³.
AS FOUND MASS IN A VACUUM - The measured value of the mass(es) as they were received by Troemner.
AS LEFT MASS IN A VACUUM - The measured value of the mass(es) after they were adjusted, repaired or replaced when necessary. The As Found Mass in a Vacuum will equal the As Left Mass in a Vacuum if the mass(es) did not require adjustment, repair or replacement.
NOMINAL MASS - The mass value as marked on the weight.
CORRECTION - The difference between the mass value of a weight and its nominal value. A positive correction indicates that the mass value is greater than the nominal value by the amount of the correction.
AS FOUND CONVENTIONAL MASS CORRECTION - The conventional correction of the result, as it was received by Troemner, of weighing in air in accordance to International Recommendation D 28. For a weight taken at 20° C, the conventional mass is the mass of a reference weight of density 8000 kgm⁻³ which it balances in air density of 1.2 kgm⁻³. If the customer requires cleaning prior to calibration, the after cleaning correction would be reported.
AS LEFT CONVENTIONAL MASS CORRECTION - The conventional correction of the result, after adjustment, repair, or replacement of weighing in air in accordance to International Recommendation D 28. For a weight taken at 20° C, the conventional mass is the mass of a reference weight of density 8000 kgm⁻³ which it balances in air density of 1.2 kgm⁻³. The As Found will equal the As Left Conventional Mass Correction if the mass(es) did not require adjustment, repair or replacement.

(continued on next page)



Henry Troemner LLC

Calibration Certificate



201 Wolf Drive, P.O. Box 87, Thorofare, NJ 08086-0087, Phone: 856-686-1600, Fax: 856-686-1601, www.troemner.com, e-mail: troemner@troemner.com

Page 7 of 7 Pages

Weight

Certificate Number 712777-1

Date of Calibration 26-MAR-2013

NAME AND ADDRESS OF CUSTOMER

End user

Troemner Inc.

14058 SW Milton Ct

Portland OR 97224-8025

Client

Troemner (Rochester)

35 Vantage Point Drive

Rochester NY 14624

SECTION 12: DEFINITIONS AND TERMS (continued)

UNCERTAINTY - The standard deviation associated with the result of the measurement that characterizes the dispersion of the values that could reasonably be attributed to the measurand. The uncertainty is calculated in accordance with NIST TechNote 1297 / UKAS M3003 using a coverage factor of $k=2$ ($k=2$ defines an interval having a level of confidence of approximately 95 percent). The uncertainty does not include possible effects of magnetism.

TOLERANCE - Defines the limits in which the correction value and the uncertainty must fall to meet the tolerance specification for the given Class.

AS FOUND CONVENTIONAL MASS VALUE - The measured value of the mass(es) as they were received by Troemner, of weighing in air in accordance to International Recommendation OIML D 28. For a weight taken at 20° C, the conventional mass is the mass of a reference weight of density 8000 kg·m⁻³ which it balances in air density of 1.2 kg·m⁻³. If the customer requires cleaning prior to calibration, the after cleaning value would be reported.

AS LEFT CONVENTIONAL MASS VALUE - The measured value of the mass(es) after they were adjusted, repaired or replaced when necessary, of weighing in air in accordance to International Recommendation OIML D 28. For a weight taken at 20° C, the Conventional Mass is the mass of a reference weight of density 8000 kg·m⁻³ which it balances in air density of 1.2 kg·m⁻³. The As Found will equal the As Left Conventional Mass Value if the mass(es) did not require adjustment, repair or replacement.

ASTM E617-97 - Weights meet the tolerance specification for ASTM E617-97. Weights 2kg - 1g screened for magnetism using a Gaussmeter.

SECTION 13: ADDENDUM

Next calibration due date: 26-MAR-2014



NVLAP LAB CODE
200886-0

CERTIFICATE OF CALIBRATION

Customer: INTERTK
22887 NB TOWNSEND WAY
FAIRVIEW, OR 97024
Date Received: October 31, 2012
Customer Nbr: I-556813-000
PO Nbr: USA20-0000208799
Date Completed: November 14, 2012
Due Date: November 14, 2013
Manufacturer: Cornack
Model Nbr: M2013

Cert No Nbr: 2-B14VW-41-1
Description: Humidity & Temperature Logger
Serial Nbr: 04100289
ID Nbr: 19725
Unit Barcode: 900B0001241
Calibrated To: Manufacturer Specification
Calibration Proj: I-AC1259Z-0
Item Received: Limited Calibration - In Tolerance
Item Returned: Limited Calibration - In Tolerance

For calibration data, see Supplemental Report for SO Nbr 2-B14VW-41-1

Transcal Calibration Laboratories have been audited and found in compliance with ISO/IEC 17025:2005. Accredited calibrations performed within the Lab Scope of Accreditation are indicated by the presence of the Accredited Body's Logo and Certificate Number on this Certificate of Calibration. Any measurement not covered by this Lab Scope are listed in the notes section of the certificate. This report must not be used to claim product certification approval, or endorsement by NVLAP, NIST, or any agency of the Federal Government.

Transcal calibrations are performed in compliance with the requirements of ISO/IEC 17025:2005, ISO TS16949, ANSRKCSL Z540-1994, and ISO 10012-1992. When specified continuously the requirements of 100CFR21, 100CFR50 App. B and NQA-1 are also covered.

The traceability includes no less than a documented chain of comparison realization of SI units measurement uncertainty, documentation, competence, periodic recalibration and measurement assurance. Transcal documents the traceability of measurements to the SI units through the National Institute of Standards and Technology (NIST) or the National Research Council of Canada (NRC), or other recognized national measurement institutes (NMIs) or international standard bodies, or to measurable conditions created in our laboratory or accepted fundamental and/or material physical constants by comparison to consensus standards. This specific path of traceability for the reported measurement results is maintained at the Transcal facility and is available there for review.

Complete records of work performed are maintained by Transcal and are available for inspection. Laboratory standards used in the performance of this calibration are shown on the Supplemental Report. The results in this report relate only to the item calibrated or tested and the determination of in or out of tolerance is specific to the model and no reference is made to the tolerances shown on the supplemental report. These tolerances are either the original equipment manufacturer's (OEM's) warranted specifications or the client's requested specifications.

The applied uncertainty is the uncertainty of the calibration process. The Test Uncertainty Ratio (TUR) is calculated as per NCSL International R19, section 8.2. All calibrations have been performed using processes having a TUR of 4:1 or better, unless otherwise noted on the Supplemental Report. Uncertainties have been estimated at a 95 percent confidence level ($k=2$). Calibration at a 4:1 TUR (or greater) provides reasonable confidence that the instrument is within the stated tolerances. For measuring instruments in order to consider the contribution to the uncertainty from reproducibility of the unit under test (UUT), add 0.6 of the UUT's least significant digit to the reported uncertainty. For mass calibrations, Conventional Coefficient of Variation (COV) is maintained at or below 100.0 ppm.

Any number of factors can cause a unit to drift out of tolerance at any time following its calibration. Limitations on the uses of this instrument are detailed in the OEM's operating instructions.

Notes: Limited Calibration: Temperature tested in Celsius only, approval per Ian Stephens 503-626-6694 x7306

Calibrated At: 14058 SW Millon Ct
Portland, OR 97224
By: Lant Hooks
Digitally Signed On November 14, 2012

Facility: Responding
14058 SW Millon Ct
Portland, OR 97224
503-598-8700

Marie Jaso
Lab Manager
Digitally Signed By Drake Dunning for
Date: November 15, 2012



SUPPLEMENTAL REPORT FOR 2-B14VW-41-1

CALIBRATION LAB DATA AS FOUND / AS LEFT

Service Order Nbr: 2-B14VW-41-1

Description: Humidity & Temperature Logger

Serial: 04100289

Customer: INTERTEK

Calibrated: 11/14/2012

Date Due: 11/14/2013

Service Type: K6

Mfr: Comark

Model: N2013

PO Nbr: USA20-0000208799

ID Nbr: 19725

Calibration Proc: 1-AC12597-0

Description	Setpoints	Accuracy	Low Limit	High Limit	As Found / As Left	g	Uncertainty (k=2, ±)	TUR
Temperature Measure								
Temperature	70.0°F	±(1 °F)	69.0	71.0	NA			
	23.0°C	±(0.5 °C)	22.5	23.5	23.2 °C			
Relative Humidity Measure								
%RH Measure	50.0%RH	±(3 %RH)	27.0	33.0	31.3 %RH			
	50.0%RH	±(3 %RH)	47.0	53.0	49.1 %RH			
	75.0%RH	±(3 %RH)	72.0	78.0	74.1 %RH			

As Found and As Left Data recorded on 11/14/2012

Temperature: 69.5°F / 20.8°C

Relative Humidity: 48%

Temp/RH Asset: 1012W

Asset

Manufacturer

Model

Description

Cal Date

Due Date

Traceability Numbers

666W

Thunder Scientific

2500

Humidity/Temperature Generator

6/2/2012

12/31/2012

2-6056W-11-1

The reported uncertainty is the uncertainty of the calibration process. For measuring instruments, add 0.6 of the least significant digit to the reported uncertainty to obtain the measurement uncertainty of the unit under test at the specific test point.

Reported resolution of the UUT does not represent calibration uncertainty or accuracy of the UUT.

Field not applicable.



SUPPLEMENTAL REPORT FOR 2-B14VW-41-1

CALIBRATION LAB DATA AS FOUND / AS LEFT

Description	Setpoints	Accuracy	Low Limit	High Limit	As Found / As Left	8 P	Uncertainty (k=2, ±)	TUR
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Remarks:

Limited Calibration: Temperature tested in Celsius only, approval per Ian Stephens 503-626-5694 x7306

The reported uncertainty is the uncertainty of the calibration process. For measuring instruments add 0.6 of the least significant digit to the reported uncertainty to obtain the measurement uncertainty of the unit under test at the specific test point.

Reported resolution of the UUT does not represent calibration uncertainty or accuracy of the UUT.

Field not applicable.

CERTIFICATE OF CALIBRATION

INTERTEK TESTING FAIRVIEW OR

CALIBRATION DATE: 03/20/13

CUSTOMER: ADMIN.6513000
 INST. MANUFACTURER: SENSUS
 INST. DESCRIPTION: P.D. METER
 MODEL NUMBER: S-275
 SERIAL NUMBER: 19199330
 RATED UNCERTAINTY: +/- .5 % RD.
 UNCERTAINTY GIVEN: FLOW measurement uncertainty: +/- .194 % RD.
 NOTES: AS RECEIVED WITHIN SPECS. REFERENCE CONDITIONS ARE: 760 mm HGA 70 F

CALIBRATION DUE: 03/20/14
 PROCEDURE: NAVAIR 17-20MG-02
 CALIBRATION FLUID: AIR @ 14.7 PSIA 70 F
 STANDARD(S) USED: A4, A24, A322 DUE 02-2014
 NIST TRACE # S1
 AMBIENT CONDITIONS: 761 mm HGA 55 % RH 71 F
 CERTIFICATE FILE #: 437261.13

TEST POINT	UUT	DM.STD. CORRECTION	NUMBER	INDICATED	ACTUAL	FACTOR
1	0.25647	0.256	SCFM	0.99818		
2	0.49996	0.499	SCFM	0.99808		
3	0.76253	0.761	SCFM	0.99800		
4	1.01445	1.012	SCFM	0.99788		
5	1.55648	1.553	SCFM	0.99777		
6	2.00267	1.998	SCFM	0.99767		
7	2.59924	2.593	SCFM	0.99760		
8	2.99955	2.992	SCFM	0.99748		
AVERAGE=			0.9978333			

All instruments used in the performance of the shown calibration have traceability to the National Institute of Standards and Technology (NIST). The uncertainty ratio between the calibration standards (NIST) used and the unit under test (UUT) is a minimum of 4:1, unless otherwise noted. Calibration has been performed per the shown procedure number, in accordance with ISO 10012:2003, ISO 17025:2005, ANSI/NCSL-Z-540.3, and/or MIL-STD-45662A. Test methods: API2530-92 & ASME MFC-3M-1989.

Dick Munns Company • 10572 Calle Lee #138 • Los Alamitos, CA 90720
 Phone (714) 827-1215 • Fax (714) 827-0823

This Calibration Certificate shall not be reproduced except in full, without approval by DICK MUNNS COMPANY. The data shown applies only to the instrument being calibrated and under the stated conditions of calibration.

Date:

Approved By:

Calibration Technician:



NVLAP LAB CODE
200886-0

Customer: INTERTEK
22887 NE TOWNSEND WAY
FAIRVIEW, OR 97024
Date Received: January 09, 2013
PO Nbr: USA20-0000208799
Customer Nbr: 1-556813-000
Date Completed: January 11, 2013
Due Date: January 11, 2014
Model Nbr: MCS-1
Manufacturer: Delmhorst Instrument Co.

Cert No Nbr: 2-B3732-21-1
Decryption: Moisture Content Standard
Serial Nbr: None
ID Nbr: 19701
Unit Barcode: 900B0011669
Calibrated To: Manufacturer Specification
Calibration Proj: 1-A3C32637-0
Item Received: In Tolerance
Item Returned: In Tolerance

For calibration data, see Supplemental Report for SO Nbr 2-B3732-21-1

Transcat Calibration Laboratories have been audited and found in compliance with ISO/IEC 17025:2005. Accredited calibrations performed within the Lab Scope of Accreditation are listed in the notes section of this certificate. This report must not be used to claim product certification approval, or endorsement by NIST, or any agency of the Federal Government.

Transcat calibrations are performed in compliance with the requirements of ISO/IEC 17025:2005, ISO 9001:2008, ISO 15189:2013, and ISO 10012:1992. When specified contractually the requirements of 100CFR121, 100CFR50 App. B and NQA-1 are also covered.

The traceability of measurements to the SI units through the National Institute of Standards and Technology (NIST) or the National Research Council of Canada (NRC), or other recognized national measurement institutes (NMIs) or international standard bodies or to measurable conditions created in our laboratory, or accepted fundamental and/or natural physical constants, radio type of calibration, or by comparison to consensus standards. The specific path of traceability for the reported measurement results is maintained at the Transcat facility and is available for review.

Complete records of work performed are maintained by Transcat and are available for inspection. Laboratory standards used in the performance of this calibration are shown on the Supplemental Report.

The results in this report relate only to the item calibrated or tested and the determination of in or out of tolerance is specific to the model(s) no reference is made to the tolerances shown on the supplemental report, these tolerances are either the original equipment manufacturer's (OEM's) warranted specifications or the client's requested specifications.

The applied uncertainty is the uncertainty of the calibration process. The Test Uncertainty Ratio (TUR) is calculated as per NCSL International R19, section 8.2. All calibrations have been performed using processes having a TUR of 4:1 or better, unless otherwise noted on the Supplemental Report. Uncertainties have been estimated at a 95 percent confidence level (k=2). Calibration at a 4:1 TUR (or greater) provides reasonable confidence that the instrument is within the stated tolerances. For measuring instruments in order to consider the contribution to the uncertainty from reproducibility of the unit under test (UUT), add 0.6 of the UUT's least significant digit to the reported uncertainty. For mass calibrations, conventional mass referenced to 8.0 g/cm³.

Any number of factors can cause a unit to drift out of tolerance at any time following its calibration. Limitations on the use of this instrument are defined in the OEM's operating instructions.

Notes:

Calibrated At: 14058 SW Millon Ct
Portland, OR 97224
By: Josina Jaquith
Digitally Signed On January 11, 2013

Facility: Transcat
14058 SW Millon Ct
Portland, OR 97224
503-598-8700

Lab Manager: Mary Jaso
Date: January 11, 2013
Digitally Signed By: Drake Dunning for



TRANSCAT[®] CALIBRATION SERVICES

SUPPLEMENTAL REPORT FOR 2-B3732-21-1

CALIBRATION LAB DATA AS FOUND / AS LEFT

Service Order Nbr: 2-B3732-21-1

Description: Moisture Content Standard

Serial: None

Customer: INTERTEK

Calibrated: 1/11/2013

Date Due: 1/11/2014

Service Type: R6

Mfg: Delmhorst Instrument Co.

Model: MCS-1

PO Nbr: USA20-0000208799

ID Nbr: 19701

Calibration Proc: 1-AC32637-0

Description	Setpoints	Accuracy	Low Limit	High Limit	As Found / As Left	Q	Uncertainty (k=2, $\pm$)	TUR
Resistance 4 Wire Comp Source								
Resistance Source	1.100MOhm	$\pm 10\%$ Rdg)	0.990	1.210	1.095 MOhm			
	120.0MOhm	$\pm 10\%$ Rdg)	108.0	132.0	121.2 MOhm			

As Found and As Left Data recorded on 1/11/2013

Temperature: 71.4°F / 21.9°C

Relative Humidity: 36%

Temp/RH Asset: 1012W

Asset	Manufacturer	Model	Description	Cal Date	Due Date	Traceability Numbers
822W	Agilent	3458A Opt 002	Digital Multimeter, 8.5 Digit	12/23/2012	12/31/2013	5-B2546-1-1

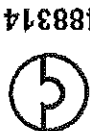
The reported uncertainty is the uncertainty of the calibration process for measuring instruments and 0.6 of the least significant digit to the reported uncertainty to obtain the measurement uncertainty of the unit under test at the specified point.

