NEBRASKA
Good Life. Great Roots.
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 Certificate for Volume Transfer of LPG

Calibration Date: May 31, 2022

Certificate Number: 2022-078-1

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

POC: Mike Boehler
Phone: 402-471-2087

Date Received: 05/31/2022

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

Artifact(s) Description

Test Item(s): 100 gal LPG Prover
Serial No: **49529**
Manufacture: Arrow Tank
Condition: good

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

Procedure: NIST SOP 21(2019)

Metrologist: JPL

Temperature: 22.5 ºC **Humidity:** 51.0 % RH **Water Temperature:** 14.1 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
100 gal	99.95	99.95	0.2	0.025	2.001	2959

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 correction plus the measurement uncertainty is equal to or less than the specified tolerance. RED print indicates an out-of-tolerance reading. It is the decision of the Laboratory to adjust the artifact when the sum of the correction and the uncertainty exceed 95% of the maximum permissible error. All of the tolerances and specifications were evaluated according to NIST HB 105-4 (2019)
- 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 7 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

E-signature is colpy only

Date: 6/6/2022

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 for Volume Transfer of LPG

Calibration Date: May 31, 2022

Certificate Number: 2022-078-2

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

POC: Mike Boehler
Phone: 402-471-2087

Date Received: 05/31/2022

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

Artifact(s) Description

Test Item(s): 25 gal LPG Prover
Serial No: **49528**
Manufacture: Arrow Tank
Condition: good

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

Calibration Information

Reference Standards Used:

NE-1586-5 gal

Procedure: NIST SOP 21(2019)

Metrologist: JPL

Temperature: 22.7 ºC **Humidity:** 53.0 % RH **Water Temperature:** 14.9 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
25 gal	25.071	25	0.05	0.022	2.011	232

Conversion Factors

1 gallon (U.S.) (gal) = 231 in³

1 gallon (U.S.) (gal) = 3.785 412 E-03 m³

Pertinent Information

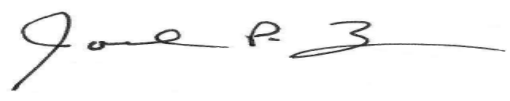
- The artifact is considered in-tolerance when the correction plus the measurement uncertainty is equal to or less than the specified tolerance. RED print indicates an out-of-tolerance reading. It is the decision of the Laboratory to adjust the artifact when the sum of the correction and the uncertainty exceed 95% of the maximum permissible error. All of the tolerances and specifications were evaluated according to NIST HB 105-4 (2019)
- 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 6 minute(s) 0 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:  E-signature is colpy only

Date: 6/6/2022

Joel P. Lavicky, State Metrologist

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Attachments: Table 1 and Chart 1 - LPG Prover Pressure Corrections
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Calibration Certificate of Mass

Calibration Date: April 5, 2022 | **Certificate Number:** 2022-051-1

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): Cast weights
ID / Asset Number: **Area 35**
Manufacture: Rice Lake & Troemner
Material: Cast Iron

Artifact(s) Description:

Date Received: April 1, 2022
Serial Number(s): See Next Page
Class Specification: NIST Class F
Condition: Good (some wear)

Reference Standards Used:
NSL lb standards

Procedure Used:
NIST HB 6969, SOP 8 (2019)

Metrologist:
JPL

Equipment Used:
Mettler XP 604
Mettler XPR32003

Environmental Cond. **Temp:** 22.2 °C **Pressure:** 715.1 mmHg **Relative Humidity:** 47.8 %

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. It is the decision of the Laboratory to adjust the artifact(s) when the sum of the correction and the uncertainty exceed 95% of the maximum permissible error. All of the tolerances and design specifications (except density, hardness and magnetism) were evaluated according to ASTM E617 (2018) and/or NIST HB 105-1 (2019) for the artifacts designated class.

- 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.

- It is the end user's responsibility to verify that the weights meet the accuracy requirements outlined in NIST Handbook 44 (2020), Appendix A Fundamental Considerations, when using the weights for calibration of commercial (Legal for Trade) scales.

