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DEPARTMENT OF AGRICULTURE

Nebraska Standards Laboratory
3721 West Cuming St.
Lincoln, NE 68524
(402) 471-2087

Director of Agriculture
Steve Wellman
P.O. Box 94947
Lincoln, NE 68509-4947
(402) 471-2341
www.nda.nebraska.gov

Calibration Date:	**3/12/2019**	***Certificate of Calibration of Volume Transfer***	**Certificate Number:**	**2016-056-1**

Items Submitted:

Quantity	Nominal Volume	Manufacturer	Type
2	100 gal	Brownie	Bottom Drain Prover

Submitted By: FSCP Area 35
3721 West Cuming St.
Lincoln, NE 68524

POC: Mike Boehler
402-471-3422
michael.boehler@nebraska.gov

Test Results

Nominal Volume	Serial Number	Material	Cubical Coefficient of Expansion (/°F)	**As Found Volume Delivered @ 60 °F**	**As left Volume Delivered @ 60 °F**	Uncertainty (U)	(*k*)
100 gal	7861642	SS	0.0000265	**99.9963 gal**	**99.9963 gal**	0.0087 gal	2.02
100 gal	888231102	SS	0.0000265	**99.9844 gal**	**99.9844 gal**	0.0087 gal	2.02

The data in this report only applies to those items specifically listed on this report.

Volume delivered at 60˚F after a 30 second pour and 10 second drain for test measures. For provers and a 30 second drain time would apply.

Conversion Factors:

1 gal = 231 in³
1 gal = 3.785 412 E-03 m³

Traceability Statement:

The artifact(s) described in this report have been compared to the Standards of the State of Nebraska. The Standards of the State of Nebraska are traceable to the International System of Units (SI) through the National Institute of Standards and Technology (NIST) and are part of a comprehensive measurement assurance program for ensuring continued accuracy and measurement traceability within the level of uncertainty reported by this laboratory. The calibration number for this report is the only unique calibration number to be used in referencing measurement traceability for the artifact(s) described in this report.

Uncertainty Statement:

The combined standard uncertainty includes uncertainties reported for the standard, uncertainties associated with the measurement process, uncertainties for any observed deviations from reference values which are less than surveillance limits and the standard uncertainty for any uncorrected errors. The combined standard uncertainty is multiplied by a coverage factor (*k*), to give the expanded uncertainty, which defines an interval with a 95.45 percent level of confidence. The expanded uncertainty presented in this report is consistent with the Guide to the Expression of Uncertainty in Measurement (2008, revised 2012). Some components of the calibration can be evaluated through a Type A evaluation, or the method of evaluation of uncertainty by the statistical analysis (standard deviation) from the observations taken.

Pertinent Information:

The artifact(s) listed above have been found and/or left within the maximum permissible error for the specification stated above, except as noted. An artifact is considered in-compliance when the correction plus the measurement uncertainty is equal to or less than the maximum permissible error.

Condition of Item(s) Submitted for Calibration:
Good

Treatment of Item(s) before Calibration:
Tested as Found

Environmental conditions at time of calibration:

Temp ˚C	19.6	Humidity %	48.7
Pressure mmHg	761.09		

Laboratory Reference Standard Used;
100 gal NE 44158

Procedure Used:
NISTIR 7383, SOP 19

Water temperature at time of calibration:
43.66 °F

Date Submitted: 3/18/2019

Joel P. Lavicky, Metrologist

3/27/2019
Date:

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Calibration Certificate for Volume Transfer of LPG

Calibration Date: March 22, 2019

Certificate Number: 2019-056-2

Submitted by: FSCP Area 35
3721 West Cuming St.
Lincoln, NE 68524

POC: Mike Boehler
Phone: 402-471-2087

Date Received: 03/18/2019

PO Number: N/A
Job Order #: N/A

Artifact(s) Description

Test Item(s): 107 gal LPG Prover
Serial No: 104
Manufacture: National BD
Condition: Poor

Material: Steel, Prover, Low Carbon
Specification: NIST HB 105-4
Cubical Coefficient of Expansion: 0.0000186 / ºF

Calibration Information

Reference Standards Used:
NE-44158-100gal
NE-1586-5 gal
NE-514-1 gal

Procedure: NIST SOP 21

Metrologist: JPL

Temperature: 19.8 ºC **Humidity:** 45.0 % RH **Water Temperature:** 7.3 ºC

Calibration Results

Nominal Volume (at zero mark on gauge)	Prover Volume As Found @ 60 ºF and 100 psig (gal)	Prover Volume As Left @ 60 ºF and 100 psig (gal)	Spec. Tol. ± (gal)	Uncertainty ± (gal)	*k* factor	Degrees of Freedom
107 gal	106.913	106.913	0.214	0.022	2	6590

Conversion Factors
1 gallon (U.S.) (gal) = 231 in³
1 gallon (U.S.) (gal) = 3.785 412 E-03 m³

Pertinent Information

- The artifact is considered in-tolerance when the error is equal to or less than the specified tolerance minus the measurement uncertainty. RED print indicates an out-of-tolerance reading.
- Enter the Pressure Correction from Table 1 that corresponds with the pressure being tested on your LPG Meter Test form.
- The calibration item was calibrated in a 'wet down' condition using water. The calibration data above applies when the prover bottom zero is obtained during a 30 (± 5) second period after cessation of the main flow.
- The drain time (using gravity) to the bottom zero was approximately 10 minute(s) 30 seconds.
- The Top Securty Seal Number is Ne lab and the Bottom Security Seal Number is "NE Lab".