Reported resolution of the UUT does not represent calibration uncertainty or accuracy of the UUT.

Field not applicable.

Calibration Lab Data Report - Page 1 of 1

Service Order Nbr: 2-B3732-21-1



Cert. No.: 4198-4488314

Calibration complies with ISO/IEC
17025, ANSI/NCSL Z540-1, and 9001



Certification
Certificate No. 1750.01

Traceable® Certificate of Calibration for Hand Held Barometer

Manufactured for and distributed by: VWR International, LLC, Radnor Corporate Center, Bldg 1, Ste 200, 100 Matsonford Road, Radnor, PA 19087

Instrument Identification:

Model: 61161-398 S/N: 122400624 Manufacturer: Control Company

Standards/Equipment:

Description	Serial Number	Due Date	NIST Traceable Reference
Digital Barometer	D4540001	8/16/12	1000302796
Digital Thermometer	41334977/41335607	9/14/12	4000-3893288

Certificate Information:

Technician: 67 Procedure: CAL-32 Cal Date: 7/17/12 Cal Due: 7/17/14
Test Conditions: 25.5°C 43.0 %RH 1015 mbar

Calibration Data: (New Instrument)

Units)	Nominal	As Found	In Tol	Nominal	As Left	In Tol	Min	Max	±U	TUR
mbar	N.A.			652.00	647	Y	644	660	1.20	>4:1
mbar	N.A.			760.20	747	Y	742	768	1.20	>4:1
mbar	N.A.			1,013.20	1,011	Y	1,005	1,021	1.20	>4:1
°C	N.A.			26.265	26.1	Y	24.3	26.3	0.161	>4:1

This instrument was calibrated using instruments traceable to National Institute of Standards and Technology.

A Test Uncertainty Ratio of at least 4:1 is maintained unless otherwise stated and is calculated using the expanded measurement uncertainty. Uncertainty evaluation includes the instrument under test and is calculated in accordance with the ISO "Guide to the Expression of Uncertainty in Measurement" (GUM). The uncertainty represents an expanded uncertainty using a coverage factor k=2 to approximate a 95% confidence level. In tolerance conditions are based on test results falling within specified limits with no reduction by the uncertainty of the measurement. The results contained herein relate only to the item calibrated. This certificate shall not be reproduced except in full, without written approval of Control Company.

Accuracy: ±(Max-Min)/2; Min = As Left Nominal (Rounded); Tolerance; Max = As Left Nominal (Rounded) + Tolerance; ±U = Expanded Measurement Uncertainty; TUR = Test Uncertainty Ratio; Measurement = Standard's Reading; As Left = Instrument's Reading; In Tol = In Tolerance; Min/Max = Acceptance Range; ±U = Expanded Measurement Uncertainty; Date = MMBDDYY

Nicol Rodriguez, Quality Manager

Wallace Berry, Technical Manager

Maintaining Accuracy:

In our opinion once calibrated your Hand Held Barometer should maintain its accuracy. There is no exact way to determine how long calibration will be maintained. Hand Held Barometers change little, if any at all, but can be affected by aging, temperature, shock, and contamination.

Recalibration:

For factory calibration and re-certification traceable to National Institute of Standards and Technology contact Control Company.

CONTROL COMPANY 4455 Rex Road Friendswood, TX 77546 USA
Phone 281 482-1714 Fax 281 482-9448 service@control3.com www.control3.com
Control Company is an ISO 17025:2005 Calibration Laboratory Accredited by (A2LA) American Association for Laboratory Accreditation, Certificate No. 1750.01.
Control Company is ISO 9001:2008 Quality Certified by (DNV) Det Norske Veritas, Certificate No. CERT-01505-2006-AQ-110U-FVA
International Laboratory Accreditation Cooperation (ILAC) - Multilateral Recognition Arrangement (MRA).

Page 1 of 1

Traceable® is a registered trademark of Control Company

© 2009 Control Company



NVLAP LAB CODE

200886-0

CERTIFICATE OF CALIBRATION



Customer: INTERTEK
22887 NE TOWNSEND WAY
FAIRVIEW, OR 97024
PO Box: USA20-0000208799
Date Received: December 05, 2012
Date Completed: December 14, 2012
Due Date: December 14, 2013
Model Nbr: 1430
Manufacturer: Dwyer Instruments Inc.
Cert/ISO Nbr: 2-B269F-41-1
Description: Microtector
Serial Nbr: B49U
ID Nbr: 19673
Unit Barcodes: 901B0055114

Calibrated To: Manufacturer Specification
Calibration Proc: J-AC15388-2
Item Received: In Tolerance
Item Returned: In Tolerance

For calibration data, see Supplemental Report for SO Nbr 2-B269F-41-1

TRANSCAT Calibration Laboratories have been audited and found in compliance with ISO/IEC 17025:2005. Accredited calibrations performed within the Lab Scope of Accreditation are indicated by the presence of the Accredited Body Logo and Certificate Number on this Certificate of Calibration. Any measurements on an accredited calibration not covered by that Lab Scope are listed in the notes section of the certificate. This report must not be used to claim product certification approval, or endorsement by NVLAP, NIST, or any agency of the Federal Government.

TRANSCAT calibrations as applicable are performed in compliance with the requirements of ISO 9001:2008, ISO TS16949, ANSI/ISO Z540-1994, and ISO 10012-1992. When specified contractually the requirements of ISO/IEC 17025:2005, App. B and NQA-1 are also covered.

The certificate includes no less than an unbiased chain of comparison realization of SI units measurement uncertainty, competency, periodic recertification and measurement assurance. TRANSCAT documents the usability of measurement to the SI units through the National Institute of Standards and Technology (NIST) or the National Research Council of Canada (NRC), or other recognized national measurement institutes (NMI) or international standard bodies or to measurement conditions created in our laboratory, or accepted Fundamental and/or natural physical constants ratio type of calibration or by comparison to consensus standards. The specific path or traceability for the reported measurement result is maintained at the TRANSCAT facility and is available to the client for review.

Complete records of work performed are maintained by TRANSCAT and are available for inspection. Laboratory standards used in the performance of this calibration are shown on the Supplemental Report. The results in this report relate only to the item calibrated or tested and the determination of in or out of tolerance is specific to the model and no reference above based on the tolerances shown on the supplemental report; these tolerances are either the original equipment manufacturer's (OEM's) warranted specifications or the client's requested specifications.

This applied uncertainty is the uncertainty of the calibration process. The Test Uncertainty Ratio (TUR) is calculated as per NCSL International R19, section 2. All calibrations have been performed using procedures having a TUR of 4:1 or better, unless otherwise noted on the Supplemental Report. Users should note that the confidence level is 95 percent confidence level (95% CL). Calibration at a 4:1 TUR (or greater) provides reasonable confidence that the instrument is within the stated tolerances. For measuring instruments in order to consider the confidence to the uncertainty from reproducibility of the unit under test (UUT), add 0.6 of the UUT's least significant digit to the reported uncertainty. For mass calibrations, conventional mass reference is used to 0.01 g/m³.

Any number of factors can cause a unit to drift out of tolerance at any time following its calibration. Limitations on the uses of this instrument are detailed in the OEM's operating instructions.

Notes:

Calibrated At:
14058 SW Million Ct
Portland, OR 97224
By: Greg Gille
Digitally Signed On December 14, 2012

Facility Representative:
14058 SW Million Ct
Portland, OR 97224
503-598-8700

Marc Jaso
Lab Manager

Digitally Signed By Drake Dunning for
Date: December 14, 2012

Revision 0

This certificate may not be reproduced except in full without the written approval of TRANSCAT. Additional information, if applicable, may be included on separate report(s).



SUPPLEMENTAL REPORT FOR 2-B269F-41-1

CALIBRATION LAB DATA AS FOUND / AS LEFT

Service Order Nbr: 2-B269F-41-1
Description: Micrometer
Serial: E49U
Customer: INTERTEK
Calibrated: 12/14/2012
Date Due: 12/14/2013
Service Type: R6

Mfg: Dwyer Instruments Inc.
Model: 1430

PO Nbr: USA20-0000208799
ID Nbr: 19673
Calibration Proc: 1-AC15388-2

Description	Setpoints	Accuracy	Low Limit	High Limit	As Found / As Left	Q	Uncertainty (k=2, ±)	TUR
Length Measure								
Linearity	0.2100in	±(0.0002 in)	0.2098	0.2102	0.2100 in			
	0.4200in	±(0.0002 in)	0.4198	0.4202	0.4200 in			
	0.6050in	±(0.0002 in)	0.6048	0.6052	0.6050 in			
	0.8150in	±(0.0002 in)	0.8148	0.8152	0.8150 in			
	1.0000in	±(0.0002 in)	0.9998	1.0002	1.0000 in			
Function Check								
Meter Deflection			P	P	P			

The reported uncertainty is the uncertainty of the calibration process. For measuring instruments add 0.6 of the least significant digit to the reported uncertainty to obtain the measurement uncertainty of the unit under test at the specific test point.

Reported resolution of the UUT does not represent calibration uncertainty or accuracy of the UUT.

Field not applicable.



TRANS-CAT[®] CALIBRATION SERVICES

SUPPLEMENTAL REPORT FOR 2-B269F-41-1

CALIBRATION LAB DATA AS FOUND / AS LEFT

Description	Setpoints	Accuracy	Low Limit	High Limit	As Found / As Left	8 1	Uncertainty (k=2, $\pm$)	TUR
-------------	-----------	----------	-----------	------------	--------------------	--------	---------------------------	-----

As Found and As Left Data recorded on 12/14/2012

Temperature: 67.8°F / 19.9°C

Relative Humidity: 42%

Temp/RH Asset: 1015W

Asset	Manufacturer	Model	Description	Cal Date	Due Date	Traceability Numbers
1101W	SPI	10-616-1	Gage Block Set, 12 pcs.	9/11/2012	9/30/2013	604572-1 & 604572-2
495W	Starrett	\$0728	AA Granite Surface Plate	11/4/2008	11/4/2013	R111528

The reported uncertainty is the uncertainty of the calibration process. For measuring instruments sold 0.6 of the least significant digit to the reported uncertainty to obtain the measurement uncertainty of the unit under test at the specified point.

Reported resolution of the UUT does not represent calibration uncertainty or accuracy of the UUT

Field not applicable.

Appendix E

Sample Calculations

Equations and Sample Calculations - Method 5G

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

BR	Dry burn rate, kg/hr
m _a	Total particulate matter collected, mg
V _{m(sld)}	Volume of gas sampled corrected to standard conditions, dscf
V _s	Average dilution tunnel gas velocity, ft/sec
C _p	Particulate concentration, g/dscf
Q _{sd}	Average dilution tunnel gas flow rate, dscf/min
E	Particulate emission rate, lbs/hr
PR	Proportional rate variation, %

Dry Burn Rate

Using equation 28-3:

$$BR = \frac{60 \times W^{wd}}{100 - \%M_v} \times \frac{\theta}{100}$$

Where,

- BR = Dry burn rate, lb/hr
- W^{wd} = Mass of wood burned (wet basis) during test run, lb
- θ = Total time of test run, minutes
- $\%M_v$ = Average moisture content of test fuel charge, wet basis percent

Sample Calculation:

Dry basis moisture of fuel = 20.03%

Using the equation 28-2 for converting dry basis moisture to wet basis moisture,

$$\%M_v = \frac{20.03 \times 100}{20.03 + 100}$$

$$\%M_v = 16.69\%$$

The wet weight of the fuel charge was 7.8 pounds. Converting pounds to kilograms yields a weight of 3.538 kg. The run time for this run was 180 minutes. Therefore, the burn rate equation appears thus:

$$BR = \frac{60 \times 3.538 \times (100 - 16.69)}{180 \times 100}$$

$$BR = 0.98 \text{ kg/hr} = 2.17 \text{ lb/hr}$$

Volume of Gas Sampled Corrected to Dry Standard Conditions

Using equation 5-1:

$$V_{m(std)} = V_m \times Y \times \left(\frac{P_{std}}{P_b} \right) \times \frac{T_m}{\left(P_b + \frac{\Delta H}{13.6} \right)}$$

Where:

K	=	17.64 °R/in. Hg
T ^{std}	=	528 °R
P ^{std}	=	29.92 in. Hg
V _m	=	Volume of gas sample measured at the dry gas meter, ccf
Y	=	Dry gas meter calibration factor, dimensionless
P _b	=	Barometric pressure at the testing site, in. Hg
ΔH	=	Average pressure differential across the orifice meter, in. H ₂ O
T _m	=	Absolute average dry gas meter temperature, °R

Sample Calculation:

$$V_{m(std)} = 98.434 \times 1.01 \times \left(\frac{528}{29.92} \right) \times \frac{30.03 + \frac{13.6}{0.7}}{532.5}$$

$$V_{m(std)} = 99.116 ft^3$$

Dilution Tunnel Gas Velocity

Using equations 2-7 and 2-6, calculated at each recorded interval:

$$v_s = k_p \times C_p \times \sqrt{\Delta P} \times \sqrt{\frac{T_s^{(avg)}}{P_s \times M_s}}$$

$$M_s = M_d \times (1 - B^{ws}) + 18.0 \times B^{ws}$$

Where:

$$v_s = \text{Average dilution tunnel gas velocity, ft/sec}$$

$$k_p = \text{Pitot tube constant: } 85.49 \frac{\text{ft}}{\text{sec}} \left[\frac{(\text{lb/lb-mole}) \times (\text{inches Hg})^{\frac{1}{2}}}{(\text{inches Hg}) \times (\text{inches Hg})} \right]$$

$$C_p = \text{Pitot tube coefficient (0.99 for standard pitot tube; 0.84 may be used for S-type pitot tubes constructed according to Method 2 procedures), unless } \Delta P \text{ measured during the pre-test flow traverse of the dilution tunnel; the square root of the } \Delta P \text{ values are averaged for this calculation, in, H}_2\text{O}$$

$$P_b = \text{Barometric pressure at test site, in. Hg}$$

$$P_s = \text{Static Pressure of tunnel, in. Hg}$$

$$P_t = \text{Absolute tunnel pressure, } = P_b + P_s$$

$$M_s = \text{Molecular weight of tunnel gas; assume } M_d = 29 \text{ lb/lb-mole (per method 5G)}$$

$$B^{ws} = \text{Moisture content of dilution tunnel gas, ratio; assume 4% (per method 5G)}$$

$$T_s = \text{Dilution tunnel temperature, } ^\circ\text{R; } (^{\circ}\text{R} = ^\circ\text{F} + 460)$$

Sample calculation:

$$M_s = 29 \times (1 - 0.04) + 18.0 \times 0.04 = 28.56$$

$$v_s = 85.49 \times 0.99 \times \sqrt{0.0351} \times \sqrt{\frac{(548)}{(30.03 + \frac{-0.45}{13.6}) \times (28.56)}} = 12.69 \frac{\text{ft}}{\text{sec}}$$

Particulate Concentration

Using equation 5G-2:

$$C_s = 0.001 \frac{g}{m^3} \times \frac{V_{m(std)}}{m_n}$$

Where:

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

Sample calculation:

$$C_s = \frac{99.116}{0.001 \times 16.2}$$

$$C_s = 0.000163 \text{ g/dscf}$$

Average Dilution Tunnel Gas Flow Rate

Using equation 2-8, calculated at each recorded interval:

$$\bar{Q}_{sd} = 3600 \times (1 - B^{ws}) \times v_s \times A \times \frac{T_{sd}}{T_s} \times \frac{P_s}{P_{sd}} \times \frac{T_{s(avg)}}{T_{sd}}$$

Where:

$\bar{Q}_{sd}$	=	Gas flow rate corrected to dry, standard conditions, dscf/hr
3600	=	Conversion from seconds to hours
B^{ws}	=	Moisture content of dilution tunnel gas, ratio; assume 4% (per method 5G)
v_s	=	Average dilution tunnel gas velocity, ft/sec
A	=	Cross sectional area of dilution tunnel, ft ²
T_{sd}	=	Standard absolute temperature, 538°R
$T_{s(avg)}$	=	Average absolute dilution tunnel temperature, °R, (°R = °F + 460)
P_b	=	Barometric pressure at test site, in. Hg
P_g	=	Dilution tunnel static pressure, in. Hg
P_s	=	Absolute dilution tunnel gas pressure, in Hg, (Hg = $P_b + P_g$)
P_{sd}	=	Standard absolute pressure, 29.92 in Hg