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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Lincoln, NE 68509-4947
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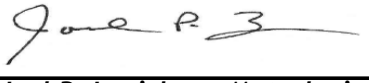
Calibration Date: April 5, 2022 | **Certificate Number:** 2022-051-1

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	0.30	N	0.30	0.14	2	1.1	7.2
25 lb	WM-D23	0.51	N	0.51	0.14	2	1.1	7.2
25 lb	WM-D24	-0.08	N	-0.08	0.14	2	1.1	7.2
25 lb	WM-D25	-0.28	N	-0.28	0.14	2	1.1	7.2
25 lb	WM-D26	0.43	N	0.43	0.14	2	1.1	7.2
25 lb	WM-D28	0.22	N	0.22	0.14	2	1.1	7.2
25 lb	WM-D29	0.27	N	0.27	0.14	2	1.1	7.2
25 lb	WM-D44	-0.02	N	-0.02	0.14	2	1.1	7.2
50 lb	A5C 1	-0.97	N	-0.97	0.28	2	2.3	7.2
50 lb	A5C 4	0.57	N	0.57	0.28	2	2.3	7.2
50 lb	A5C 11	0.58	N	0.58	0.28	2	2.3	7.2
50 lb	B-C-1	-0.92	N	-0.92	0.28	2	2.3	7.2
50 lb	B-C-2	0.94	N	0.94	0.28	2	2.3	7.2
50 lb	B-C-3	-0.52	N	-0.52	0.28	2	2.3	7.2
50 lb	B-C-6	1.67	N	1.67	0.28	2	2.3	7.2
50 lb	B-C-9	1.86	N	1.86	0.28	2	2.3	7.2
50 lb	B-C-12	1.20	N	1.20	0.28	2	2.3	7.2
50 lb	WM50-16	0.07	N	0.07	0.28	2	2.3	7.2
50 lb	WM-50-50A	-0.22	N	-0.22	0.28	2	2.3	7.2
50 lb	WM-50-56	1.58	N	1.58	0.28	2	2.3	7.2
500 lb	WM-T519	32.5	Y	7.1	2.9	2.002	23	7.2
1000 lb	1	-26.1	N	-26.1	5.8	2.019	45	7.2
1000 lb	2	2.9	N	2.9	5.8	2.019	45	7.2
1000 lb	3	-29.9	N	-29.9	5.8	2.019	45	7.2
1000 lb	4	-81.4	Y	23.8	5.8	2.019	45	7.2
1000 lb	5	-83.2	Y	18.4	5.8	2.019	45	7.2
1000 lb	6	-107.7	Y	15.7	5.8	2.019	45	7.2
1000 lb	7	-19.9	N	-19.9	5.8	2.019	45	7.2
1000 lb	8	25.0	N	25.0	5.8	2.019	45	7.2
1000 lb	9	12.1	N	12.1	5.8	2.019	45	7.2
1000 lb	10	-32.7	N	-32.7	5.8	2.019	45	7.2
1000 lb	11	-30.6	N	-30.6	5.8	2.019	45	7.2
1000 lb	12	-27.5	N	-27.5	5.8	2.019	45	7.2
1000 lb	13	-85.1	Y	9.3	5.8	2.019	45	7.2
1000 lb	14	-51.5	Y	14.5	5.8	2.019	45	7.2
1000 lb	15	-79.9	Y	18.9	5.8	2.019	45	7.2
1000 lb	16	-57.0	Y	14.9	5.8	2.019	45	7.2
1000 lb	17	29.5	N	29.5	5.8	2.019	45	7.2
1000 lb	18	-71.4	Y	16.7	5.8	2.019	45	7.2
1000 lb	19	-27.5	N	-27.5	5.8	2.019	45	7.2
1000 lb	20	-29.7	N	-29.7	5.8	2.019	45	7.2

Conversion Factors

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



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Joel P. Lavicky *Metrologist*

4/26/2022
Date of Issue

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Calibration Date: 4/14/2022

Certificate of Calibration of Volume Transfer

Certificate Number: 2022-062-1

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	**99.991 gal**	**99.991 gal**	0.012 gal	2.01
100 gal	888231102	SS	0.0000265	**100.002 gal**	**100.002 gal**	0.012 gal	2.01

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 a 30 second drain time would apply.

Conversion Factors:

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

Traceability Statement:

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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. It is the decision of the Laboratory to adjust the artifact(s) when the sum of the correction and uncertainty exceed 95% of the maximum permissible error. All of the tolerances and specifications were evaluated according to NIST HB 105-3 (2010).

Condition of Item(s) Submitted for Calibration:
Good

Laboratory Reference Standard Used;
100 gal NE 44158

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

Procedure Used:
NISTIR 7383, SOP 19 (2019)

Environmental conditions at time of calibration:

Temp ˚C	22.0	Humidity %	46.7
Pressure mmHg	728.90		

Water temperature at time of calibration:
49.08 °F

Date Submitted: 4/12/2022

E-signature is copy only

Joel P. Lavicky, Metrologist

4/26/2022
Issue Date: