

## Calibration Certificate of Mass

Calibration Date: August 24, 2021

Certificate Number: 2021-119-1

Submitted By: FSCP Area 50  
3721 West Cuming St.  
Lincoln, NE 68524

Point of Contact: Tom Demuth  
Ph. 402-471-3422  
email: [tom.demuth@nebraska.gov](mailto:tom.demuth@nebraska.gov)  
PO Number: N/A

Test Item(s): 22-cast weights  
ID / Asset Number: Area 50  
Manufacture: Troemner  
Material: Cast Iron

Artifact(s) Description:

Date Received: August 16, 2021  
Serial Number(s): See Next Page  
Class Specification: NIST Class F  
Condition: Good (some wear)

Reference Standards Used:

Procedure Used:

Equipment Used:

NSL 1b standards

NIST HB 6969, SOP 8 (2019)

Mettler XPR32003

Metrologist:

JPL

Environmental Cond.

Temp: 25.2 °C Pressure: 725.68 mmHg Relative Humidity: 49.3 %

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 versus 8.0 g/cm<sup>3</sup> reference mass density and an air density of 1.2 mg/cm<sup>3</sup> 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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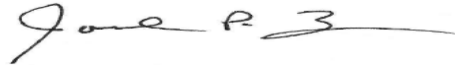
### Calibration Results

| 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/cm <sup>3</sup> ) |
|--------------|--------------------|---|----------------|--|-------------------|------------|------------------------|--------------------------------------|
| 15 lb        | WM15-13            | -0.506                                    | Y              | -0.416                                   | 0.083             | 2          | 0.68                   | 7.2                                  |
| 15 lb        | WM15-14            | -0.126                                    | Y              | -0.126                                   | 0.083             | 2          | 0.68                   | 7.2                                  |
| 25 lb        | WM25-29            | -0.11                                     | N              | -0.11                                    | 0.14              | 2          | 1.1                    | 7.2                                  |
| 25 lb        | WM25-27            | -0.36                                     | N              | -0.36                                    | 0.14              | 2          | 1.1                    | 7.2                                  |
| 25 lb        | WM25-42            | 0.26                                      | N              | 0.26                                     | 0.14              | 2          | 1.1                    | 7.2                                  |
| 25 lb        | WM25-44            | -0.71                                     | N              | -0.71                                    | 0.14              | 2          | 1.1                    | 7.2                                  |
| 25 lb        | WM25-65            | 0.28                                      | N              | 0.28                                     | 0.14              | 2          | 1.1                    | 7.2                                  |
| 25 lb        | WM25-66            | -0.20                                     | N              | -0.20                                    | 0.14              | 2          | 1.1                    | 7.2                                  |
| 25 lb        | WM25-67            | -0.51                                     | N              | -0.51                                    | 0.14              | 2          | 1.1                    | 7.2                                  |
| 25 lb        | WM25-68            | 0.56                                      | N              | 0.56                                     | 0.14              | 2          | 1.1                    | 7.2                                  |
| 25 lb        | WM25-69            | -0.20                                     | N              | -0.20                                    | 0.14              | 2          | 1.1                    | 7.2                                  |
| 25 lb        | WM25-70            | 0.74                                      | N              | 0.74                                     | 0.14              | 2          | 1.1                    | 7.2                                  |
| 25 lb        | WM25-71            | 0.16                                      | N              | 0.16                                     | 0.14              | 2          | 1.1                    | 7.2                                  |
| 25 lb        | WM25-72            | 0.53                                      | N              | 0.53                                     | 0.14              | 2          | 1.1                    | 7.2                                  |
| 25 lb        | WM25-73            | -0.70                                     | N              | -0.70                                    | 0.14              | 2          | 1.1                    | 7.2                                  |
| 25 lb        | WM25-74            | 0.66                                      | N              | 0.66                                     | 0.14              | 2          | 1.1                    | 7.2                                  |
| 25 lb        | WM25-106           | -0.15                                     | N              | -0.15                                    | 0.14              | 2          | 1.1                    | 7.2                                  |
| 25 lb        | WM25-113           | 0.48                                      | N              | 0.48                                     | 0.14              | 2          | 1.1                    | 7.2                                  |
| 25 lb        | WM25-114           | -0.35                                     | N              | -0.35                                    | 0.14              | 2          | 1.1                    | 7.2                                  |
| 25 lb        | WM25-116           | -0.18                                     | N              | -0.18                                    | 0.14              | 2          | 1.1                    | 7.2                                  |
| 25 lb        | WM25-117           | -0.24                                     | N              | -0.24                                    | 0.14              | 2          | 1.1                    | 7.2                                  |
| 25 lb        | WM25-119           | -0.46                                     | N              | -0.46                                    | 0.14              | 2          | 1.1                    | 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