Sample calculation:

$$\bar{Q}_{sd} = 3600 \times (1 - 0.04) \times 12.69 \times \frac{144}{(\pi \times 3^2)} \times \frac{548}{528} \times \frac{30.03 + \frac{13.6}{-0.45}}{29.92}$$

$$\bar{Q}_{sd} = 8313.36 \text{ dscf/hr} = 138.56 \text{ dscf/min}$$

Particulate Emission Rate

Using equation 5G-3 and 5G-4:

$$E = C_s \times Q_{sd}$$

$$E_{adj} = K_3 \times E_{0.83}$$

Where:

E	=	Particulate emission rate, g/hr
E_{adj}	=	Particulate emission rate, adjusted, g/hr
C_s	=	Concentration of particulate matter in the stack, corrected to dry, standard conditions, g/dscf
Q_{sd}	=	Average dilution tunnel gas flow rate, dscf/hr
K_3	=	Constant, 1.82 for metric units, 0.643 for English units

Sample calculation:

$$E = 0.000163 \times 8313.36$$

$$E = 1.36 \text{ g/hr}$$

$$E_{adj} = 1.82 \times 1.36_{0.83}$$

$$E = 2.35 \text{ g/hr}$$

Proportional Rate Variation

Using equation 5H-9, calculated at each recorded interval:

$$PR = \frac{\theta \times (V_m^m \times V_s^s \times T_m^m \times T_{sl}^s)}{10 \times (V_m^m \times V_{sl}^s \times T_s^s \times T_m^m)} \times 100$$

Where:

PR	=	Percent proportional rate
θ	=	Time of test, min
S_i	=	Measured tracer gas concentration for the " i^{th} " interval, in this case, the inverse of the calculated flow in the stack based on CO_2 concentrations in the stack and in the dilution tunnel
$V_{m(sl)}$	=	Volume of gas sample measured by the dry gas meter during the " i^{th} " 10 minute interval, dscf
V_m	=	Volume of gas sample as measured by dry gas meter, dscf
V_{sl}	=	Average gas velocity in the dilution tunnel during each 10 minute interval, i , of the test run, m/sec
V_s	=	Average gas velocity in the dilution tunnel, m/sec
T_{ml}	=	Absolute average dry gas meter temperature during each 10 minute interval, i , of the test run, $^{\circ}R$
T_m	=	Absolute average dry gas meter temperature, $^{\circ}R$
T_{sl}	=	Absolute average gas temperature in the dilution tunnel during each 10 minute interval, i , of the test run, $^{\circ}R$
T_s	=	Absolute average gas temperature in the dilution tunnel, $^{\circ}R$

Sample calculation (for the reading at 50 minutes into test run 1):

$$PR = \frac{180 \times 5.6 \times 12.69 \times 533 \times 552}{10 \times 98.434 \times 12.63 \times 548 \times 532} \times 100$$

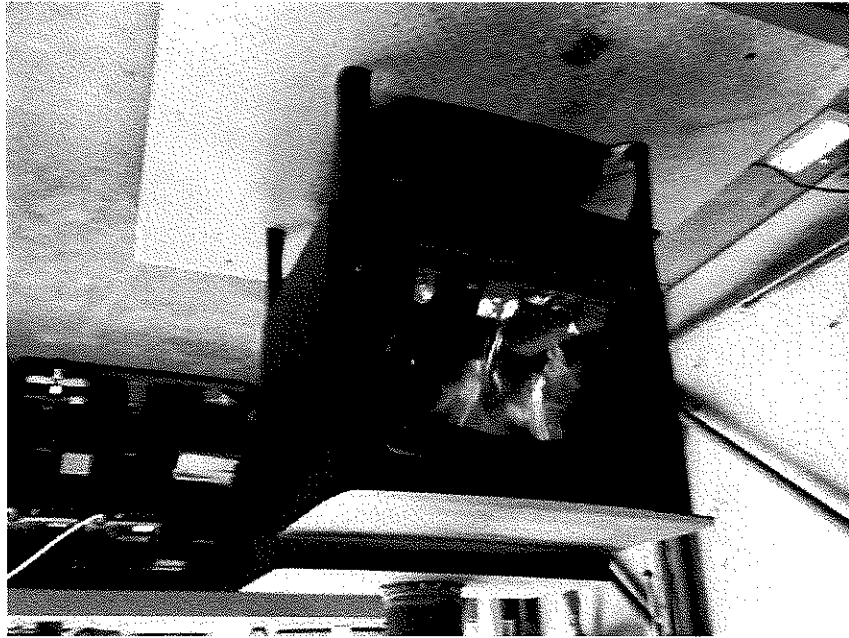
$$PR = 103.8\%$$

Appendix F

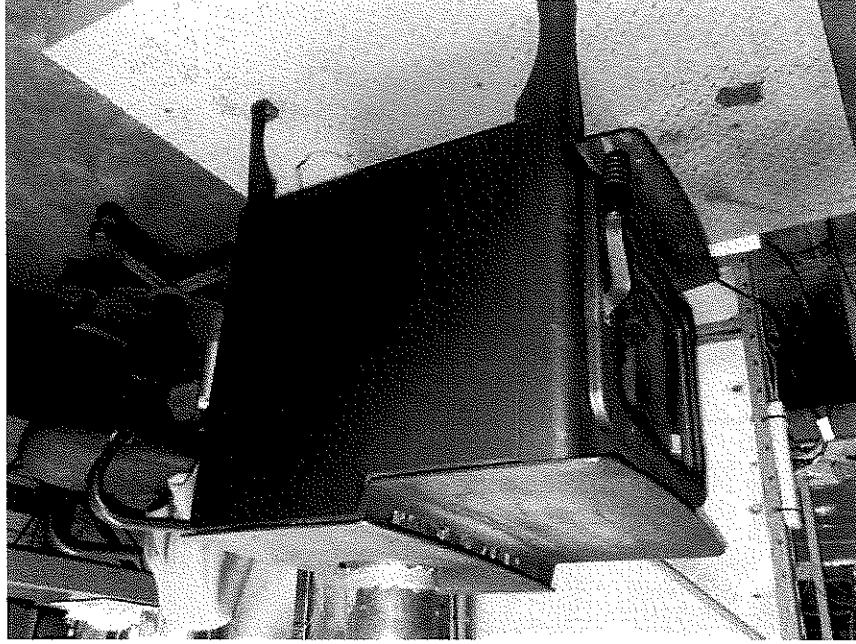
Test Data

Lennox Hearth Products
Grand View 300
G101161435

Stove Photos



Front view



Side view

8/27/2010

V1.1

2

2=noncat
3=pellet

Ave.

(K)

Totals:	1.7032	5.2685	122.76
---------	--------	--------	--------

10

Approximate Air and Blower settings for Grandview 300 emission testing.

- Low/Medium Low Burn Rate
 - Warm stove to equilibrium (approx. 560 deg. F).
 - Start Pre-burn.
 - Pre-burn damper setting should be 3.5" down, from full open.
 - Pre-burn fan setting should be run for the full duration of pre-burn at the 8 o'clock position.
 - Start test run at with an approx. Delta-T of 335 deg F.
 - Fan should be turned off at start of test.
 - Turn fan to 5 o'clock position at 25 minutes into test run.
- Medium High Burn Rate
 - Warm stove to equilibrium (approx. 560 deg. F).
 - Start Pre-burn.
 - Pre-burn damper setting should be 3" down, from full open.
 - Pre-burn fan setting should be run for the full duration of the pre-burn on the high setting.
 - Start test run.
 - Fan should be turned off at start of test.
 - Turn fan to High setting, after door is closed upon test start.
- High Burn Rate
 - Warm stove to equilibrium (approx. 560 deg. F).
 - Start Pre-burn.
 - Pre-burn damper setting should set to full open.
 - Pre-burn fan setting should be run for the full duration of the pre-burn on the high setting.
 - Start test run.
 - Fan should be turned off at start of test.
 - Turn fan to High setting, after door is closed upon test start.

TEST RESULTS
EPA METHOD 5G-3

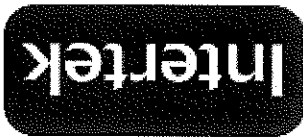


Project Number: G101161435
 Manufacturer: Lennox
 Model: GV 300
 Sample ID Number: PRT1305240718-001
 Test Date: 13-May-13
 Test Run Number: 1

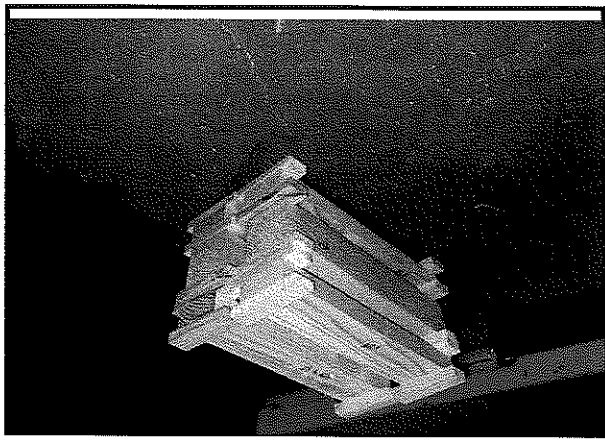
1.43	Dry Burn-Rate, kg/hr:	
1.76	Emission-Rate, g/hr:	
2.91	Adjusted Emission-Rate, g/hr:	
Duration of Test, Minutes		
300		
Dry Gas Meter Standardization		
Train A	Train B	
0	0	Dry Gas Meter Beginning Reading, ft ³
46.421	46.471	Dry Gas Meter Ending Reading, ft ³
1.004	1.004	Barometric Pressure Correction Factor
0.995	0.995	Dry Gas Meter Calibration Factors (Y factors)
0.984	0.981	Dry Gas Meter Temperature Factors
1.001	1.001	Dry Gas Meter Delta-H Correction Factors
45.555	45.638	Dry Gas Meter STD Volume Sampled, ft ³
Dilution Tunnel Flow / Volume		
Standardized Tunnel Flow, dscfm		
139.806		
Total Tunnel Volume, scf		
41941.671		
Emission Calculations		
Train A	Train B	
920.673	919.001	Sample Ratios (Total Tunnel Volume / Total Sample Volume)
9.5	9.6	Sample Particulate Mass, mg
8.746	8.822	Total Emissions, grams
1.75	1.76	Emission-Rate, g/hr
2.89	2.92	Adjusted Emission Rates, g/hr
Deviation, %		
0.00		
0.01		
0.28%		
Operating Parameters		
Train A	Train B	
81.3274918	81.3879318	Max Filter Temperature, °F
0.006@4	0.004@2	Post-Test Leak Check, cfm @ in. Hg vac.
Average Firebox Surface Temperature delta-T, °F		
75.9630742		
79		Maximum Ambient Temperature, °F
73		Minimum Ambient Temperature, °F
Fuel Properties		
19.40	22.82	Wet Fuel Load Weight, lb.
18.58	19.40	Dry-Basis Fuel Load Moisture Content, %
3.90	4.80	Wet-Basis Fuel Load Moisture Content, %
4.3313098		Actual Coal Bed, lb.

Test Engineer:

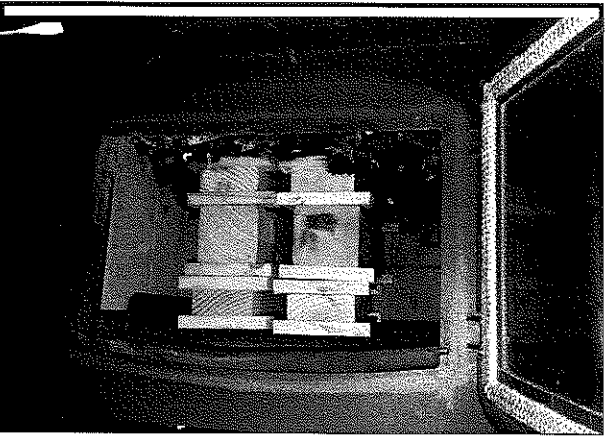
Date: 5/13/13



PROJECT / TEST INFORMATION	
Project Number:	G101161435
Manufacturer:	Lennox
Model:	GV 300
Sample ID Number:	PRT1305240718-001
Test Date:	13-May-13
Test Run Number:	1
Date tunnel cleaned:	5/10/2013
Purpose of Test	Certification



Appliance Information		
Appliance Type:	2	1 - Catalytic 2 - Non - Catalytic 3 - Pellet 4 - Hydronic
Firebox Volume, ft ³ :	2.92	N/A for pellet type
Convection Blower	2	1 - No Fan 2 - Fan Optional 3 - Fan Standard



Test Settings	
Primary Air:	3" from full open to top of air rod.
Secondary Air:	Fixed
Control Board:	NA
Blower/Fan:	On High
Pre-Burn Activities	
Time	Activity
Coal bed was leveled at 102 mintes	
Start-Up Procedure	
Loading of fuel, sec. : Fuel loaded by 60 seconds	
Fuel-loading door : Closed at 3:00	
Primary air: Fully open until 4:45 then slowly set to 3" from full open by 5:00	
Secondary air: fixed	
Control board: NA	
Blower / fan: Blower on high at 10 minutes	
Other Notes	

Test Engineer: *BB*

Date: *6/4/13*

Project Number: G101161435	Manufacturer: Lennox	Model: GV 300	Sample ID Number: PRT1305240718-001	Test Date: 13-May-13	Test Run Number: 1
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Firebox Volume, ft ³ :	2.92
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Calibration Reference ID	Set meter to Species 1	Set Temperature to 70F	Set pin setting to 444
	12%	22%	22.0

PRE-BURN FUEL PROPERTIES			
Eq. ID No.:	Time:	Temp., °F:	67
Piece No.	Length, In.	Weight, Lb.	Moisture, %, Dry Basis
1	17.00	19.2	19.4
2		18.2	22.4
3			18.9
4			
5			
6			
7			
8			
9			
10			
11			
12			
Total Weight		0.0	Average, %db
			20.5

TEST FUEL LOAD PROPERTIES			
Eq. ID No.:	Time:	Temp., °F:	70
Piece No.	Length, In.	Weight, Lb.	Moisture, %, Dry Basis
1	4.90	22.4	23.1
2	5.00	24.4	23.1
3	2.50	22.4	23.4
4	2.20	23.3	21.7
5	2.60	23.0	24.2
6	2.20	22.1	22.0
7			
8			
Totals		9.5	9.9
% of Weight		49	51
Total weight, wet, lb.		19.40	
Total weight, dry, kg		7.16	
Average Moisture, dry		22.82	
Average Moisture, wet		18.58	



Project Number:	G101161435
Manufacturer:	Lennox
Model:	GV 300
Sample ID Number:	PRT1305240718-001
Test Date:	13-May-13
Test Run Number:	1

Average Firebox Temp, °F	322.216
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Final Coal Bed Wt, lb	4.33131
-----------------------	---------

Coal Bed Range	3.9	to	4.8
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EPA Method 28
Pre Burn Data

Duration, Minutes	Room	Dilution Tunnel	Flue Gas	Firebox Top	Firebox Bottom	Firebox Back	Firebox Left	Firebox Right	Catalyst Outlet	Flue Draft	Fuel Weight	Weight Loss	Temperature Data									
0	73	162	694	942	171	528	509	528		-0.09	13.70	9.37										
10	73	135	565	883	191	504	486	505		-0.09	11.66	2.04										
20	74	135	592	938	195	485	469	485		-0.09	9.45	2.21										
30	75	130	554	833	225	322	480	499		-0.08	7.22	2.23										
40	75	114	449	684	234	267	486	510		-0.07	5.88	1.33										
50	75	103	347	491	234	253	481	509		-0.06	5.50	0.39										
60	75	97	296	382	236	242	473	501		-0.05	5.23	0.27										
70	75	94	267	331	234	234	460	490		-0.05	5.01	0.21										
80	75	92	251	307	234	228	447	480		-0.04	4.78	0.23										
90	75	91	240	294	235	222	435	470		-0.04	4.57	0.22										
100	74	89	230	282	233	213	421	462		-0.04	4.33	0.24										

Test Engineer:

Date: 5/14/13

Project Number:	G101161435
Manufacturer:	Lennox
Model:	GV 300
Sample ID No:	PRT1305240718-001
Test Date:	13-May-13
Test Run No:	1

Temperature Data

Firebox Temp Start	316.127
Firebox Temp End	240.164
Firebox Delta-T	76.0
Max Filter Temps	Train A 81.3275
	Train B 81.3879

