

Agricultural Laboratory
6531 SE Forbes Ave, Suite B
Topeka, Kansas 66619
(785) 296-7020



Office of the Secretary
900 SW Jackson, Room 456
Topeka, Kansas 66612
(785) 296-3556

Jackie McClaskey, Secretary

Governor Sam Brownback

Test Date: 10/27/2015

Kansas Metrology Laboratory Certificate of Calibration

Test No.: K15145-4.2



NEBRASKA DEPARTMENT OF AGRICULTURE
FOOD SAFETY & CONSUMER PROTECTION
PO BOX 94757
LINCOLN NE 68509

Manufacturer: Troemner
S/N: WM-G89-5
Number of Pieces: 12 of 23 total

Nominal Mass	Weight's Markings	Assumed Density (g/cm ³)	Conventional Mass As Found (g)	Conventional Mass As Left (g)	Expanded Uncertainty ± (mg)	In Tolerance Adjusted Rejected
500 mg	500 mg	7.84	0.4999963	0.4999963	0.0013	In Tolerance
200 mg	200 mg	7.84	0.19999855	0.19999855	0.00068	In Tolerance
200 mg	200 mg •	7.84	0.19997880	0.19997880	0.00068	In Tolerance
100 mg	100 mg	7.84	0.09997167	0.09997167	0.00075	In Tolerance
50 mg	50	16.6	0.04994128	0.04994128	0.00047	In Tolerance
20 mg	20	2.7	0.02000965	0.02000965	0.00028	In Tolerance
20 mg	20 •	2.7	0.02001706	0.02001706	0.00028	In Tolerance
10 mg	10	2.7	0.01000843	0.01000843	0.00035	In Tolerance
5 mg	5	2.7	0.00502249	0.00502249	0.00026	In Tolerance
2 mg	2	2.7	0.00201239	0.00201239	0.00023	In Tolerance
2 mg	2 •	2.7	0.00201674	0.00201674	0.00023	In Tolerance
1 mg	1	2.7	0.00101960	0.00101960	0.00042	In Tolerance

This document certifies the above mentioned artifacts were compared to the Standards of the State of Kansas which are traceable to the National Institute of Standards and Technology. The conventional mass is the weight in normal air (1.2 mg/cm³) at 20 °C versus the reference density of 8.0 g/cm³. Calibration of listed items was performed according to NISTIR 6969, SOP 4 (Double Substitution) and/or NISTIR 5672, SOP 5 (3-1).

Tolerances were evaluated to ASTM Class 4. Surface finish and magnetism were not evaluated as it is assumed to be done by the manufacturer.

Uncertainty Statement:

The combined standard uncertainty includes the standard uncertainty reported for the; standards, tare weights, the standard uncertainty for the measurement process, the standard uncertainty for air buoyancy corrections as stated in OIML R111-1 [2004E] eq. C.6.3-1, and a component of uncertainty to account for any observed deviations (Bias) from NIST (National Institute of Standards and Technology) values that are less than surveillance limits. Factors not considered in the evaluation: magnetism, weights are considered to meet magnetism specifications unless measurement aberrations are noted, balance eccentricity and linearity, these factors are considered as a part of the measurement assurance process when using a check standard with adequate degrees of freedom. The combined uncertainty is multiplied by the coverage factor (k -value) reported to give an expanded uncertainty, which defines an interval having a level of confidence of 95.45 percent. The coverage factor reported is based on the effective degrees of freedom as outlined in JCGM 100:2008 section G.4. The expanded uncertainty presented in this report is also consistent with and follows NISTIR 6969, SOP 29. The expanded uncertainty is not to be confused with a tolerance limit for the user during application.

Uncertainty Analysis:

Nominal	S_p	$u_S (k=1)$	$u_{tare} (k=1)$	$u_{Air\ Buoyancy\ Eq.}$	ρ_{air}	Procedure
500 mg	0.000561	0.000255	No Tare	0.0000211	1.15053	SOP 5
200 mg	0.000293	0.000150	No Tare	0.00000845	1.15032	SOP 5
200 mg	0.000293	0.000150	No Tare	0.00000845	1.15034	SOP 5
100 mg	0.000334	0.000150	No Tare	0.00000423	1.15027	SOP 5
50 mg	0.000199	0.0000950	No Tare	0.0000121	1.14994	SOP 5
20 mg	0.000114	0.0000650	No Tare	0.0000217	1.14970	SOP 5
20 mg	0.000114	0.0000650	No Tare	0.0000217	1.14955	SOP 5
10 mg	0.000158	0.0000700	No Tare	0.0000109	1.14945	SOP 5
5 mg	0.000104	0.0000550	No Tare	0.00000546	1.14929	SOP 5
2 mg	0.0000948	0.0000550	No Tare	0.00000219	1.14916	SOP 5
2 mg	0.0000948	0.0000550	No Tare	0.00000219	1.14903	SOP 5
1 mg	0.000189	0.0000650	No Tare	0.00000109	1.14879	SOP 5

All values listed as a component of the overall uncertainty are in units of milligrams (mg) or (mg/cm³).

Traceability Statement:

The Kansas Metrology Laboratory Standards are traceable to the SI through 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 laboratory test number identified above is the unique report number to be used in referencing measurement traceability for artifacts identified in this report only.

Condition of Item(s) Submitted for Testing: Minor wear.

Treatment of Item(s) before Testing: Item(s) were tested as found.

Documentary Standards: NIST Handbook 105 Series, NISTIR 6969, SOP 4, NISTIR 5672, SOP 5, & ASTM E 617-13 or OIML R111-1

Item(s) Received on: 10/13/2015

Item(s) Acclimated: 10/14/2015 8:58:00 AM

Environmental Conditions:

Temperature	Barometric Pressure	Relative Humidity
20.4 °C	729.50 mmHg	44.2 %

Values are averages recorded over the duration of testing



Keith Arkenberg, Metrologist

10/28/2015

Date

KML Software Version: 8.3

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Office of the Secretary
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Jackie McClaskey, Secretary

Governor Sam Brownback

Test Date: 10/15/2015

Kansas Metrology Laboratory Certificate of Calibration

Test No.: K15145-4.1



NEBRASKA DEPARTMENT OF AGRICULTURE
FOOD SAFETY & CONSUMER PROTECTION
PO BOX 94757
LINCOLN NE 68509

Manufacturer: Troemner

S/N: WM-G89-5

Number of Pieces: 11 of 23 total

Nominal Mass	Weight's Markings	Assumed Density (g/cm ³)	Conventional Mass As Found (g)	Conventional Mass As Left (g)	Expanded Uncertainty ± (mg)	In Tolerance Adjusted Rejected
300 g	300g	7.84	300.000882	300.000882	0.081	In Tolerance
200 g	200g	7.84	200.001307	200.001307	0.098	In Tolerance
100 g	100g	7.84	100.000031	100.000031	0.024	In Tolerance
50 g	50g	7.84	50.000565	50.000565	0.017	In Tolerance
30 g	30g	7.84	30.000005	30.000005	0.019	In Tolerance
20 g	20	7.84	20.0005435	20.0005435	0.0072	In Tolerance
10 g	10	7.84	10.0001910	10.0001910	0.0066	In Tolerance
5 g	5	7.84	5.0002642	5.0002642	0.0046	In Tolerance
3 g	3	7.84	3.0000179	3.0000179	0.0042	In Tolerance
2 g	2	7.84	2.0002424	2.0002424	0.0031	In Tolerance
1 g	1	7.84	0.9998559	0.9998559	0.0014	In Tolerance

This document certifies the above mentioned artifacts were compared to the Standards of the State of Kansas which are traceable to the National Institute of Standards and Technology. The conventional mass is the weight in normal air (1.2 mg/cm³) at 20 °C versus the reference density of 8.0 g/cm³. Calibration of listed items was performed according to NISTIR 6969, SOP 4 (Double Substitution) and/or NISTIR 5672, SOP 5 (3-1).

Tolerances were evaluated to ASTM Class 4. Surface finish and magnetism were not evaluated as it is assumed to be done by the manufacturer.

Uncertainty Statement:

The combined standard uncertainty includes the standard uncertainty reported for the standards, tare weights, the standard uncertainty for the measurement process, the standard uncertainty for air buoyancy corrections as stated in OIML R111-1 [2004E] eq. C.6.3-1, and a component of uncertainty to account for any observed deviations (Bias) from NIST (National Institute of Standards and Technology) values that are less than surveillance limits. Factors not considered in the evaluation: magnetism, weights are considered to meet magnetism specifications unless measurement aberrations are noted, balance eccentricity and linearity, these factors are considered as a part of the measurement assurance process when using a check standard with adequate degrees of freedom. The combined uncertainty is multiplied by the coverage factor (k -value) reported to give an expanded uncertainty, which defines an interval having a level of confidence of 95.45 percent. The coverage factor reported is based on the effective degrees of freedom as outlined in JCGM 100:2008 section G.4. The expanded uncertainty presented in this report is also consistent with and follows NISTIR 6969, SOP 29. The expanded uncertainty is not to be confused with a tolerance limit for the user during application.

Uncertainty Analysis:

Nominal	S_p	$U_S (k=1)$	$U_{tare} (k=1)$	$U_{Air Buoyancy Eq.}$	ρ_{air}	Procedure
300 g	0.0310	0.0172	No Tare	-0.00282	1.16265	SOP 5
200 g	0.0411	0.0121	No Tare	-0.00184	1.16199	SOP 5
100 g	0.00818	0.00907	No Tare	-0.000896	1.16141	SOP 5
50 g	0.00667	0.00470	No Tare	-0.000366	1.16109	SOP 5
30 g	0.00831	0.00302	No Tare	-0.000217	1.16093	SOP 5
20 g	0.00280	0.00222	No Tare	-0.000145	1.16101	SOP 5
10 g	0.00273	0.00183	No Tare	-0.0000907	1.16568	SOP 5
5 g	0.00201	0.000970	No Tare	-0.0000404	1.16450	SOP 5
3 g	0.00175	0.000650	No Tare	-0.0000256	1.16591	SOP 5
2 g	0.00142	0.000495	No Tare	-0.0000174	1.16654	SOP 5
1 g	0.000515	0.000455	No Tare	-0.00000659	1.16131	SOP 5

All values listed as a component of the overall uncertainty are in units of milligrams (mg) or (mg/cm³).

Traceability Statement:

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Condition of Item(s) Submitted for Testing: Minor wear.

Treatment of Item(s) before Testing: Item(s) were tested as found.

Documentary Standards: NIST Handbook 105 Series, NISTIR 6969, SOP 4, NISTIR 5672, SOP 5, & ASTM E 617-13 or OIML R111-1

Item(s) Received on: 10/13/2015

Item(s) Acclimated: 10/14/2015 8:58:00 AM

Environmental Conditions:

Temperature	Barometric Pressure	Relative Humidity
20.1 °C	736.43 mmHg	41.4 %

Values are averages recorded over the duration of testing



Keith Arkenberg, Metrologist

10/28/2015
Date

KML Software Version: 8.3

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**Wyoming Department of Agriculture
Weights and Measures Laboratory
6607 Campstool Rd
Cheyenne, WY 82002
(307)777-7556**



Calibration Certificate

For

One – 31 lb Class F Cylindrical Weight Kit (20 weights),
Forty – 25 lb Class F Weights,
Two – 15 lb Class F Weights,
Twenty One – 1000 lb Class F Weights,
and
One – 31 lb Class F “Block” Weight Kit (37 weights)

Manufacturer: Listed in Table A thru D
Serial No.: Listed in Table A thru D

RECEIVED

JAN 26 2016

Submitted by
Darren Wells
Nebraska Department of Agriculture
P.O Box 94757
301 Centennial Mall South
Lincoln, NE 68509
(402)471-3422

Food Safety & Consumer Protection

Nominal (lb & oz)	Assumed Density (g/cm ³)	Conventional Mass Correction (mg)		Tolerance (mg)	Expanded Uncertainty (mg)
		As Found	As Left		
5 lb-1	7.84	-146	-146	227	12
5-2	7.84	-127	-127	227	12
5-3	7.84	-136	-136	227	12
5-4	7.84	-156	-156	227	12
5-5	7.84	-112	-112	227	12
1-1	7.84	-23.8	-23.8	70	3.4
1-2	7.84	-10.1	-10.1	70	3.4
1-3	7.84	-29.1	-29.1	70	3.4
1-4	7.84	-4.5	-4.5	70	3.4
1-5	7.84	-1.5	-1.5	70	3.4
8 oz	7.84	-44.7	-44.7	45	1.3
4	7.84	6.2	6.2	23	1.0
2	7.84	4.85	4.85	11	0.31
1	7.84	2.79	2.79	5.4	0.16
½	7.84	0.389	0.389	2.8	0.076
¼	7.84	0.635	0.635	1.7	0.039
⅛	7.84	0.559	0.559	1.3	0.013
1/16	7.84	0.129	0.129	1.1	0.011
1/32	7.84	0.4848	0.4848	0.87	0.0067
1/32	7.84	0.1968	0.1968	0.87	0.0067

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

Table A – Unknown Manufacturer 31 lb Class F Cylindrical Weight Kit, S/N WM-2A86. Condition: fair.

Serial Number	Nominal (lb)	Conventional Mass Correction (g)		Tolerance (g)	Expanded Uncertainty (g)
		As Found	As Left		
D31	25	0.02	0.02	1.1	0.12
D34	25	-102.89	-0.12	1.1	0.12
D40	25	0.04	0.04	1.1	0.12
D41	25	-48.64	0.48	1.1	0.12
D43	25	-145.11	0.35	1.1	0.12
D44	25	-145.59	-0.07	1.1	0.12
NE-23	25	0.17	0.17	1.1	0.12
NE-27	25	0.10	0.10	1.1	0.12
NE-28	25	-1.30	0.25	1.1	0.12
NE-29	25	0.21	0.21	1.1	0.12
NE-38	25	-1.08	0.76	1.1	0.12
NE-39	25	-1.11	0.46	1.1	0.12
WM25-21	25	-1.17	0.00	1.1	0.12
WM25-23	25	-3.09	-0.04	1.1	0.12
WM25-29	25	0.45	0.45	1.1	0.12
WM25-30	25	0.09	0.09	1.1	0.12
WM-D16	25	-1.97	0.11	1.1	0.12
WM-D17	25	-0.60	-0.60	1.1	0.12
WM-D18	25	-2.02	0.07	1.1	0.12
WM-D18	25	-0.82	0.35	1.1	0.12
WM-D19	25	-0.18	-0.18	1.1	0.12
WM-D20	25	0.04	0.04	1.1	0.12
WM-D27	25	-0.26	-0.26	1.1	0.12
WM-D31	25	-2.42	-0.09	1.1	0.12
WM-D32	25	-2.09	0.31	1.1	0.12
WM-D33	25	-1.25	0.16	1.1	0.12
WM-D34	25	-1.11	0.35	1.1	0.12
WM-D35	25	-1.74	0.05	1.1	0.12
WM-D36	25	-0.82	0.23	1.1	0.12
WM-D37	25	-2.77	-0.07	1.1	0.12
WM-D38	25	-1.84	0.46	1.1	0.12
WM-D39	25	-0.86	0.13	1.1	0.12
WM-D40	25	-0.91	0.02	1.1	0.12
WM-D41	25	-1.44	0.22	1.1	0.12
WM-D42	25	-2.26	0.16	1.1	0.12
WM-D43	25	0.36	0.36	1.1	0.12
WM-D45	25	-2.50	0.03	1.1	0.12
WM-D47	25	-0.42	-0.42	1.1	0.12
WM-D49	25	-2.94	-0.03	1.1	0.12
WM-D50	25	-0.64	-0.64	1.1	0.12
WM 15-19	15	-1.11	-0.13	0.68	0.12
WM 15-18	15	-1.00	-0.02	0.68	0.12

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

Table B – Various Manufacturer 25 lb and 15 lb Class F Weights. Condition: good; assumed density 7.20 g/cm³.

Nominal (lb & oz)	Assumed Density (g/cm ³)	Conventional Mass Correction (mg)		Tolerance (mg)	Expanded Uncertainty (mg)
		As Found	As Left		
2 lb-1	7.84	-7.7	-7.7	91	5.0
2-2	7.84	-44.7	-44.7	91	5.0
2-3	7.84	-35.7	-35.7	91	5.0
2-4	7.84	-49.7	-49.7	91	5.0
2-5	7.84	-42.7	-42.7	91	5.0
2-6	7.84	-61.7	-61.7	91	5.0
2-7	7.84	-48.7	-48.7	91	5.0
2-8	7.84	-17.7	-17.7	91	5.0
2-9	7.84	-38.7	-38.7	91	5.0
2-10	7.84	-40.7	-40.7	91	5.0
2-11	7.84	-36.7	-36.7	91	5.0
2-12	7.84	-18.7	-18.7	91	5.0
2-13	7.84	-59.7	-59.7	91	5.0
2-14	7.84	-5.07	-5.07	91	5.0
1 lb-15	7.84	-16.7	-16.7	70	3.4
1-16	7.84	-21.1	-21.1	70	3.4
0.3	7.84	0.5	0.5	27	1.3
0.2	7.84	-1.86	-1.86	18	0.48
0.1	7.84	-1.66	-1.66	9.1	0.25
0.05	7.84	-0.42	-0.42	4.5	0.12
0.03	7.84	-1.37	-1.37	2.7	0.12
0.02	7.84	0.443	0.443	1.8	0.053
0.01	7.84	0.553	0.553	1.5	0.025
0.005	2.7	0.040	0.040	1.17	0.096
0.003	2.7	0.463	0.463	0.99	0.096
0.002	2.7	0.575	0.575	0.87	0.038
0.001	2.7	-0.409	-0.409	0.7	0.020
0.001	2.7	0.064	0.064	0.7	0.020
8 oz	7.84	-12.2	-12.2	45	1.3
4	7.84	2.5	2.5	23	1.0
2	7.84	1.71	1.71	11	0.31
1	7.84	1.28	1.28	5.4	0.16
1/2	7.84	1.111	1.111	2.8	0.076
1/4	7.84	-0.221	-0.221	1.7	0.039
1/8	7.84	-0.072	-0.072	1.3	0.013
1/16	7.84	0.288	0.288	1.1	0.011
1/16	7.84	0.537	0.537	1.1	0.011

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

Table D – Troemner 31 lb Class F Weight Kit, S/N 13A9. Condition: fair.

Uncertainty Statement:

The combined standard uncertainty includes the standard uncertainty reported for the standard and the standard uncertainty for the measurement process. The combined standard uncertainty is multiplied by a coverage factor of 2.02-2.07 to give an expanded uncertainty, which defines an interval having a level of confidence of approximately 95 percent. The expanded uncertainty presented in this report is consistent with the 1993 ISO Guide to the Expression of Uncertainty in Measurement. The expanded uncertainty is not to be confused with a tolerance limit for the user during application.

Traceability Statement:

Standards used for comparison are traceable to United States national standards at NIST and are part of a comprehensive measurement assurance program for ensuring continued accuracy and traceability reported by this laboratory. The laboratory test number identified above is the unique report number to be used in referencing measurement traceability for artifacts identified in this report only. Traceability is maintained to the SI using the following conversion: 1 lb = 0.45359237 kg

Supplemental Information

Description of artifacts submitted for testing:

One hundred Class F stainless steel, aluminum and cast iron test weights. Assumed densities are listed in the appropriate table.

Conditions of artifacts submitted for testing:

Condition is noted in the title of the appropriate table. Twenty five lb artifacts D41, D43, D44 and D34 were found to have significant error due to no disk and lead seal in the adjusting cavity. Several 1000 lb artifacts have damage to the corners of the weights. One thousand lb artifacts A-6 and A-11 appear to have reached the end of their service life; the adjusting cavities are full and future adjustment will not be possible by the WDA lab. All of the lead seals in the 1000 lb artifacts appears to have been repeatedly melted and are excessively thick; this results in a seal that is brittle and not secure.

Treatment of artifacts prior to testing:

Artifacts were clean upon arrival; no additional treatment needed. Thermal equilibrium: 24 hours next to balance in the laboratory.

Equipment and Standards:

<u>Balance</u>	<u>Range</u>	<u>Standards Used</u>
Mettler AX26	0 g – 22 g	WY WS, 5SY3
Mettler XP505	0 g – 500 g	WY WS, 5SY3
Mettler XP5003	0 kg – 5 kg	WY WS, 5SY3
Mettler XP32003	0 kg – 32 kg	WY WS
Mettler XP604	0 kg – 600 kg	WY WS

Procedure used:

Single Substitution Method (NISTIR 6969, SOP 7)

Environmental conditions are maintained within the following parameters:

<u>Temperature</u>	<u>Relative Humidity</u>
18 °C to 27 °C	40 % to 60 %

Date Artifacts Received: January 11, 2016

Date of test: January 12, 2016 through January 14, 2016

Test performed by:



Date of Report Preparation: January 19, 2016

Robert Weidler

WDA State Metrologist

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**Wyoming Department of Agriculture
Weights and Measures Laboratory
6607 Campstool Road
Cheyenne, WY 82002
(307)777-7556**



Calibration Certificate

For

Two-5 gallon Test Measures
and
Three-5 gallon Provers

Manufacturer: Listed on Following Table
Serial No.: Listed on Following Table

Submitted by
Darren Wells
Nebraska Department of Agriculture
P.O. Box 94757
301 Centennial Mall South
Lincoln, NE 68509
(402)471-3422

Manufacturer	Model Number	Serial Number	Nominal (gal)	Prover Volume* (in ³)	Prover Error (in ³)	Expanded Uncertainty (in ³)
Seraphin	E	WDA 15877	5	1154.96*	-0.04	0.28
Seraphin	E	WDA 15879	5	1155.04*	0.04	0.28
Sensitive Measurements	RSHD	144	5	1154.97**	-0.03	0.28
Sensitive Measurements	RSHD	145	5	1154.96**	-0.04	0.28
Sensitive Measurements	RSHD	146	5	1154.92**	-0.08	0.28
<i>The data in this table applies only to those items specifically listed on this report.</i>						

*Prover Volume is Volume to Deliver after a 30 second pour and 10 second drain time at a reference temperature of 60° F.

**Prover Volume is Volume to Deliver after the cessation of flow and 30 second drain time at a reference temperature of 60° F.

Uncertainty Statement:

The combined standard uncertainty includes the standard uncertainty reported for the standard and the standard uncertainty for the measurement process. The combined standard uncertainty is multiplied by a coverage factor of 2.02 to give an expanded uncertainty, which defines an interval having a level of confidence of approximately 95 percent. The expanded uncertainty presented in this report is consistent with the 1993 ISO Guide to the Expression of Uncertainty in Measurement. The expanded uncertainty is not to be confused with a tolerance limit for the user during application.

Traceability Statement:

Standards used for comparison are traceable to United States national standards at NIST and are part of a comprehensive measurement assurance program for ensuring continued accuracy and traceability reported by this laboratory. The laboratory test number identified above is the unique report number to be used in referencing measurement traceability for artifacts identified in this report only. Traceability to the SI is maintained using the conversion factor: 1 gallon = 231 in³ = 3.785412 L = 0.003785412 m³.

Supplemental Information**Description of artifacts submitted for testing:**

Two-5 gallon Stainless Steel Test Measures and three-5 gallon stainless steel provers; assumed Cubical Coefficient of Thermal Expansion 0.0000265/°F.

Conditions of artifacts submitted for testing:

Artifacts were in good condition for the type and class.

Treatment of artifacts prior to testing:

Artifacts were degreased and thoroughly rinsed prior to calibration. Artifacts WDA 15877 and WDA 15879 were missing identification plate and were affixed with seals bearing the serial numbers. "As Found" Prover Error for artifact 145 was 0.36 in³ and for artifact 146 was -0.54 in³; all other artifacts were not adjusted.

Equipment and Standards:

Standard	Range
NBS 4214	5 gallons

Procedure used:

Volume Transfer Method (NISTIR 7383, SOP 19)

Average environmental conditions at time of test:

Temperature	Barometric Pressure	Relative Humidity
19.6 °C	605.8 mm Hg	44.9 %

Date Artifacts Received: January 11, 2016

Date of test: January 14, 2016 and January 15, 2016

Test performed by:



Robert Weidler
WDA State Metrologist

Date of Report Preparation: January 15, 2016

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