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9/16/2021

Date of Issue

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Calibration Date: 8/30/2021

**Certificate of Calibration  
of Volume Transfer**

Certificate Number: 2021-119-2

**Items Submitted:**

| Quantity | Nominal Volume | Manufacturer | Type                 |
|----------|----------------|--------------|----------------------|
| 2        | 5 gal          | Seraphin     | Test Measure 4" Neck |

**Submitted By:** FSCP Area 50

3721 West Cuming St.  
Lincoln, NE 68524

**POC:** Tom Demuth

402-471-3422

[tom.demuth@nebraska.gov](mailto:tom.demuth@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)  |
|----------------|---------------|----------|---------------------------------------|-----------------------------------|----------------------------------|-----------------|------|
| 5 gal          | 39423-E       | SS       | 0.0000265                             | <b>4.9988 gal</b>                 | <b>4.9988 gal</b>                | 0.0012 gal      | 2.04 |
| 5 gal          | 39423-F       | SS       | 0.0000265                             | <b>4.9996 gal</b>                 | <b>4.9996 gal</b>                | 0.0012 gal      | 2.04 |

*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 in<sup>3</sup>

1 gal = 3.785 412 E-03 m<sup>3</sup>

**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:**

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**Condition of Item(s) Submitted for Calibration:**

Good

**Laboratory Reference Standard Used:**

5 gal SP NE 1586

**Treatment of Item(s) before Calibration:**

Tested as Found

**Procedure Used:**

NISTIR 7383, SOP 19 (2019)

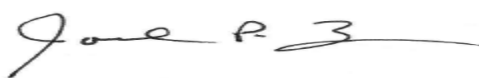
**Environmental conditions at time of calibration:**

|               |        |            |      |
|---------------|--------|------------|------|
| Temp °C       | 24.1   | Humidity % | 49.8 |
| Pressure mmHg | 730.25 |            |      |

**Water temperature at time of calibration:**

75.42 °F

**Date Submitted:** 8/16/2021



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Joel P. Lavicky, Metrologist

Issue Date:

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Calibration Date: 9/15/2021

**Certificate of Calibration  
of Volume Transfer**

Certificate Number: 2021-119-3

**Items Submitted:**

| Quantity | Nominal Volume | Manufacturer | Type               |
|----------|----------------|--------------|--------------------|
| 3        | 5 gal          | SMI          | "Special" J Prover |

**Submitted By:** FSCP Area 50  
3721 West Cuming St.  
Lincoln, NE 68524

**POC:** Tom Demuth  
402-471-3422  
tom.demuth@nebraska.gov

**Test Results**

| Nominal Volume | Serial Number | Material | Cubical Coefficient of Expansion (1/°F) | As Found Volume Delivered @ 60 °F | As left Volume Delivered @ 60 °F | Uncertainty (U) | (k)  |
|----------------|---------------|----------|---|-----------------------------------|----------------------------------|-----------------|------|
| 5 gal          | 0236          | SS       | 0.0000265                               | 4.99975 gal                       | 4.99975 gal                      | 0.00095 gal     | 2.02 |
| 5 gal          | 0237          | SS       | 0.0000265                               | 4.99879 gal                       | 4.99879 gal                      | 0.00095 gal     | 2.02 |
| 5 gal          | 0238          | SS       | 0.0000265                               | 4.99988 gal                       | 4.99988 gal                      | 0.00095 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 a 30 second drain time would apply.

**Conversion Factors:**

1 gal = 231 in<sup>3</sup>  
1 gal = 3.785 412 E-03 m<sup>3</sup>

**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:**

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**Condition of Item(s) Submitted for Calibration:**

Good

**Laboratory Reference Standard Used:**

5 gal SP NE 1586

**Treatment of Item(s) before Calibration:**

Repaired before Calibration

**Procedure Used:**

NISTIR 7383, SOP 19 (2019)

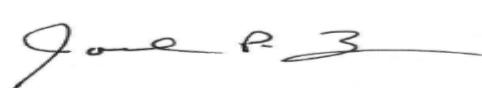
**Environmental conditions at time of calibration:**

|               |        |            |      |
|---------------|--------|------------|------|
| Temp °C       | 23.2   | Humidity % | 50.2 |
| Pressure mmHg | 727.96 |            |      |

**Water temperature at time of calibration:**

71.73 °F

**Date Submitted:** 8/16/2021



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Joel P. Lavicky, Metrologist

Issue Date:

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## Calibration Certificate of Mass

|   |  |  |                            |
|---|--|--|----------------------------|
| Calibration Date: August 31, 2021   |  | Certificate Number: 2021-119-4   |                            |
| <u>Submitted By:</u> FSCP Area 50<br>3721 West Cuming St.<br>Lincoln, NE 68524  |  | <u>Point of Contact:</u> Tom Demuth<br>Ph. 402-471-3422<br><u>email:</u> <a href="mailto:tom.demuth@nebraska.gov">tom.demuth@nebraska.gov</a><br><u>PO Number:</u> |                            |
| Test Item(s): Metric Weight Kit<br>Serial Number(s): WM-G89-10<br>Condition: Excellent (little wear)<br>Material: Stainless Steel   | <u>Artifact(s) Description:</u>                      | Date Received: 8/16/2021<br>ID / Asset Number: Area 50<br>Class Specification: ASTM 4<br>Manufacture: Troemner   |                            |
| <u>Reference Standards Used:</u><br>OPI & /Den Metric<br>Volland-1707   | <u>Procedure Used:</u><br>NIST HB 6969, SOP 8 (2019) | <u>Equipment Used:</u><br>Sartorius CC 1201<br>Mettler AT 106  | <u>Metrologist:</u><br>JPL |
| <u>Environmental Cond.</u>  | Temp: 21.2 °C  | Pressure: 727.202 mmHg   | Relative Humidity: 56 %    |
| <u>Pertinent Information</u>  |  |  |                            |
| <p>• 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. <b>RED</b> 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.</p> <p>• All corrections stated in this report correlate to a "Conventional Mass" (CM), also known as "apparent mass", scale verses 8.0 g/cm<sup>3</sup> reference mass density and an air density of 1.2 mg/cm<sup>3</sup> at 20 °C.</p> <p>• The Artifacts in "red" do not meet ASTM 4 tolerances but do meet ASTM 5 tolerances and should be evaluated before use.</p> <p>• 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.</p> |  |  |                            |
| <u>Traceability Statement</u>   |  |  |                            |
| 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.  |  |  |                            |
| <u>Uncertainty Statement</u>  |  |  |                            |
| 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 ( <i>k</i> ), 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 <i>Guide to the Expression of Uncertainty in Measurement (2008, revised 2012)</i> . 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.   |  |  |                            |

Calibration Date: August 31, 2021

Certificate Number: 2021-119-4

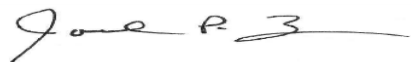
### Calibration Results

| Nominal Mass | Serial Number / ID | As Found Conventional Mass Correction (g) | Adjusted (Y/N) | As Left Conventional Mass Correction (g) | Uncertainty ± (g) | (k) factor | ASTM 4 MPE ± (g) | Assumed Density (g/cm <sup>3</sup> ) |
|--------------|--------------------|---|----------------|--|-------------------|------------|------------------|--------------------------------------|
| 300 g        |                    | 0.00261                                   | n              | 0.00261                                  | 0.00089           | 2          | 0.006            | 7.84                                 |
| 200 g        |                    | 0.00229                                   | n              | 0.00229                                  | 0.0006            | 2.004      | 0.004            | 7.84                                 |
| 100 g        |                    | 0.00127                                   | n              | 0.00127                                  | 0.00025           | 2.003      | 0.002            | 7.84                                 |
| 50 g         |                    | 0.00087                                   | n              | 0.00087                                  | 0.00015           | 2.003      | 0.0012           | 7.84                                 |
| 30 g         |                    | 0.00033                                   | n              | 0.00033                                  | 0.00012           | 2.008      | 0.0009           | 7.84                                 |
| 20 g         |                    | 0.000217                                  | n              | 0.000217                                 | 0.000094          | 2.001      | 0.0007           | 7.84                                 |
| 10 g         |                    | 0.000352                                  | n              | 0.000352                                 | 0.000062          | 2.002      | 0.0005           | 7.84                                 |
| 5 g          |                    | 0.000240                                  | n              | 0.000240                                 | 0.000045          | 2.002      | 0.00036          | 7.84                                 |
| 3 g          |                    | 0.000292                                  | n              | 0.000292                                 | 0.000038          | 2.003      | 0.0003           | 7.84                                 |
| 2 g          |                    | 0.000110                                  | n              | 0.000110                                 | 0.000034          | 2.003      | 0.00026          | 7.84                                 |
| 1 g          |                    | 0.000023                                  | n              | 0.000023                                 | 0.000025          | 2.008      | 0.0002           | 7.84                                 |

#### Conversion Factors

1 ounce (avoirdupois) (oz) = 28.349 52 g

1 pound (avoirdupois) (lb) = 453.592 37 g exactly



Joel P. Lavicky Metrologist

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