Interval		10	Duration of Test, Min		300	Temperature Data												Time	
Interval	Duration	0	73	90	227	269	233	213	317	378	406	451	Catalyst Outlet	Train A Filter	75	73	77	76	76
		1	10	73	301	360	213	317	378	406	451	451	Firebox Right	Train A Filter	75	73	77	76	76
		2	20	74	106	401	492	216	182	353	384	384	Firebox Left	Train B Filter	78	77	76	76	75
		3	30	74	115	468	596	207	159	336	371	371	Firebox Back	Train B Filter	79	80	76	76	75
		4	40	74	122	506	683	199	158	344	378	378	Firebox Bottom	Train A Filter	81	81	77	76	75
		5	50	75	122	495	687	193	163	368	398	398	Firebox Top	Train A Filter	81	81	77	76	76
		6	60	75	117	439	607	190	174	393	423	423	Flue Gas	Train A Filter	81	81	77	76	76
		7	70	75	114	420	549	184	186	407	442	442	Dilution Tunnel	Train A Filter	80	80	77	76	76
		8	80	76	109	387	506	180	197	417	456	456	Room	Train A Filter	80	80	77	76	76
		9	90	76	106	365	466	176	206	419	463	463		Train A Filter	80	80	77	76	76
		10	100	78	104	350	441	174	212	420	466	466		Train A Filter	80	80	77	76	76
		11	110	78	102	330	411	178	220	421	467	467		Train A Filter	80	80	77	76	76
		12	120	77	100	323	397	177	228	416	466	466		Train A Filter	80	80	77	76	76
		13	130	78	98	309	378	180	234	412	466	466		Train A Filter	80	80	77	76	76
		14	140	78	96	298	360	181	238	410	468	468		Train A Filter	80	80	77	76	76
		15	150	76	94	273	331	181	241	404	473	473		Train A Filter	79	79	77	76	76
		16	160	77	92	254	303	182	248	400	473	473		Train A Filter	79	79	77	76	76
		17	170	77	91	240	283	186	250	395	467	467		Train A Filter	79	79	77	76	76
		18	180	77	90	232	270	189	248	389	458	458		Train A Filter	79	79	77	76	76
		19	190	77	89	226	262	193	244	381	451	451		Train A Filter	78	78	77	76	76
		20	200	76	88	217	251	194	233	373	443	443		Train A Filter	78	78	77	76	76
		21	210	76	88	208	239	197	216	358	431	431		Train A Filter	78	78	77	76	76
		22	220	76	87	200	228	196	201	342	416	416		Train A Filter	78	78	77	76	76
		23	230	76	86	194	221	202	190	329	401	401		Train A Filter	77	77	77	76	76
		24	240	76	85	191	216	204	183	316	391	391		Train A Filter	77	77	77	76	76
		25	250	77	85	188	213	205	179	308	382	382		Train A Filter	77	77	77	76	76
		26	260	77	85	186	210	207	176	304	373	373		Train A Filter	77	77	77	76	76
		27	270	79	85	184	208	205	173	300	365	365		Train A Filter	76	76	78	78	77
		28	280	76	84	181	205	205	171	296	359	359		Train A Filter	76	76	78	78	76
		29	290	77	84	179	201	205	168	291	352	352		Train A Filter	76	76	78	78	76
		30	300	76	83	178	199	203	167	286	347	347		Train A Filter	76	76	78	78	76

Test Engineer: *[Signature]*

Date: 5/22/13



TEST DATA
EPA METHOD 5G-3

Gas Particulate Sampling Data

Project Number: G101161435
Manufacturer: Lennox
Model: GV 300
Sample ID Number: PRT1305240718-001
Test Date: 13-May-13
Test Run Number: 1

Barometer, In. Hg	RH, %	Sample Box Correction (Y) Factors
Start 30.00		Meter Box (A) 0.995
End 30.05		Meter Box (B) 0.995
Duration of Test Min		
300		

Leak Check, cfm @ In Hg	0.006@4	0.004@2
Train A		
Train B		

Maximum Vacuum	
Train A	0.00
Train B	0.00

Time	Particulate Sampling Data									
	Tunnel	Train A	Train B	Delta-H	Flue	Fuel	Weight	Loss	Volume	Volume
0	0.043	0.32	0.33	-0.040	19.40	19.40	19.40	0.000	0.000	0.000
10	0.043	0.31	0.34	-0.059	18.71	0.69	1.564	1.547	101.47	100.43
20	0.043	0.30	0.34	-0.072	17.27	1.44	3.128	3.094	102.27	101.18
30	0.043	0.33	0.32	-0.079	15.41	1.86	4.692	4.641	103.07	101.96
40	0.043	0.30	0.33	-0.081	13.25	2.16	6.256	6.188	103.60	102.50
50	0.043	0.30	0.33	-0.079	11.27	1.98	7.820	7.735	103.49	102.40
60	0.043	0.31	0.34	-0.073	9.71	1.56	9.384	9.282	102.98	101.89
70	0.043	0.31	0.35	-0.070	8.45	1.26	10.895	10.882	99.16	98.07
80	0.043	0.31	0.34	-0.066	7.34	1.10	12.285	12.290	90.84	92.08
90	0.043	0.31	0.34	-0.063	6.41	0.93	13.852	13.863	102.05	102.51
100	0.043	0.31	0.34	-0.061	5.60	0.81	15.396	15.424	100.23	101.41
110	0.043	0.30	0.35	-0.057	4.82	0.78	16.942	16.984	100.11	101.10
120	0.043	0.30	0.34	-0.057	4.16	0.66	18.477	18.518	99.21	99.24
130	0.043	0.30	0.34	-0.054	3.55	0.61	20.024	20.057	99.82	99.42
140	0.043	0.31	0.34	-0.053	3.04	0.51	21.662	21.685	105.56	105.04
150	0.043	0.31	0.34	-0.047	2.69	0.35	23.123	23.165	93.96	95.29
160	0.043	0.31	0.36	-0.043	2.45	0.24	24.687	24.711	100.41	99.38
170	0.043	0.32	0.34	-0.041	2.21	0.23	26.315	26.322	104.39	103.44
180	0.043	0.32	0.34	-0.038	2.00	0.21	27.806	27.810	95.50	96.43
190	0.043	0.31	0.35	-0.038	1.77	0.23	29.350	29.349	98.78	98.61
200	0.043	0.30	0.34	-0.037	1.58	0.19	30.919	30.915	100.34	100.30
210	0.043	0.31	0.36	-0.035	1.43	0.16	32.451	32.438	97.92	97.49
220	0.043	0.31	0.34	-0.033	1.26	0.17	34.008	33.997	99.44	99.72
230	0.043	0.32	0.35	-0.032	1.11	0.15	35.565	35.559	99.42	99.90
240	0.043	0.32	0.34	-0.031	0.92	0.19	37.160	37.150	101.82	101.73
250	0.043	0.31	0.34	-0.030	0.77	0.15	38.692	38.668	97.77	97.03
260	0.043	0.31	0.33	-0.030	0.60	0.16	40.237	40.208	98.60	98.43
270	0.043	0.31	0.35	-0.030	0.47	0.13	41.850	41.813	102.96	102.62
280	0.043	0.32	0.34	-0.029	0.32	0.15	43.357	43.325	96.18	96.65
290	0.043	0.31	0.34	-0.029	0.16	0.16	44.914	44.876	99.43	99.20
300	0.043	0.32	0.34	-0.029	0.00	0.16	46.471	46.421	99.42	98.79

Test Engineer:

Date: 5/14/13



Dilution Tunnel Velocity Traverse
EPA Method 5G-3

Project Number: G101161435
Manufacturer: Lennox
Model: GV 300
Sample ID Number: PRT1305240718-001
Test Date: 13-May-13
Test Run Number: 1

		Dilution Tunnel		Temp, °F	Square Root
		Delta P	In. H2O		
A1	0.0460	96	0.2145		
	0.0460	96	0.2145		
	0.0420	96	0.2049		
	0.0340	96	0.1844		
A Center	0.0500	96	0.2236		
B1	0.0380	95	0.1949		
B2	0.0460	95	0.2145		
B3	0.0460	95	0.2145		
B4	0.0340	95	0.1844		
B Center	0.0480	95	0.2191		
Averages	0.043	95.5	0.2033		

Tunnel Diameter	6.000	inches
Tunnel Static	-0.200	in. H2O
Tunnel Area	0.19635	ft ²
Pitot Correction	0.9186	factor
Baro. Pressure	30.00	
Pitot Factor	0.99	(0.99 for standard, 0.84 or Cal. For S-Type)
Initial Velocity	13.860	ft/ Sec
Initial Flow	149.33	ft ³ /min

Test Engineer:

Date: 5/22/13

DILUTION TUNNEL PARTICULATE CALCULATIONS

EPA Method 5G-3



Project Number: G101161435
 Manufacturer: Lennox
 Model: GV 300
 Sample ID Number: PRT1305240718-001
 Test Date: 13-May-13
 Test Run Number: 1

Intertek Equipment No.'s 19683, 19684

Sample Train - 1					
Sample Component	Component	ID Number	Final, mg	Tare, mg	Particulate, mg
A - Front Filter Catch	Filter	534	121		
B - Rear Filter Catch	Filter	535	120		
C - Seal Set	O-Ring				
Total, A+B+C-Tares			249.5	241	8.5
Probe & Filter Holder	Probe	24	125692.1	125691.1	1.0
			Total Particulate, mg		
			9.5		

Sample Train - 2					
Sample Component	Component	ID Number	Final, mg	Tare, mg	Particulate, mg
A - Front Filter Catch	Filter	536	120.2		
B - Rear Filter Catch	Filter	537	120.7		
C - Seal Set	O-Ring				
Total, A+B+C-Tares			249.5	240.9	8.6
Probe & Filter Holder	Probe	33	125732.5	125731.5	1.0
			Total Particulate, mg		
			9.6		

Test Engineer:

Date: 5/21/13

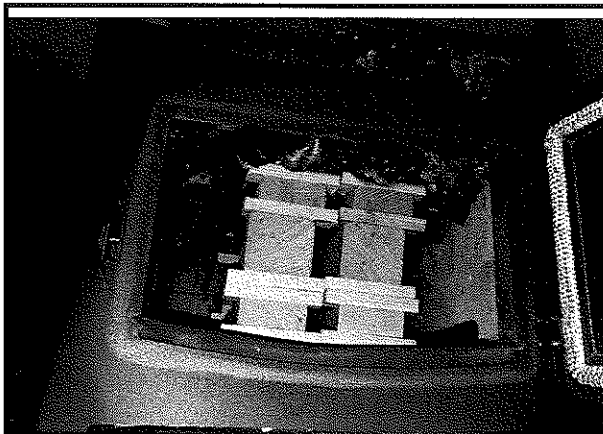
Project Number: G101161435
 Manufacturer: Lennox
 Model: GV 300
 Sample ID Number: PRT1305240718-001
 Test Date: 14-May-13
 Test Run Number: 2

Dry Burn-Rate, kg/hr:		0.94
Emission-Rate, g/hr:		1.66
Adjusted Emission-Rate, g/hr :		2.77
Duration of Test, Minutes		
467		
Dry Gas Meter Standardization		
Train A		Train B
Dry Gas Meter Beginning Reading, ft³		1.589
Dry Gas Meter Ending Reading, ft³		72.924
Barometric Pressure Correction Factor		1.009
Dry Gas Meter Calibration Factors (V factors)		0.995
Dry Gas Meter Temperature Factors		0.980
Dry Gas Meter Delta-H Correction Factors		1.001
Dry Gas Meter STD Volume Sampled, ft³		70.238
69.713		
Dilution Tunnel Flow / Volume		
Standardized Tunnel Flow, dsctm		
142.585		
Total Tunnel Volume, scf		
66587.239		
Emission Calculations		
Train A		Train B
Sample Ratios (Total Tunnel Volume / Total Sample Volume)		948.027
Sample Particulate Mass, mg		13.1
Total Emissions, grams		12.419
Emission-Rate, g/hr		1.60
Adjusted Emission Rates, g/hr		1.72
2.85		
Deviation, %		3.07%
0.04		
2.26%		
Operating Parameters		
Train A		Train B
Max Filter Temperature, °F		76.71
Post-Test Leak Check, cfm @ in. Hg vac.		0.008@6
0.011@6		
Average Firebox Surface Temperature delta-T, °F		119.59
Maximum Ambient Temperature, °F		77
Minimum Ambient Temperature, °F		73
Fuel Properties		
Wet Fuel Load Weight, lb.		19.70
Dry-Basis Fuel Load Moisture Content, %		22.48
Wet-Basis Fuel Load Moisture Content, %		18.35
Coal Bed Range, lb.		4.00
Actual Coal Bed, lb.		4.2

PROJECT / TEST INFORMATION	
Project Number:	G101161435
Manufacturer:	Lennox
Model:	GV 300
Sample ID Number:	PRT1305240718-001
Test Date:	14-May-13
Test Run Number:	2
Date tunnel cleaned:	5/10/2013
Purpose of Test	Certification



Appliance Information		
Appliance Type:	2	1 - Catalytic 2 - Non - Catalytic 3 - Pellet 4 - Hydronic
Firebox Volume, ft ³ :	2.92	N/A for pellet type
Convection Blower	2	1 - No Fan 2 - Fan Optional 3 - Fan Standard



Test Settings	
Primary Air:	Set at 3.5" from full open to the top of the control rod.
Secondary Air:	Fixed
Control Board:	NA
Blower/Fan:	Set at the 8 o'clock position on the dial
Pre-Burn Activities	
Time	Activity
At 85 minutes leveled coal bed.	
Start-Up Procedure	
Loading of fuel, sec.:	Loaded by 1:45
Fuel-loading door:	Closed by 4:30
Primary air:	Fully open until 4:45 then slowly set to test setting (full closed).
Secondary air:	Fixed
Control board:	NA
Blower / fan:	Off until 25 minutes then set a 5 o'clock position on the dial.
Other Notes	
At 7 hours opened door and re-arranged coals due to no weight loss in 10 minutes.	
Test was stopped at 7:47 due to a stable 0 reading for more than 30 seconds.	

Test Engineer: 

Date: 6/4/13

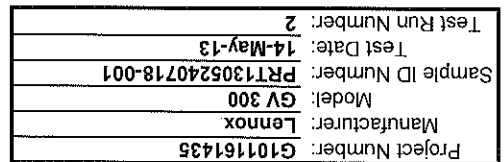
Project Number: G101161435	Manufacturer: Lennox	Model: GV 300	Sample ID Number: PRT1305240718-001	Test Date: 14-May-13	Test Run Number: 2
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Firebox Volume, ft ³ :	2.92
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Calibration Reference ID	Set meter to Species 1	Set Temperature to 70F	Set pin setting to 444
	12%	22%	22.0

PRE-BURN FUEL PROPERTIES			
Eq. ID No.:	Length, In.	Weight, Lb.	Moisture, %, Dry Basis
1	17.00	18.9	19.9
2	17.00	21.8	19.9
3			21.5
4			
5			
6			
7			
8			
9			
10			
11			
12			
Total Weight	0.0	Average, %db	20.2

TEST FUEL LOAD PROPERTIES			
Allowable Fuel Load Range: 18.4 to 22.4			
Eq. ID No.:	Time:	8:20	Temp., °F: 67
Piece No.	Length, In.	Weight, Lb.	Moisture, %, Dry Basis
1	17.00	2.40	21.7
2	17.00	2.40	21.2
3	17.00	2.60	23.8
4	17.00	2.50	22.4
5	17.00	4.90	22.1
6	17.00	4.90	21.6
7			
8			
Totals	9.9	9.8	
% of Weight	50	50	
Total weight, wet, lb.	19.70		
Total weight, dry, kg	7.30		
Average Moisture, dry	22.48		
Average Moisture, wet	18.35		



Coal Bed Range	4.0	to	4.9
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Average Firebox Temp, °F	335.187
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Final Coal Bed Wt, lb	4.2
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[illegible]

Date: 5/24/13



TEST DATA
EPA METHOD 5G-3

Project Number:	G101161435
Manufacturer:	Lennox
Model:	GV 300
Sample ID No:	PRT1305240718-001
Test Date:	14-May-13
Test Run No:	2

Temperature Data

Firebox Temp Start	335.187
Firebox Temp End	215.6
Firebox Delta-T	119.6
Max Filter Temps	
Train A	76.705
Train B	76.8807