Traceability Statement

The artifact(s) described in this report have been compared to the Standards of the State of Nebraska. The Standards of the State of Nebraska are traceable to the SI through the National Institute of Standards and Technology (NIST) and are part of a comprehensive measurement assurance program for ensuring continued accuracy and measurement traceability within the level of uncertainty reported by this laboratory. The International System of Units (SI) for volume is the cubic meter (m³) (see Conversion Factors below). The report number for this report is the only unique report number to be used in referencing measurement traceability for the artifact(s) described in this report.

Uncertainty Statement

The combined standard uncertainty includes uncertainties for the standard(s), for the measurement process, for the material cubical coefficient of expansion, for reading meniscus, for the pressure gauge, for graduated neck errors and for the thermometer(s) used for measuring the water temperature. The combined standard uncertainty is multiplied by a coverage factor, *k* , to give the expanded uncertainty, which defines an interval with a 95.45 % level of confidence. The expanded uncertainty presented in this report is consistent with JCGM 100:2008, *Evaluation of measurement data — Guide to the expression of uncertainty in measurement (GUM 1995 with minor corrections)* . A component for the effects of viscosity was not included in the uncertainty budget.

Signature: Joel P. Lavicky, State Metrologist

Date: 3/27/2019

The results in this certificate only applies to those items specifically listed in this certificate. The certificate cannot be considered complete unless it contains all pages. The document may not be reproduced except in full, without the written consent of the Nebraska Standards Laboratory

Attachments: Table 1 and Chart 1 - LPG Prover Pressure Corrections
Table 2 - LPG Prover Temperature Corrections
Table 3 - Volume Corrections for Thermal Expansion or Contraction of Prover
Table 4 - Volume Correction Factors to 60 ºF

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Calibration Certificate of Mass

Calibration Date: December 17, 2019 | **Certificate Number:** 2019-156-1

Submitted By: FSCP Area 35
3721 West Cuming St.
Lincoln, NE 68524

Point of Contact: Mike Boehler
Ph. 402-471-3422
email: *michael.boehler@nebraska.gov*
PO Number: N/A

Test Item(s): (20)-1000, (20)-50 & (8)-25 lb weights
Serial Number(s): See Next Page
Manufacture: Various
Condition: Good (some wear)

Artifact(s) Description:

Date Received: December 13, 2019
ID / Asset Number: FSCP Area 35
Class Specification: NIST Class F
Material: Cast iron

Reference Standards Used:
NSL lb standards

Procedure Used:
NIST HB 6969, SOP 8 (2018)

Metrologist:
JPL

Equipment Used:
Mettler XPR32003
Mettler XP 604

Environmental Cond. **Temp:** 19.7 °C **Pressure:** 762.5 mmHg **Relative Humidity:** 49.6 %

Pertinent Information

- The artifact(s) listed in this document have been found and/or left within the maximum permissible error for the specification stated above, except as noted. An artifact is considered in-compliance when the correction plus the measurement uncertainty is equal to or less than the maximum permissible error. RED print indicates an out-of-compliance reading. All of the tolerances and specifications were evaluated according to ASTM E617 (2018) and/or NIST HB 105-1 (2019).

- All corrections stated in this report correlate to a "Conventional Mass" (CM), also known as "apparent mass", scale verses 8.0 g/cm³ reference mass density and an air density of 1.2 mg/cm³ at 20 °C.

Traceability Statement

The artifact(s) described in this certificate have been compared to the Standards of the State of Nebraska. The Standards of the State of Nebraska are traceable to the International System of Units (SI) through the National Institute of Standards and Technology (NIST) and are part of a comprehensive measurement assurance program for ensuring continued accuracy and measurement traceability within the level of uncertainty reported by this laboratory. The calibration number for this certificate is the only unique calibration number to be used in referencing measurement traceability for the artifact(s) described in this certificate.

Uncertainty Statement

The combined standard uncertainty includes uncertainties reported for the standard, uncertainties associated with the measurement process, uncertainties for any observed deviations from reference values which are less than surveillance limits and the standard uncertainty for any uncorrected errors associated with air buoyance corrections. The combined standard uncertainty is multiplied by a coverage factor (k), to give the expanded uncertainty, which defines an interval with a 95.45 percent level of confidence. The expanded uncertainty presented in this report is consistent with the *Guide to the Expression of Uncertainty in Measurement (2008, revised 2012)*. Some components of the calibration can be evaluated through a Type A evaluation, or the method of evaluation of uncertainty by the statistical analysis (standard deviation) from the observations taken. Magnetic testing has not been performed, therefore, there are no components for the effects of it in the uncertainty budget.

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Calibration Date: December 17, 2019 | **Certificate Number:** 2019-156-1

Calibration Results

Nominal Mass	Serial Number / ID	As Found Conventional Mass Correction (g)	Adjusted (Y/N)	As Left Conventional Mass Correction (g)	Uncertainty ± (g)	(*k*) factor	NIST Class F MPE ± (g)	Assumed Density (g/cm³)
25 lb	WM-D15	-0.07	N	-0.07	0.14	2	1.1	7.2
25 lb	WM-D23	-0.40	N	-0.40	0.14	2	1.1	7.2
25 lb	WM-D24	-0.17	N	-0.17	0.14	2	1.1	7.2
25 lb	WM-D25	-0.67	N	-0.67	0.14	2	1.1	7.2
25 lb	WM-D26	-0.69	N	-0.69	0.14	2	1.1	7.2
25 lb	WM-D28	-1.00	Y	0.02	0.14	2	1.1	7.2
25 lb	WM-D29	-0.41	N	-0.41	0.14	2	1.1	7.2
25 lb	WM-D44	-0.49	N	-0.49	0.14	2	1.1	7.2
50 lb	A5C*1	4.30	Y	-0.37	0.28	2	2.3	7.2
50 lb	A5C*4	0.96	N	0.96	0.28	2	2.3	7.2
50 lb	A5C-11	-0.81	N	-0.81	0.28	2	2.3	7.2
50 lb	B-C-1	1.76	N	1.76	0.28	2	2.3	7.2
50 lb	B-C-2	1.43	N	1.43	0.28	2	2.3	7.2
50 lb	B-C-3	2.14	Y	0.29	0.28	2	2.3	7.2
50 lb	B-C-4	0.18	N	0.18	0.28	2	2.3	7.2
50 lb	B-C-5	-0.72	N	-0.72	0.28	2	2.3	7.2
50 lb	B-C-6	1.78	N	1.78	0.28	2	2.3	7.2
50 lb	B-C-7	-0.13	N	-0.13	0.28	2	2.3	7.2
50 lb	B-C-8	0.38	N	0.38	0.28	2	2.3	7.2
50 lb	B-C-9	1.27	N	1.27	0.28	2	2.3	7.2
50 lb	B-C-11	3.67	Y	-0.25	0.28	2	2.3	7.2
50 lb	B-C-12	0.60	N	0.60	0.28	2	2.3	7.2
50 lb	WM-0213	0.79	N	0.79	0.28	2	2.3	7.2
50 lb	WM-50-12	-0.32	N	-0.32	0.28	2	2.3	7.2
50 lb	WM-50-18	2.27	Y	0.09	0.28	2	2.3	7.2
50 lb	WM-50-52	1.26	N	1.26	0.28	2	2.3	7.2
50 lb	WM-50-53	1.27	N	1.27	0.28	2	2.3	7.2
50 lb	WM-50-7	-0.56	N	-0.56	0.28	2	2.3	7.2
1000 lb	1	151.9	Y	0.4	5.6	2.009	45	7.2
1000 lb	2	-86.9	Y	8.1	5.6	2.009	45	7.2
1000 lb	3	-69.3	Y	21.2	5.6	2.009	45	7.2
1000 lb	4	-24.5	N	-24.5	5.6	2.009	45	7.2
1000 lb	5	-54.2	Y	8.2	5.6	2.009	45	7.2
1000 lb	6	38.7	N	38.7	5.6	2.009	45	7.2
1000 lb	7	10.6	N	10.6	5.6	2.009	45	7.2
1000 lb	8	27.5	N	27.5	5.6	2.009	45	7.2
1000 lb	9	-109.6	Y	37.1	5.6	2.009	45	7.2
1000 lb	10	-15.2	N	-15.2	5.6	2.009	45	7.2
1000 lb	11	-29.7	N	-29.7	5.6	2.009	45	7.2
1000 lb	12	2.8	N	2.8	5.6	2.009	45	7.2
1000 lb	13	108.7	Y	6.2	5.6	2.009	45	7.2
1000 lb	14	-10.5	N	-10.5	5.6	2.009	45	7.2
1000 lb	15	-29.8	N	-29.8	5.6	2.009	45	7.2
1000 lb	16	-38.5	Y	7.1	5.6	2.009	45	7.2
1000 lb	17	33.6	N	33.6	5.6	2.009	45	7.2
1000 lb	18	-16.5	N	-16.5	5.6	2.009	45	7.2
1000 lb	19	12.0	N	12.0	5.6	2.009	45	7.2
1000 lb	20	-27.6	N	-27.6	5.6	2.009	45	7.2

Conversion Factors

1 ounce (avoirdupois) (oz) = 28.349 52 g
1 pound (avoirdupois) (lb) = 453.592 37 g exactly

Joel P. Lavicky *Metrologist*

12/26/2019
Date of Issue