Interval	10	Duration of Test, Min	467
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Time		Temperature Data																	
Interval	Duration	Room	Dilution Tunnel	Flue Gas	Firebox Top	Firebox Bottom	Firebox Back	Firebox Left	Firebox Right	Catalyst Outlet	Train A Filter	Train B Filter	Train A DGM	Train B DGM	72	73	74	75	76
0	0	74	91	242	377	166	309	406	417		72	72			72	73	74	75	76
1	10	74	93	255	380	160	355	378	397		74	74			74	75	76	77	78
2	20	73	95	325	543	163	323	340	363		75	75			75	76	77	78	79
3	30	73	98	356	623	185	239	319	343		76	76			76	77	78	79	80
4	40	74	99	369	625	175	192	312	336		76	76			76	77	78	79	80
5	50	74	101	384	648	159	186	313	337		76	76			76	77	78	79	80
6	60	74	102	387	661	161	193	324	347		76	76			76	77	78	79	80
7	70	76	99	352	600	164	203	339	360		77	77			77	78	79	80	81
8	80	75	97	328	552	151	213	351	370		77	77			77	78	79	80	81
9	90	76	95	307	515	149	222	360	376		77	77			77	78	79	80	81
10	100	76	93	291	482	154	227	365	377		77	77			77	78	79	80	81
11	110	77	92	277	455	151	229	365	376		77	77			77	78	79	80	81
12	120	77	91	272	445	134	232	365	374		76	76			76	77	78	79	80
13	130	76	90	265	435	127	235	365	373		76	76			76	77	78	79	80
14	140	76	89	255	418	126	237	367	372		76	76			76	77	78	79	80
15	150	76	89	249	406	118	241	369	370		76	76			76	77	78	79	80
16	160	76	88	238	395	132	244	370	368		76	76			76	77	78	79	80
17	170	77	88	232	384	140	246	372	363		76	76			76	77	78	79	80
18	180	76	87	214	353	136	245	372	358		76	76			76	77	78	79	80
19	190	77	86	200	320	142	240	367	350		76	76			76	77	78	79	80
20	200	77	85	193	309	143	240	364	345		76	76			76	77	78	79	80
21	210	76	85	189	309	132	240	364	344		76	76			76	77	78	79	80
22	220	76	84	185	305	135	241	366	345		76	76			76	77	78	79	80
23	230	76	84	181	300	143	241	367	343		76	76			76	77	78	79	80
24	240	76	85	178	294	152	240	368	340		76	76			76	77	78	79	80
25	250	76	84	174	285	168	236	367	335		76	76			76	77	78	79	80
26	260	76	84	168	274	163	231	362	327		76	76			76	77	78	79	80
27	270	76	84	163	264	153	226	356	320		76	76			76	77	78	79	80
28	280	76	83	159	259	152	223	351	314		76	76			76	77	78	79	80
29	290	76	83	157	253	157	220	344	308		76	76			76	77	78	79	80
30	300	76	82	155	250	160	217	337	303		76	76			76	77	78	79	80
31	310	76	82	154	247	159	214	331	300		76	76			76	77	78	79	80
32	320	76	82	153	245	165	211	325	297		76	76			76	77	78	79	80
33	330	75	82	152	240	168	208	319	294		76	76			76	77	78	79	80
34	340	76	81	149	233	169	205	313	290		76	76			76	77	78	79	80
35	350	75	81	146	226	171	202	307	286		76	76			76	77	78	79	80
36	360	76	81	143	223	169	198	301	281		76	76			76	77	78	79	80
37	370	75	81	142	221	172	195	296	278		76	76			76	77	78	79	80
38	380	76	81	141	220	169	193	292	276		76	76			76	77	78	79	80
39	390	75	80	140	218	165	192	289	275		76	76			76	77	78	79	80
40	400	75	80	139	216	169	191	285	273		76	76			76	77	78	79	80
41	410	74	80	138	213	172	189	281	271		75	75			76	77	78	79	80
42	420	75	80	137	210	170	187	277	268		76	76			76	77	78	79	80
43	430	75	81	137	206	167	185	274	265		76	76			76	77	78	79	80
44	440	76	80	136	207	166	181	270	261		76	76			76	77	78	79	80
45	450	74	80	134	209	166	178	266	260		76	76			76	77	78	79	80

Test Engineer:

Date: 5/14/13



TEST DATA
EPA METHOD 5G-3

Project Number:	G101161435
Manufacturer:	Lennox
Model:	GV 300
Sample ID No:	PRT1305240718-001
Test Date:	14-May-13
Test Run No:	2

Temperature Data

Firebox Temp Start	335.187
Firebox Temp End	215.6
Firebox Delta-T	119.6
Max Filter Temps	
Train A	76.705
Train B	76.8807

Interval	10	Duration of Test, Min	467
Time			
Temperature Data			
Interval	46	460	467
Duration	Room	75	74
	Dilution	80	80
	Tunnel	135	135
	Flue	211	213
	Gas	170	169
	Firebox	175	175
	Bottom	262	260
	Back	260	261
	Left		
	Right		
	Firebox		
	Catalyst		
	Outlet		
	Train A	76	75
	Filter		
	Train B	75	78
	DGM		
	Train A	78	76
	DGM		
	Train B		

Test Engineer:

Date:

5/14/13



TEST DATA
EPA METHOD 56-3

Gas Particulate Sampling Data

Project Number: G101161435
Manufacturer: Lennox
Model: GV 300
Sample ID Number: PRT1305240718-001
Test Date: 14-May-13
Test Run Number: 2

Barometer, In. Hg	RH, %	Sample Box Correction (Y) Factors
Start	30.23	Meter Box (A)
End	30.15	Meter Box (B)
Duration of Test, Min		467

Leak Check, cfm @ in Hg	0.008@6	0.011@6
Train A		
Train B		

Maximum Vacuum	Train A	Train B
0.00	0.00	0.00

Particulate Sampling Data										Time
Train A	Train B	Proportional Rate	Proportional Rate	Train B Volume	Train A Volume	Weight Loss	Fuel Weight	Flue Draft	Train B Delta-H	
0.00	0.00	99.97	99.98	1.536	1.589	19.70	19.70	-0.041	0.32	0
0.00	0.00	98.65	100.15	3.009	3.096	0.70	19.00	-0.052	0.34	10
0.00	0.00	103.44	103.44	4.527	4.661	1.04	17.97	-0.063	0.32	20
0.00	0.00	101.54	101.54	6.072	6.158	1.28	16.69	-0.067	0.33	30
0.00	0.00	97.37	99.17	7.532	7.665	1.29	15.40	-0.069	0.32	40
0.00	0.00	103.70	99.14	9.088	9.174	1.47	13.93	-0.071	0.33	50
0.00	0.00	100.28	99.70	10.595	10.695	1.48	12.45	-0.069	0.32	60
0.00	0.00	98.68	96.07	12.084	12.167	1.15	11.31	-0.064	0.32	70
0.00	0.00	99.03	96.71	13.584	13.655	0.97	10.34	-0.061	0.34	80
0.00	0.00	97.81	97.88	15.056	15.152	0.83	9.51	-0.057	0.35	90
0.00	0.00	93.65	94.08	16.462	16.585	0.71	8.79	-0.054	0.34	100
0.00	0.00	90.17	93.07	17.815	18.000	0.69	8.10	-0.051	0.34	110
0.00	0.00	94.63	92.29	19.235	19.402	0.66	7.45	-0.051	0.35	120
0.00	0.00	92.48	95.01	20.623	20.845	0.63	6.82	-0.050	0.34	130
0.00	0.00	90.75	91.41	21.986	22.234	0.59	6.23	-0.047	0.34	140
0.00	0.00	97.55	90.06	23.452	23.603	0.56	5.67	-0.046	0.35	150
0.00	0.00	91.30	92.25	24.825	25.006	0.45	5.22	-0.043	0.34	160
0.00	0.00	97.03	101.40	26.285	26.549	0.46	4.76	-0.042	0.35	170
0.00	0.00	93.42	102.30	27.692	28.107	0.37	4.39	-0.039	0.34	180
0.00	0.00	94.34	100.84	29.115	29.645	0.28	4.11	-0.035	0.34	190
0.00	0.00	104.36	103.34	30.690	31.222	0.21	3.90	-0.033	0.34	200
0.00	0.00	101.05	101.38	32.216	32.770	0.27	3.64	-0.032	0.35	210
0.00	0.00	103.52	102.39	33.780	34.334	0.19	3.44	-0.030	0.35	220
0.00	0.00	102.71	101.46	35.332	35.884	0.18	3.26	-0.029	0.34	230
0.00	0.00	103.01	104.55	36.889	37.482	0.20	3.07	-0.028	0.34	240
0.00	0.00	103.36	101.60	38.452	39.036	0.14	2.93	-0.027	0.35	250
0.00	0.00	101.59	104.73	39.989	40.638	0.18	2.75	-0.026	0.35	260
0.00	0.00	101.51	99.48	41.525	42.160	0.10	2.65	-0.025	0.34	270
0.00	0.00	102.83	101.72	43.082	43.717	0.16	2.49	-0.024	0.35	280
0.00	0.00	101.77	102.23	44.623	45.282	0.14	2.34	-0.023	0.35	290
0.00	0.00	102.71	101.71	46.179	46.840	0.14	2.20	-0.023	0.35	300
0.00	0.00	103.24	103.34	47.743	48.423	0.12	2.08	-0.023	0.35	310
0.00	0.00	102.58	101.70	49.297	49.981	0.15	1.93	-0.023	0.34	320
0.00	0.00	103.84	103.84	50.862	51.572	0.13	1.80	-0.023	0.33	330
0.00	0.00	99.50	99.50	52.373	53.097	0.13	1.67	-0.023	0.34	340
0.00	0.00	101.20	100.53	53.907	54.638	0.12	1.55	-0.022	0.34	350
0.00	0.00	101.93	102.10	55.455	56.201	0.11	1.44	-0.021	0.34	360
0.00	0.00	102.40	101.84	57.008	57.763	0.11	1.33	-0.020	0.34	370
0.00	0.00	102.96	102.46	58.570	59.335	0.15	1.18	-0.020	0.35	380
0.00	0.00	103.62	103.56	60.142	60.924	0.12	1.06	-0.020	0.34	390
0.00	0.00	101.69	100.94	61.685	62.473	0.11	0.96	-0.020	0.35	400
0.00	0.00	102.82	100.87	63.245	64.021	0.14	0.82	-0.020	0.35	410
0.00	0.00	103.73	105.02	64.819	65.633	0.09	0.73	-0.020	0.34	420
0.00	0.00	99.56	99.56	66.335	67.161	0.27	0.46	-0.019	0.35	430
0.00	0.00	103.44	102.98	67.905	68.742	0.14	0.32	-0.019	0.34	440
0.00	0.00	103.73	103.86	69.479	70.336	0.12	0.20	-0.018	0.35	450
0.00	0.00	99.84	99.84	70.994	71.853	0.10	0.10	-0.018	0.35	460
0.00	0.00	98.21	98.21	72.037	72.924	0.10	0.00	-0.020	0.34	467

Test Engineer:

Date: 5/14/13



Dilution Tunnel Velocity Traverse
EPA Method 5G-3

Project Number: G101161435
Manufacturer: Lennox
Model: GV 300
Sample ID Number: PRT1305240718-001
Test Date: 14-May-13
Test Run Number: 2

Dilution Tunnel		Temp, °F	Square Root	
Delta P	In. H2O			
A1	0.0440	90	0.2098	Averages
A2	0.0480	90	0.2191	
A3	0.0420	90	0.2049	
A4	0.0380	90	0.1949	
A Center	0.0480	90	0.2191	
B1	0.0380	89	0.1949	
B2	0.0440	89	0.2098	
B3	0.0420	89	0.2049	
B4	0.0340	89	0.1844	
B Center	0.0480	89	0.2191	
		89.5	0.2028	

Tunnel Diameter **6.000** inches
Tunnel Static **-0.210** in. H2O
Tunnel Area 0.19635 F12
Pitot Correction 0.9259 factor
Baro. Pressure 30.23
Pitot Factor **0.99** (0.99 for standard, 0.84 or Cal. For S-Type)
Initial Velocity 13.700 Ft/Sec
Initial Flow 150.36 Ft3/min

Test Engineer: 

Date: 5/14/13



Project Number: G101161435
Manufacturer: Lennox
Model: GV 300
Sample ID Number: PRT1305240718-001
Test Date: 14-May-13
Test Run Number: 2

Intertek Equipment No.'s 19683, 19684

Sample Train - 1					
Sample Component	Component	ID Number	Final, mg	Tare, mg	Particulate, mg
A - Front Filter Catch	Filter	538	120.6		
B - Rear Filter Catch	Filter	539	120.7		
C - Seal Set	O-Ring				
Total, A+B+C-Tares			254.3	241.3	13
Probe & Filter Holder	Probe	26	124265.6	124265.5	0.1
			Total Particulate, mg		
			13.1		

Sample Train - 2					
Sample Component	Component	ID Number	Final, mg	Tare, mg	Particulate, mg
A - Front Filter Catch	Filter	540	121.2		
B - Rear Filter Catch	Filter	541	119.8		
C - Seal Set	O-Ring				
Total, A+B+C-Tares			254.5	241	13.5
Probe & Filter Holder	Probe	27	123700.3	123699.8	0.5
			Total Particulate, mg		
			14		

Test Engineer:

Date: 5/14/13



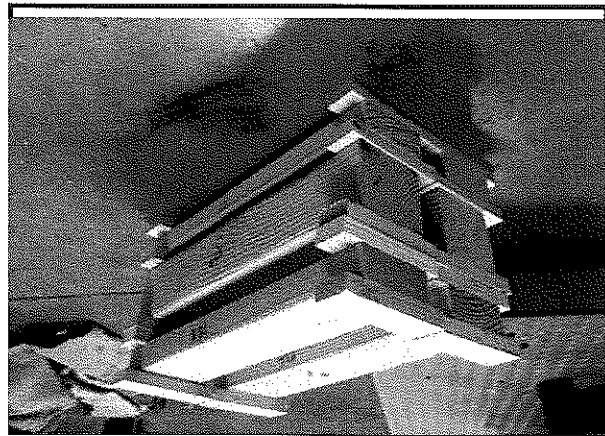
TEST RESULTS
EPA METHOD 5G-3

Project Number: G101161435
Manufacturer: Lennox
Model: GV 300
Sample ID Number: PRT1305240718-001
Test Date: 15-May-13
Test Run Number: 3

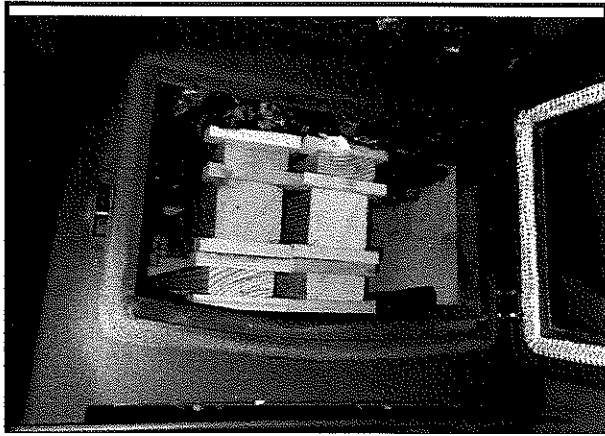
Dry Burn-Rate, kg/hr:		0.85	
Emission-Rate, g/hr:		1.65	
Adjusted Emission-Rate, g/hr:		2.76	
Duration of Test, Minutes:		495	
Dry Gas Meter Standardization			
Train A		Train B	
Dry Gas Meter Beginning Reading, ft³		0	
Dry Gas Meter Ending Reading, ft³		76.063	
Barometric Pressure Correction Factor		1.005	
Dry Gas Meter Calibration Factors (Y factors)		0.995	
Dry Gas Meter Temperature Factors		0.987	
Dry Gas Meter Delta-H Correction Factors		1.001	
Dry Gas Meter STD Volume Sampled, ft³		75.159	
74.915			
Dilution Tunnel Flow / Volume			
Standardized Tunnel Flow, dscfm			
Total Tunnel Volume, scf			
Train A		Train B	
Sample Ratios (Total Tunnel Volume / Total Sample Volume)			
Sample Particulate Mass, mg		15.2	
Total Emissions, grams		12.779	
Emission-Rate, g/hr		1.55	
Adjusted Emission Rates, g/hr		2.62	
Deviation, %		5.26%	
0.07		3.87%	
Operating Parameters			
Train A		Train B	
Max Filter Temperature, °F		75.9942703	
Post-Test Leak Check, cfm @ in. Hg vac.		.008@4	
Average Firebox Surface Temperature delta-T, °F		121.637149	
Maximum Ambient Temperature, °F		78	
Minimum Ambient Temperature, °F		72	
Fuel Properties			
Wet Fuel Load Weight, lb.		18.80	
Dry-Basis Fuel Load Moisture Content, %		20.97	
Wet-Basis Fuel Load Moisture Content, %		17.33	
Coal Bed Range, lb.		3.80	
Actual Coal Bed, lb.		4.70	

Test Engineer:

PROJECT / TEST INFORMATION	
Project Number:	G101161435
Manufacturer:	Lennox
Model:	GV 300
Sample ID Number:	PRT1305240718-001
Test Date:	15-May-13
Test Run Number:	3
Date tunnel cleaned:	5/10/2013
Purpose of Test	Certification



Appliance Information		
Appliance Type:	2	1 - Catalytic 2 - Non - Catalytic 3 - Pellet 4 - Hydronic
Firebox Volume, ft ³ :	2.92	N/A for pellet type
Convection Blower	2	1 - No Fan 2 - Fan Optional 3 - Fan Standard



Test Settings	Primary Air: 3.5" from full open Secondary Air: fixed Control Board: NA Blower/Fan: Fan set at the 8 O'clock position on the dial.
Pre-Burn Activities	At 85 minutes leveled coals
Time	Activity
Start-Up Procedure	Loading of fuel, sec. : Loaded by 65 seconds Fuel-loading door : closed by 4:30 Primary air: Fully open until 4:45 then slowly set to test setting (full closed) at 5:00 minutes. Secondary air: Fixed Control board: NA Blower / fan: Blower off until 25 minutes then turned to the 5 O'clock position on the dial.
Other Notes	

Test Engineer: CS

Date: 5/15/13



TEST FUEL DATA
EPA METHOD 5G-3

Project Number:	G101161435
Manufacturer:	Lennox
Model:	GV 300
Sample ID Number:	PRT1305240718-001
Test Date:	15-May-13
Test Run Number:	3

Firebox Volume, ft ³ :	2.92
-----------------------------------	------

Calibration Reference ID	
Set meter to Species 1	
Set Temperature to 70F	12%
Set pin setting to 444	22%
	22.0

PRE-BURN FUEL PROPERTIES			
Eq. ID No.:		Time:	7:15
Piece No.	Length, In.	Weight, Lb.	Moisture, %, Dry Basis
1	17.00	18.7	20.4
2		22.7	19.3
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			
Total Weight		0.0	Average, %db
			20.1

TEST FUEL LOAD PROPERTIES			
Eq. ID No.:		Time:	8:25
Piece No.	Length, In.	Weight, Lb.	Moisture, %, Dry Basis
1	17.00	4.90	25.9
2	17.00	4.80	22.5
3	17.00	2.40	21.3
4	17.00	2.20	19.4
5	17.00	2.30	19.9
6	17.00	2.20	19.0
7			
8			
Totals		9.1	9.7
% of Weight		48	52
Total weight, wet, lb.		18.80	
Average Moisture, dry		20.97	
Total weight, dry, kg		7.05	
Average Moisture, wet		17.33	

Date: 5/22/13

Test Engineer: [Signature]

Project Number:	G101161435
Manufacturer:	Lennox
Model:	GV 300
Sample ID Number:	FRT1305240718-001
Test Date:	15-May-13
Test Run Number:	3

Average Firebox Temp. °F 326.573

Coal Bed Range 3.8 to 4.7

Final Coal Bed Wt. lb 4.7

EPA Method 28
Pre Burn Data

Temperature Data										Duration, Minutes	
Room	Dilution	Flue Gas	Firebox Top	Firebox Bottom	Firebox Back	Firebox Left	Firebox Right	Catalyst Outlet	Flue Draft		
78	174	707	1060	144	535	516	532		-0.09	9.2	4.52
77	124	486	879	156	418	522	530		-0.08	7.4	1.77
20	77	111	420	787	159	386	504	512	-0.07	6.2	1.21
30	75	102	354	662	157	366	484	492	-0.06	5.7	0.51
40	74	96	307	554	155	350	465	474	-0.05	5.4	0.31
50	74	91	272	477	158	336	446	456	-0.05	5.2	0.19
60	74	89	246	428	186	319	429	440	-0.04	5.0	0.18
70	73	86	230	394	166	306	414	424	-0.04	4.9	0.12
80	74	74	218	372	165	294	400	409	-0.04	4.8	0.17
84	74	92	243	360	167	300	402	404	-0.04	4.70	0.06

Test Engineer: 

Date: 5/22/13



TEST DATA
EPA METHOD 56-3

Project Number: G101161435
Manufacturer: Lennox
Model: GV 300
Sample ID No: PRT1305240718-001
Test Date: 15-May-13
Test Run No: 3

Temperature Data

Firebox Temp Start 326.573	Firebox Delta-T 121.6	Max Filter Temps
Firebox Temp End 204.936		Train A 75.9943
		Train B 76.1951

Interval	10	Duration of Test, Min	495	Temperature Data	
Time					
Interval	0	0	243	167	300
Duration	0	74	92	243	402
	1	10	73	273	385
	2	20	74	279	342
	3	30	74	330	320
	4	40	75	354	327
	5	50	76	388	311
	6	60	77	367	324
	7	70	76	355	338
	8	80	77	340	350
	9	90	77	319	361
	10	100	78	302	369
	11	110	76	286	374
	12	120	77	273	377
	13	130	77	261	379
	14	140	77	251	383
	15	150	77	244	382
	16	160	77	238	382
	17	170	77	229	378
	18	180	76	212	373
	19	190	76	196	363
	20	200	76	185	351
	21	210	75	177	341
	22	220	76	172	332
	23	230	76	167	325
	24	240	75	163	319
	25	250	75	161	314
	26	260	75	158	310
	27	270	75	156	306
	28	280	75	155	304
	29	290	74	153	301
	30	300	74	152	299
	31	310	75	150	296
	32	320	75	149	295
	33	330	75	148	295
	34	340	75	148	296
	35	350	74	147	296
	36	360	74	144	292
	37	370	74	142	294
	38	380	74	140	290
	39	390	74	138	287
	40	400	74	139	278
	41	410	73	139	275
	42	420	74	137	281
	43	430	74	137	278
	44	440	74	136	275
	45	450	73	135	273

Test Engineer:

Date: 5/14/13

Project Number:	G101161435
Manufacturer:	Lennox
Model:	GV 300
Sample ID No:	PRT1305240718-001
Test Date:	15-May-13
Test Run No:	3

Max Filter Temps	Train A	75.9943
	Train B	76.1951

Time		Temperature Data																											
Interval	Duration	Room	Dilution Tunnel	Flue Gas	Firebox Top	Firebox Bottom	Firebox Back	Firebox Left	Firebox Right	Catalyst Outlet	Train A Filter	Train B Filter	Train A DGM	Train B DGM	46	460	74	77	134	208	166	181	266	270		73	71	74	74
															47	470	73	77	132	204	166	179	264	267	73	71	74	74	
															48	480	73	77	129	196	167	175	260	263	73	71	74	73	
															49	490	73	77	126	188	167	171	254	258		73	71	74	73
															50	495	72	77	125	185	165	169	252	255		72	71	74	73

Date: 5/24/23



TEST DATA
EPA METHOD 56-3

Gas Particulate Sampling Data

Project Number: G101161435
Manufacturer: Lennox
Model: GV 300
Sample ID Number: PRT1305240718-001
Test Date: 15-May-13
Test Run Number: 3

Barometer, in. Hg	RH, %	Sample Box Correction (Y) Factors
Start	30.09	Meter Box (A)
End	30.06	Meter Box (B)
Duration of Test, Min		495

Leak Check, cfm @ in Hg	Train A	Train B
	.008@4	.002@2

Maximum Vacuum	Train A	Train B
	0.00	0.00

Time	Particulate Sampling Data										Train B	
	Tunnel	Train A	Train B	Flue	Fuel	Weight	Train A	Train B	Proportional	Proportional	Train A	Train B
0	0.037	0.31	0.33	-0.045	18.80	18.80	0.000	0.000	99.98	99.92	0.00	0.00
10	0.037	0.31	0.32	-0.054	17.92	0.88	1.536	1.550	100.95	102.14	0.00	0.00
20	0.037	0.31	0.32	-0.057	17.17	0.76	3.058	3.088	99.64	101.11	0.00	0.00
30	0.037	0.31	0.32	-0.065	16.03	1.14	4.489	4.514	94.05	94.15	0.00	0.00
40	0.037	0.31	0.31	-0.067	14.77	1.26	5.965	5.960	97.31	95.73	0.00	0.00
50	0.037	0.31	0.33	-0.071	13.25	1.51	7.478	7.485	100.05	101.25	0.00	0.00
60	0.037	0.30	0.34	-0.067	11.99	1.26	9.034	9.030	102.73	102.40	0.00	0.00
70	0.037	0.31	0.34	-0.065	10.88	1.11	10.574	10.570	101.59	101.99	0.00	0.00
80	0.037	0.33	0.34	-0.063	9.85	1.03	12.115	12.098	101.49	101.02	0.00	0.00
90	0.037	0.31	0.34	-0.059	8.96	0.89	13.606	13.585	98.00	98.11	0.00	0.00
100	0.037	0.31	0.33	-0.056	8.21	0.75	15.191	15.171	104.04	104.50	0.00	0.00
110	0.037	0.31	0.33	-0.054	7.51	0.71	16.693	16.665	98.46	98.30	0.00	0.00
120	0.037	0.31	0.33	-0.051	6.85	0.66	18.234	18.200	100.85	100.64	0.00	0.00
130	0.037	0.32	0.33	-0.049	6.22	0.63	19.812	19.764	103.17	102.64	0.00	0.00
140	0.037	0.31	0.33	-0.047	5.66	0.56	21.337	21.280	99.58	99.37	0.00	0.00
150	0.037	0.31	0.34	-0.046	5.13	0.53	22.860	22.791	99.39	98.99	0.00	0.00
160	0.037	0.31	0.33	-0.043	4.62	0.51	24.377	24.310	98.90	99.41	0.00	0.00
170	0.037	0.30	0.33	-0.040	4.22	0.40	25.890	25.800	97.41	97.41	0.00	0.00
180	0.037	0.31	0.33	-0.038	3.96	0.26	27.454	27.366	101.74	102.26	0.00	0.00
190	0.037	0.30	0.34	-0.035	3.77	0.19	28.994	28.897	100.08	99.89	0.00	0.00
200	0.037	0.31	0.33	-0.032	3.60	0.18	30.544	30.439	100.66	100.53	0.00	0.00
210	0.037	0.31	0.33	-0.030	3.45	0.14	32.154	32.041	104.49	104.37	0.00	0.00
220	0.037	0.31	0.33	-0.029	3.30	0.15	33.619	33.500	95.02	95.00	0.00	0.00
230	0.037	0.30	0.33	-0.027	3.16	0.15	35.172	35.046	100.69	100.62	0.00	0.00
240	0.037	0.31	0.34	-0.026	2.98	0.17	36.694	36.563	98.65	98.71	0.00	0.00
250	0.037	0.30	0.34	-0.026	2.87	0.11	38.241	38.103	100.23	100.17	0.00	0.00
260	0.037	0.31	0.34	-0.025	2.71	0.16	39.797	39.649	100.80	100.55	0.00	0.00
270	0.037	0.31	0.34	-0.024	2.57	0.14	41.344	41.187	100.20	100.01	0.00	0.00
280	0.037	0.31	0.33	-0.024	2.42	0.15	42.879	42.717	99.39	99.47	0.00	0.00
290	0.037	0.31	0.34	-0.024	2.28	0.14	44.428	44.259	100.30	100.26	0.00	0.00
300	0.037	0.32	0.35	-0.024	2.15	0.13	45.995	45.815	101.49	101.19	0.00	0.00
310	0.037	0.31	0.33	-0.023	2.03	0.12	47.517	47.332	98.52	98.58	0.00	0.00
320	0.037	0.31	0.34	-0.023	1.90	0.13	49.073	48.886	100.71	100.98	0.00	0.00
330	0.037	0.30	0.34	-0.023	1.76	0.14	50.629	50.428	100.71	100.20	0.00	0.00
340	0.037	0.32	0.33	-0.023	1.62	0.14	52.136	51.930	97.56	97.62	0.00	0.00
350	0.037	0.31	0.34	-0.022	1.50	0.12	53.672	53.465	99.45	99.77	0.00	0.00
360	0.037	0.31	0.34	-0.022	1.40	0.10	55.237	55.020	101.30	101.04	0.00	0.00
370	0.037	0.32	0.34	-0.021	1.28	0.11	56.775	56.558	99.54	99.93	0.00	0.00
380	0.037	0.31	0.34	-0.020	1.16	0.13	58.372	58.143	103.36	102.99	0.00	0.00
390	0.037	0.31	0.33	-0.020	1.05	0.10	59.930	59.702	100.82	101.29	0.00	0.00
400	0.037	0.31	0.34	-0.020	0.96	0.09	61.433	61.197	97.28	97.15	0.00	0.00
410	0.037	0.31	0.33	-0.020	0.85	0.11	62.936	62.692	97.30	97.18	0.00	0.00
420	0.037	0.31	0.33	-0.020	0.73	0.12	64.490	64.249	100.59	101.22	0.00	0.00
430	0.037	0.31	0.34	-0.020	0.63	0.10	66.046	65.799	100.74	100.78	0.00	0.00
440	0.037	0.30	0.34	-0.020	0.53	0.10	67.593	67.339	100.16	100.13	0.00	0.00
450	0.037	0.31	0.33	-0.019	0.42	0.11	69.185	68.910	103.07	102.14	0.00	0.00
460	0.037	0.31	0.35	-0.019	0.29	0.13	70.665	70.407	95.85	97.34	0.00	0.00
470	0.037	0.32	0.33	-0.020	0.21	0.08	72.213	71.947	100.27	100.15	0.00	0.00

Test Engineer: *[Signature]*

Date: 5/21/13

Project Number: G101161435	Manufacturer: Lennox	Model: GV 300	Sample ID Number: PRT1305240718-001	Test Date: 15-May-13	Test Run Number: 3
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Barometer, in. Hg	RH, %	Sample Box Correction (Y) Factors	Meter Box (A)	0.995	Meter Box (B)	0.995																	
Start	30.09																						
End	30.06																						
Duration of Test, Min																							
495																							
Particulate Sampling Data																							
Time	Tunnel	Train A	Delta-H	Train B	Flue	Draft	Fuel	Weight	Loss	Train A	Volume	Train B	Volume	Train A	Proportional	Rate	Train B	Proportional	Rate	Train A	Vacuum, in. Hg	Train B	Vacuum, in. Hg
	480	0.037	0.32	0.34	-0.019	0.10	0.11	73.745	73.469	99.25	100.56	99.26	93.80	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	490	0.037	0.32	0.34	-0.018	0.10	0.00	75.297	75.043	75.764	99.26	93.80	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	495	0.037	0.32	0.34	-0.019	0.10	0.00	76.063	75.764	99.26	93.80	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Leak Check, cfm @ in Hg		Train A		Train B		.002@2		Maximum Vacuum		Train A		Train B		0.00									



Dilution Tunnel Velocity Traverse
EPA Method 5G-3

Project Number: G101161435
Manufacturer: Lennox
Model: GV 300
Sample ID Number: PRT1305240718-001
Test Date: 15-May-13
Test Run Number: 3

Dilution Tunnel	Delta P In. H2O	Temp, °F	Square Root	Averages			
				A Center	B Center		
				A1	0.0360	86	0.1897
				A2	0.0420	86	0.2049
				A3	0.0380	86	0.1949
				A4	0.0280	86	0.1673
				A Center	0.0440	86	0.2098
				B1	0.0360	86	0.1897
				B2	0.0380	86	0.1949
				B3	0.0360	86	0.1897
				B4	0.0280	86	0.1673
				B Center	0.0440	86	0.2098
				Averages	0.037	86	0.1873

Tunnel Diameter **6.000** inches
Tunnel Static **-0.190** in. H2O
Tunnel Area 0.19635 Ft2
Pitot Correction 0.8931 factor
Baro. Pressure 30.09
Pitot Factor **0.99** (0.99 for standard, 0.84 or Cal. For S-Type)
Initial Velocity 12.641 Ft/ Sec
Initial Flow **138.98** Ft3/min

Test Engineer:

Date: **5/22/13**



Project Number: G101161435
Manufacturer: Lennox
Model: GV 300
Sample ID Number: PRT1305240718-001
Test Date: 15-May-13
Test Run Number: 3

Intertek Equipment No.'s 19683, 19684

Sample Train - 1					
Sample Component	Component	ID Number	Final, mg	Tare, mg	Particulate, mg
A - Front Filter Catch	Filter	542		121.5	
B - Rear Filter Catch	Filter	543		120.7	
C - Seal Set	O-Ring				
Total, A+B+C-Tares			256.7	242.2	14.5
Probe & Filter Holder	Probe	18	113658.7	113658.0	0.7
			Total Particulate, mg		
			15.2		

Sample Train - 2					
Sample Component	Component	ID Number	Final, mg	Tare, mg	Particulate, mg
A - Front Filter Catch	Filter	544		120.1	
B - Rear Filter Catch	Filter	545		120.4	
C - Seal Set	O-Ring				
Total, A+B+C-Tares			256.7	240.5	16.2
Probe & Filter Holder	Probe	21	113544.4	113543.4	1.0
			Total Particulate, mg		
			17.2		

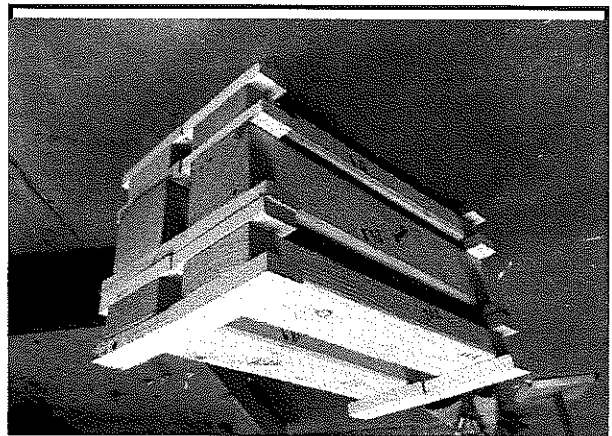
Test Engineer: CR

Date: 5/29/13

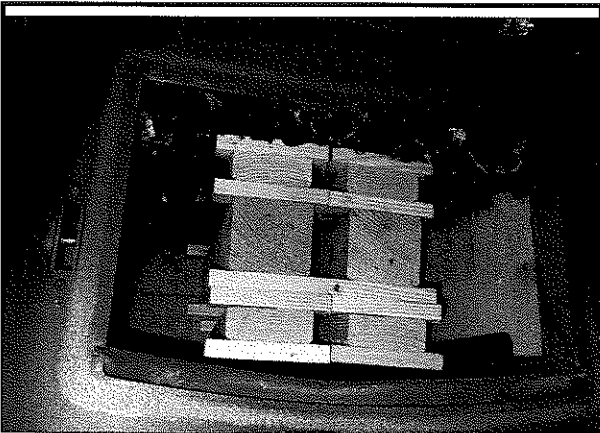
Project Number: G101161435
Manufacturer: Lennox
Model: GV 300
Sample ID Number: PRT1305240718-001
Test Date: 16-May-13
Test Run Number: 4

Dry Burn-Rate, kg/hr:		0.99
Emission-Rate, g/hr:		1.88
Adjusted Emission-Rate, g/hr:		3.07
Duration of Test, Minutes		430
Dry Gas Meter Standardization		
Dry Gas Meter Beginning Reading, ft ³	Train A	0
Dry Gas Meter Ending Reading, ft ³	Train A	65.853
Barometric Pressure Correction Factor	Train A	1.001
Dry Gas Meter Calibration Factors (V factors)	Train A	0.995
Dry Gas Meter Temperature Factors	Train A	0.984
Dry Gas Meter Delta-H Correction Factors	Train A	1.001
Dry Gas Meter STD Volume Sampled, ft ³	Train A	64.592
Dilution Tunnel Flow / Volume		
Standardized Tunnel Flow, dsctm		131.532
Total Tunnel Volume, scf		56601.800
Emission Calculations		
Sample Ratios (Total Tunnel Volume / Total Sample Volume)	Train A	876.298
Sample Particulate Mass, mg	Train A	15.0
Total Emissions, grams	Train A	13.144
Emission-Rate, g/hr	Train A	1.83
Adjusted Emission Rates, g/hr	Train A	3.01
Deviation, %	Train A	1.83%
For catalytic equipped appliances - If deviation from average emission rate is greater than 7.5% due to low particulate catch, difference is not to exceed 7.5% compared to 4.1 g/hr.		0.03
For non-catalytic appliances - If deviation from average emission rate is greater than 7.5% due to low particulate catch, difference is not to exceed 7.5% compared to 7.5 g/hr.		1.50%
Operating Parameters		
Max Filter Temperature, °F	Train A	78.4311447
Post-Test Leak Check, cfm @ in. Hg vac.	Train A	0.004@4
Average Firebox Surface Temperature delta-T, °F	Train A	73.3445982
Maximum Ambient Temperature, °F	Train A	79
Minimum Ambient Temperature, °F	Train A	74
Fuel Properties		
Wet Fuel Load Weight, lb.	Train A	19.00
Dry-Basis Fuel Load Moisture Content, %	Train A	21.67
Wet-Basis Fuel Load Moisture Content, %	Train A	17.81
Coal Bed Range, lb.	Train A	3.80
Actual Coal Bed, lb.	Train A	3.8

PROJECT / TEST INFORMATION	
Project Number:	G101161435
Manufacturer:	Lennox
Model:	GV 300
Sample ID Number:	PRT1305240718-001
Test Date:	16-May-13
Test Run Number:	4
Date tunnel cleaned:	5/10/2013
Purpose of Test	Certification



Appliance Information			
Appliance Type:	2	2.92	Firebox Volume, ft ³ :
1 - Catalytic 2 - Non - Catalytic 3 - Pellet 4 - Hydronic			
Convection Blower	2		3 - Fan Standard 2 - Fan Optional 1 - No Fan



Test Settings

Primary Air: 3.5" from full open	Secondary Air: Fixed	Control Board: NA	Blower/Fan: Off
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Pre-Burn Activities

Time	Activity
At 116 minutes raked coals	

Start-Up Procedure

Blower / fan:	Off, fan confirmation test
Control board:	NA
Secondary air:	Fixed
Primary air:	Full open until 4:45 then slowly set to full closed by 5:00
Fuel-loading door:	Closed by 4:30
Loading of fuel, sec.:	By 55 seconds

Other Notes

[illegible]

Test Engineer:

Date: _____

Project Number:	G101161435
Manufacturer:	Lennox
Model:	GV 300
Sample ID Number:	PRT1305240718-001
Test Date:	16-May-13
Test Run Number:	4

Firebox Volume, ft ³ :	2.92
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Calibration Reference ID	
Set meter to Species 1	
Set Temperature to 70F	12%
Set pin setting to 444	22%

PRE-BURN FUEL PROPERTIES			
Eq. ID No.:	Time:	Temp., °F:	67
Piece No.	In. Length,	Lb. Weight,	Moisture, %, Dry Basis
1	8@17	19.8	21.9
2		19.1	20.1
3			20.4
4			
5			
6			
7			
8			
9			
10			
11			
12			
Total Weight			
0.0			
Average, %db			
20.0			

TEST FUEL LOAD PROPERTIES			
Eq. ID No.:	Time:	Temp., °F:	68
Piece No.	In. Length,	Lb. Weight,	Moisture, %, Dry Basis
1	17.00	5.00	22.1
2	17.00	4.70	22.0
3	17.00	2.30	23.8
4	17.00	2.40	22.6
5	17.00	2.30	20.2
6	17.00	2.30	18.9
7			
8			
Totals			
9.3			
9.7			
% of Weight			
49			
51			
Total weight, wet, lb.			
19.00			
Average Moisture, dry			
21.67			
Total weight, dry, kg			
7.08			
Average Moisture, wet			
17.81			



Project Number:	G101161435
Manufacturer:	Lennox
Model:	GV 300
Sample ID Number:	PRT1305240718-001
Test Date:	16-May-13
Test Run Number:	4

Average Firebox Temp, °F	365.877
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Coal Bed Range	3.8	to	4.7
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Final Coal Bed Wt, lb	3.8
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EPA Method 28
Pre Burn Data

Duration, Minutes	Room	Dilution Tunnel	Flue Gas	Firebox Top	Firebox Bottom	Firebox Back	Firebox Left	Firebox Right	Catalyst Outlet	Flue Draft	Fuel Weight	Weight Loss
0	79	187	715	1048	176	523	529	501	-0.0938	9.90	6.10	
10	81	124	486	899	207	507	492		-0.0779	8.26	1.64	
20	80	120	467	875	213	490	478		-0.0762	6.55	1.72	
30	81	108	401	814	214	481	467		-0.0645	5.63	0.91	
40	80	103	354	705	220	473	463		-0.0587	5.25	0.38	
50	78	99	317	611	218	463	450		-0.0527	5.02	0.23	
60	78	94	292	554	221	452	438		-0.0485	4.83	0.18	
70	78	91	276	518	212	441	430		-0.0466	4.64	0.19	
80	77	90	263	493	218	427	419		-0.0446	4.44	0.20	
90	77	89	254	476	217	416	409		-0.0423	4.26	0.19	
100	75	91	248	464	223	406	399		-0.0417	4.07	0.19	
110	76	88	242	450	224	397	390		-0.0402	3.89	0.18	
116	76	94	262	433	227	394	384		-0.045	3.80	0.09	

Test Engineer:

Date: 5/22/13

~~SECRET~~

Firebox Temp Start	365.877
Firebox Temp End	292.532
Firebox Delta-T	73.3

Max Filter Temps	Train A	Train B
	78.4311	78.7736

Temperature Data





TEST DATA
EPA METHOD 56-3

Gas Particulate Sampling Data

Project Number: G101161435
Manufacturer: Lennox
Model: GV 300
Sample ID Number: PRT1305240718-001
Test Date: 16-May-13
Test Run Number: 4

Barometer, in. Hg	RH, %	Sample Box Correction (Y) Factors
Start 30.00		Meter Box (A)
End 29.88		Meter Box (B)
Duration of Test, Min		430

Leak Check, cfm @ in Hg	0.008@6
Train A	0.004@4
Train B	

Maximum Vacuum	Train A	0.00
	Train B	0.00

Particulate Sampling Data										Duration of Test, Min		430
Time	Tunnel	Train A	Train B	Delta-P	Delta-H	Delta-H	Flue	Draft	Fuel	Weight	Weight	Loss
	Volume	Volume	Volume	Proportional	Rate	Rate	Proportional	Rate	Volume	Volume	Volume	Volume
0	0.033	0.31	0.34	-0.045	19.00	19.00	0.000	0.000	0.000	99.99	99.99	99.99
10	0.033	0.31	0.34	-0.052	18.25	17.40	0.85	3.083	1.539	1.553	101.40	102.29
20	0.033	0.31	0.34	-0.055	17.40	16.35	1.05	4.608	4.631	101.35	101.60	101.60
30	0.033	0.31	0.34	-0.062	16.35	15.30	1.06	6.149	7.664	100.25	100.58	100.58
40	0.033	0.31	0.34	-0.065	15.30	14.27	1.34	9.199	9.214	101.41	101.25	101.25
50	0.033	0.30	0.33	-0.070	13.97	12.57	1.39	7.664	7.682	100.10	100.02	100.02
60	0.033	0.30	0.33	-0.069	12.57	11.27	1.30	10.732	10.738	101.46	101.32	101.32
70	0.033	0.30	0.34	-0.069	11.27	10.10	1.16	12.278	12.277	101.76	101.79	101.76
80	0.033	0.30	0.33	-0.067	10.10	9.11	1.00	13.767	13.762	98.17	97.97	97.97
90	0.033	0.31	0.34	-0.064	9.11	8.34	0.77	15.315	15.308	101.85	101.86	101.86
100	0.033	0.30	0.35	-0.061	8.34	7.56	0.77	16.854	16.847	101.15	101.16	101.16
110	0.033	0.31	0.34	-0.059	7.56	6.86	0.70	18.361	18.352	98.95	98.90	98.90
120	0.033	0.31	0.34	-0.059	6.86	6.20	0.66	19.875	19.865	99.27	99.28	99.28
130	0.033	0.33	0.33	-0.056	6.20	5.63	0.57	21.398	21.387	99.79	99.81	99.81
140	0.033	0.30	0.34	-0.055	5.63	5.11	0.52	22.930	22.922	100.29	100.57	100.57
150	0.033	0.30	0.33	-0.053	5.11	4.60	0.51	24.457	24.449	99.88	99.97	99.97
160	0.033	0.30	0.33	-0.052	4.60	4.17	0.43	25.989	25.987	100.17	100.64	100.64
170	0.033	0.30	0.35	-0.048	4.17	3.92	0.25	27.505	27.497	99.00	98.70	98.70
180	0.033	0.31	0.34	-0.046	3.92	3.66	0.26	29.038	29.027	100.01	99.90	99.90
190	0.033	0.30	0.34	-0.044	3.66	3.46	0.20	30.574	30.565	100.16	100.36	100.36
200	0.033	0.30	0.34	-0.043	3.46	3.06	0.20	33.693	33.684	103.71	103.85	103.85
210	0.033	0.31	0.33	-0.041	3.26	2.86	0.19	35.174	35.161	96.43	96.24	96.24
220	0.033	0.31	0.33	-0.040	3.06	2.69	0.18	36.691	36.678	98.74	98.81	98.81
230	0.033	0.30	0.34	-0.040	2.86	2.51	0.18	38.220	38.209	99.50	99.69	99.69
240	0.033	0.31	0.34	-0.039	2.69	2.32	0.19	39.766	39.752	100.57	100.45	100.45
250	0.033	0.30	0.34	-0.039	2.51	2.16	0.17	41.393	41.372	105.81	105.41	105.41
260	0.033	0.30	0.34	-0.038	2.32	2.00	0.15	42.818	42.800	92.67	92.91	92.91
270	0.033	0.30	0.33	-0.036	2.16	1.83	0.17	44.351	44.333	99.66	99.72	99.72
280	0.033	0.30	0.34	-0.036	2.00	1.65	0.18	45.883	45.865	99.56	99.60	99.60
290	0.033	0.32	0.34	-0.036	1.83	1.49	0.16	47.416	47.395	99.58	99.42	99.42
300	0.033	0.31	0.34	-0.035	1.65	1.33	0.16	49.021	49.000	104.26	104.28	104.28
310	0.033	0.31	0.34	-0.035	1.49	1.19	0.14	50.509	50.495	96.60	97.09	97.09
320	0.033	0.30	0.34	-0.035	1.33	1.05	0.14	52.013	51.996	97.59	97.43	97.43
330	0.033	0.31	0.34	-0.035	1.19	0.92	0.13	53.559	53.533	100.29	99.76	99.76
340	0.033	0.30	0.33	-0.035	1.05	0.81	0.11	55.117	55.095	101.04	101.38	101.38
350	0.033	0.30	0.34	-0.034	0.92	0.68	0.13	56.662	56.596	100.21	97.43	97.43
360	0.033	0.32	0.33	-0.034	0.81	0.55	0.13	58.185	58.156	98.76	101.22	101.22
370	0.033	0.32	0.34	-0.033	0.68	0.43	0.12	59.705	59.678	98.56	98.77	98.77
380	0.033	0.32	0.34	-0.032	0.55	0.30	0.13	61.252	61.231	100.25	100.74	100.74
390	0.033	0.30	0.33	-0.032	0.43	0.16	0.13	62.778	62.750	98.89	98.52	98.52
400	0.033	0.31	0.33	-0.032	0.30	0.06	0.10	64.374	64.349	103.43	103.71	103.71
410	0.033	0.31	0.33	-0.032	0.16	0.00	0.10	65.853	65.813	95.83	94.92	94.92
420	0.033	0.31	0.34	-0.032	0.10	0.00	0.10	66.374	64.349	103.43	103.71	103.71
430	0.033	0.30	0.33	-0.032	0.00	0.00	0.10	65.853	65.813	95.83	94.92	94.92

Test Engineer:

Date: 5/22/13



Dilution Tunnel Velocity Traverse
EPA Method 5G-3

Project Number: G101161435
Manufacturer: Lennox
Model: GV 300
Sample ID Number: PRT1305240718-001
Test Date: 16-May-13
Test Run Number: 4

	Dilution Tunnel		Delta P Temp, °F	Square Root
	In. H2O			
A1	0.0320	88	0.1789	0.2000
A2	0.0400	88	0.1844	0.2000
A3	0.0340	88	0.1844	0.2000
A4	0.0300	88	0.1732	0.1844
A Center	0.0340	88	0.1844	0.1844
B1	0.0300	88	0.1732	0.1844
B2	0.0360	88	0.1897	0.1844
B3	0.0340	88	0.1844	0.1673
B4	0.0280	88	0.1673	0.1844
B Center	0.0340	88	0.1844	0.1814
Averages	0.0332	88	0.1814	

Tunnel Diameter	6.000	inches
Tunnel Static	-0.170	in. H2O
Tunnel Area	0.19635	Ft2
Pitot Correction	0.9837	factor
Baro. Pressure	30.00	
Pitot Factor	0.99	(0.99 for standard, 0.84 or Cal. For S-Type)
Initial Velocity	12.280	Ft/ Sec
Initial Flow	134.12	Ft3/min

Date: 5/22/13

Test Engineer: CJO



Project Number: G101161435
Manufacturer: Lennox
Model: GV 300
Sample ID Number: PRT1305240718-001
Test Date: 16-May-13
Test Run Number: 4

Intertek Equipment No.'s 19683, 19684

Sample Train - 1					
Sample Component	Component	ID Number	Final, mg	Tare, mg	Particulate, mg
A - Front Filter Catch	Filter	546	120.1		
B - Rear Filter Catch	Filter	547	120.2		
C - Seal Set	O-Ring	NA			
Total, A+B+C-Tares			254.9	240.3	14.6
Probe & Filter Holder	Probe	19	126537.1	126536.7	0.4
			Total Particulate, mg		
			15		

Sample Train - 2					
Sample Component	Component	ID Number	Final, mg	Tare, mg	Particulate, mg
A - Front Filter Catch	Filter	548	120.6		
B - Rear Filter Catch	Filter	549	119.6		
C - Seal Set	O-Ring	NA			
Total, A+B+C-Tares			255.2	240.2	15
Probe & Filter Holder	Probe	28	124052.7	124052.0	0.7
			Total Particulate, mg		
			15.7		

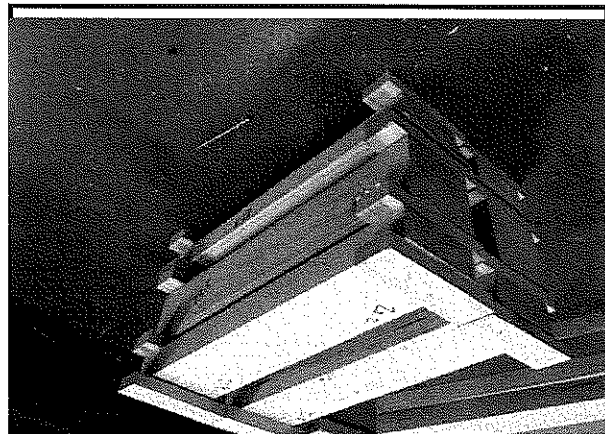
Test Engineer: *BS*

Date: 5/22/13

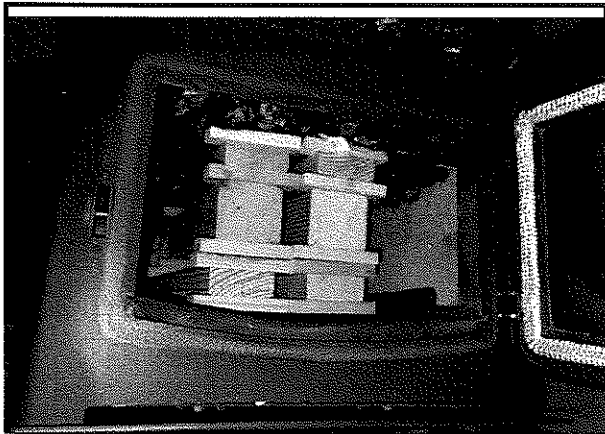
Project Number: G101161435
Manufacturer: Lennox
Model: GV 300
Sample ID Number: PRT1305240718-001
Test Date: 17-May-13
Test Run Number: 5

Dry Burn-Rate, kg/hr:		2.42
Emission-Rate, g/hr:		2.88
Adjusted Emission-Rate, g/hr :		4.38
Duration of Test, Minutes		170
Dry Gas Meter Standardization		
Dry Gas Meter Beginning Reading, ft ³	Train A	0
Dry Gas Meter Ending Reading, ft ³	Train A	24.635
Barometric Pressure Correction Factor	Train A	1.003
Dry Gas Meter Calibration Factors (Y factors)	Train A	0.995
Dry Gas Meter Temperature Factors	Train A	0.978
Dry Gas Meter Delta-H Correction Factors	Train A	1.001
Dry Gas Meter STD Volume Sampled, ft ³	Train A	24.059
Dilution Tunnel Flow / Volume		
Standardized Tunnel Flow, dsctm		134.197
Total Tunnel Volume, scf		22813.520
Emission Calculations		
Sample Ratios (Total Tunnel Volume / Total Sample Volume)	Train A	948.237
Sample Particulate Mass, mg	Train A	9.3
Total Emissions, grams	Train A	8.819
Emission-Rate, g/hr	Train A	3.11
Adjusted Emission Rates, g/hr	Train A	4.67
Deviation, %	Train A	6.65%
Operating Parameters		
For catalytic equipped appliances - If deviation from average emission rate is greater than 7.5% due to low particulate catch, difference is not to exceed 7.5% compared to 4.1 g/hr.	Train A	0.14
For non-catalytic appliances - If deviation from average emission rate is greater than 7.5% due to low particulate catch, difference is not to exceed 7.5% compared to 7.5 g/hr.	Train A	7.77%
Max Filter Temperature, °F	Train A	81.9981003
Post-Test Leak Check, cfm @ In. Hg vac.	Train A	0.008@6
Average Firebox Surface Temperature delta-T, °F	Train A	58.376172
Minimum Ambient Temperature, °F	Train A	81
Maximum Ambient Temperature, °F	Train A	75
Fuel Properties		
Wet Fuel Load Weight, lb.	Train A	18.50
Dry-Basis Fuel Load Moisture Content, %	Train A	22.46
Wet-Basis Fuel Load Moisture Content, %	Train A	18.34
Coal Bed Range, lb.	Train A	3.70
Actual Coal Bed, lb.	Train A	3.7

PROJECT / TEST INFORMATION	
Project Number:	G101161435
Manufacturer:	Lennox
Model:	GV 300
Sample ID Number:	PRT1305240718-001
Test Date:	17-May-13
Test Run Number:	5
Date tunnel cleaned:	5/10/2013
Purpose of Test	Certification



Appliance Information		
Appliance Type:	2	1 - Catalytic 2 - Non - Catalytic 3 - Pellet 4 - Hydronic
Firebox Volume, ft ³ :	2.92	N/A for pellet type
Convection Blower	2	1 - No Fan 2 - Fan Optional 3 - Fan Standard



Test Settings	Primary Air: Fully open Secondary Air: Fixed Control Board: NA Blower/Fan: On high
Pre-Burn Activities	At 64 minutes leveled coal bed
Time	Activity
Start-Up Procedure	Loading of fuel, sec.: Loaded by 70 seconds Fuel-loading door: closed by 90 seconds Primary air: Fully open full 5 minutes Secondary air: Fixed Control board: NA Blower / fan: Off for the first 5 minutes then turned to high
Other Notes	

Test Engineer:

Date: 6/4/13

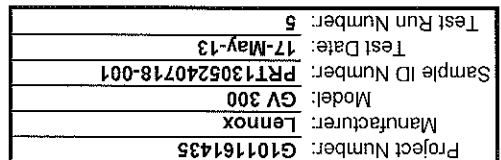
Project Number:	G101161435
Manufacturer:	Lennox
Model:	GV 300
Sample ID Number:	PRT1305240718-001
Test Date:	17-May-13
Test Run Number:	5

Firebox Volume, ft ³ :	2.92
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Calibration Reference ID	
Set meter to Species 1	
Set Temperature to 70F	12%
Set pin setting to 444	22%
	22.0

PRE-BURN FUEL PROPERTIES					
Eq. ID No.:	Time:	Temp., °F:	Temp., °F:	67	
Piece No.	Length, In.	Weight, Lb.	Moisture, %, Dry Basis		
1	17.00	20.3	21.5	20.4	
2	17.00		18.7	21.9	19.3
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
Total Weight		0.0	Average, %db		20.4

Eq. ID No.:	Time:	Temp., °F:	Temp., °F:	67	
Piece No.	Length, In.	Weight, Lb.	Moisture, %, Dry Basis		
1	17.00	2.10	23.8	21.7	23.8
2	17.00	2.40	22.7	19.3	20.2
3	17.00	2.10	21.9	20.5	22.6
4	17.00	2.20	23.1	22.3	20.4
5	17.00	4.70	22.1	24.7	24.5
6	17.00	5.00	24.8	22.7	23.2
7					
8					
Totals		8.8	9.7		
% of Weight		48	52		
Total weight, wet, lb.		18.50			
Total weight, dry, kg		6.85			
Average Moisture, dry		22.46			
Average Moisture, wet		18.34			



Coal Bed Range	3.7	to	4.6
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Average Firebox Temp, °F	381.998
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Final Coal Bed Wt, lb	3.7
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Duration, Minutes	Temperature Data										Room	Dilution Tunnel	Flue Gas	Firebox Top	Firebox Bottom	Firebox Back	Firebox Left	Firebox Right	Catalyst Outlet	Flue Draft	Fuel Weight	Weight Loss		
	0	75	245	740	885	158	522	498	491	-0.10													15.70	12.00
10	74	200	714	839	172	297	509	535	-0.10	12.36	3.34	10	74	192	702	825	177	264	500	548	-0.10	9.28	3.08	
20	77	192	702	825	177	264	500	548	-0.10	9.28	3.08	20	77	184	681	839	176	257	506	565	-0.10	6.42	2.86	
30	74	184	681	839	176	257	506	565	-0.10	6.42	2.86	30	74	161	593	750	180	268	527	578	-0.08	4.75	1.67	
40	76	161	593	750	180	268	527	578	-0.08	4.75	1.67	40	76	147	494	560	183	288	544	587	-0.08	4.09	0.66	
50	73	147	494	560	183	288	544	587	-0.08	4.09	0.66	50	73	88	428	438	184	271	524	567	-0.07	3.80	0.29	
60	74	88	428	438	184	271	524	567	-0.07	3.80	0.29	60	74	75	120	408	407	183	259	509	552	-0.066	3.70	0.10
63	75	120	408	407	183	259	509	552	-0.066	3.70	0.10	63	75											

Date: 5/21/3

Project Number: Q101161435
Manufacturer: Lennox
Model: GV 300
Sample ID No: PRT1305240718-001
Test Date: 17-May-13
Test Run No: 5

Temperature Data

Firebox Temp Start	381.998
Firebox Temp End	323.622
Firebox Delta-T	58.4
Max Filter Temps	
Train A	81.9981
Train B	79.8382

Interval	10
Duration of Test, Min	170

Time		Temperature Data													
Interval	Duration	Room	Dilution Tunnel	Flue Gas	Firebox Top	Firebox Bottom	Firebox Back	Firebox Left	Firebox Right	Catalyst Outlet	Train A Filter	Train B Filter	DGM	Train A DGM	Train B DGM
0	0	75	120	408	407	183	259	509	552		73	72	77	77	77
1	10	77	148	585	605	185	254	470	510		64	68	77	77	76
2	20	79	162	653	752	185	198	438	483		73	72	78	78	77
3	30	80	166	666	801	182	184	440	482		73	72	78	78	77
4	40	81	159	625	776	179	187	457	494		67	69	79	79	78
5	50	80	150	581	688	177	197	471	510		73	66	79	79	78
6	60	81	144	546	635	174	209	481	521		73	62	80	78	78
7	70	81	140	538	602	171	226	490	526		77	75	80	78	78
8	80	81	135	514	584	171	240	496	525		78	78	80	78	78
9	90	81	131	484	525	171	247	493	523		78	77	80	79	79
10	100	80	126	456	480	172	250	484	521		79	77	80	79	79
11	110	79	121	425	435	173	255	474	522		81	79	81	79	79
12	120	80	115	383	383	175	248	464	528		82	79	81	79	79
13	130	79	112	366	355	175	235	446	523		82	80	81	79	79
14	140	80	110	352	337	176	227	428	516		82	80	81	79	79
15	150	79	109	349	325	175	223	413	512		82	80	81	79	79
16	160	78	108	345	323	175	224	408	509		82	80	81	79	79
17	170	79	107	337	314	174	224	403	503		82	80	81	79	79

Test Engineer: 

Date: 5/24/13



TEST DATA
EPA METHOD 56-G-3

Gas Particulate Sampling Data

Project Number: G101161435
Manufacturer: Lennox
Model: GV 300
Sample ID Number: PRT1305240718-001
Test Date: 17-May-13
Test Run Number: 5

Barometer, in. Hg	RH, %	Sample Box Correction (Y) Factors
Start	30.00	Meter Box (A)
End	30.00	Meter Box (B)
Duration of Test, Min		170

Leak Check, cfm @ in Hg	Train A	0.008@6
	Train B	0.006@4

Maximum Vacuum	Train A	0.00
	Train B	0.00

Time	Particulate Sampling Data									
	Tunnel	Train A	Train B	Flue	Fuel	Weight	Train A	Train B	Proportional	Proportional
0	0.038	0.30	0.33	-0.066	18.50	18.50	0.000	0.000	99.92	99.97
10	0.038	0.30	0.33	-0.088	16.88	1.62	1.432	1.530	100.70	106.74
20	0.038	0.30	0.29	-0.093	14.17	2.71	2.767	2.994	94.84	103.19
30	0.038	0.06	0.27	-0.094	11.44	2.73	4.129	4.357	96.96	96.27
40	0.038	0.05	0.26	-0.090	9.17	2.26	5.487	5.697	96.03	94.01
50	0.038	0.30	0.33	-0.085	7.46	1.72	6.885	7.188	98.07	103.80
60	0.038	0.31	0.24	-0.082	6.01	1.45	8.224	8.512	93.38	91.66
70	0.038	0.31	0.35	-0.082	4.74	1.27	9.528	9.856	90.64	92.80
80	0.038	0.32	0.33	-0.078	3.63	1.11	10.898	11.231	94.81	94.54
90	0.038	0.33	0.32	-0.075	2.81	0.82	12.231	12.596	91.85	93.44
100	0.038	0.34	0.34	-0.072	2.17	0.63	13.633	14.132	96.18	104.68
110	0.038	0.33	0.34	-0.068	1.63	0.55	15.138	15.668	102.82	104.23
120	0.038	0.31	0.34	-0.063	1.30	0.32	16.702	17.196	106.27	103.15
130	0.038	0.33	0.33	-0.060	0.99	0.31	18.288	18.725	107.47	102.94
140	0.038	0.32	0.33	-0.059	0.71	0.28	19.877	20.251	107.46	102.55
150	0.038	0.32	0.33	-0.058	0.37	0.34	21.479	21.791	108.24	103.39
160	0.038	0.32	0.33	-0.058	0.10	0.27	23.047	23.295	105.86	100.90
170	0.038	0.32	0.33	-0.056	0.00	0.10	24.635	24.805	107.12	101.22

Test Engineer: *CS*

Date: 5/17/13



Dilution Tunnel Velocity Traverse
EPA Method 5G-3

Project Number: G101161435
Manufacturer: Lennox
Model: GV 300
Sample ID Number: PRT1305240718-001
Test Date: 17-May-13
Test Run Number: 5

	Dilution Tunnel		Delta P Temp, °F	Square Root
	In. H2O	146		
A1	0.0380	146	0.1949	0.2049
A2	0.0420	146	0.2049	0.1897
A3	0.0360	146	0.1897	0.2000
A4	0.0320	146	0.1789	0.2000
A Center	0.0400	146	0.2000	0.2000
B1	0.0400	146	0.2000	0.2000
B2	0.0400	146	0.2000	0.2000
B3	0.0400	146	0.2000	0.2000
B4	0.0320	146	0.1789	0.2000
B Center	0.0400	146	0.2000	0.1934
Averages	0.038	146	0.1934	

Tunnel Diameter	6.000	inches
Tunnel Static	-0.210	in. H2O
Tunnel Area	0.19635	Ft2
Pitot Correction	0.9671	factor
Baro. Pressure	30.00	
Pitot Factor	0.99	(0.99 for standard, 0.84 or Cal. For S-Type)
Initial Velocity	13.771	Ft/ Sec
Initial Flow	136.01	Ft3/min

Test Engineer:

Date: 5/21/13



Project Number: G101161435
Manufacturer: Lennox
Model: GV 300
Sample ID Number: PRT1305240718-001
Test Date: 17-May-13
Test Run Number: 5

Intertek Equipment No.'s 19683, 19684

Sample Train - 1					
Sample Component	Component	ID Number	Final, mg	Tare, mg	Particulate, mg
A - Front Filter Catch	Filter	552		121.5	
B - Rear Filter Catch	Filter	553		120.7	
C - Seal Set	O-Ring				
Total, A+B+C-Tares			250.8	242.2	8.6
Probe & Filter Holder	Probe	35	124875.8	124875.1	0.7
			Total Particulate, mg		
			9.3		

Sample Train - 2					
Sample Component	Component	ID Number	Final, mg	Tare, mg	Particulate, mg
A - Front Filter Catch	Filter	550		120.6	
B - Rear Filter Catch	Filter	551		121.1	
C - Seal Set	O-Ring				
Total, A+B+C-Tares			249.1	241.7	7.4
Probe & Filter Holder	Probe	16A	113651.3	113650.7	0.6
			Total Particulate, mg		
			8		

Test Engineer:

Date: 5/22/13