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WEIGHTS & MEASURES CONNECTION

A Tale of Two Feet

Byline: Elizabeth Benham

NOAA, NIST prepare to drop U.S. survey foot and adopt the international survey foot in a move towards more precise positioning.

Since 1959, land surveyors and other geospatial professionals have had two standards to measure the length of a foot — the U.S. survey foot and the international foot. Both have been supported by NOAA's National Geodetic Survey (NGS) and the National Institute of Standards and Technology. And they're not exactly equal.

The difference between the two measurements is very small and barely noticeable in everyday use and is a function of their relationship to the standard meter. A U.S. survey foot is expressed as a fraction — 1200/3937 meters — while an international foot is expressed as a decimal, exactly 0.3048 meters. That's a difference of only one one-hundredth of a foot per mile. But when you begin to measure or use coordinates that span hundreds or thousands of miles, that minor difference can reach a few to several feet. In such cases, accidentally confusing the two types of feet can severely impact the precise coordinates and measurements used in engineering, surveying, mapping, agriculture, and other industries that depend on accurate positions.

That's why NIST and NOAA are retiring the U.S. survey foot, and standardizing on the international foot. And the modernization of the National Spatial Reference System, a precise coordinate system that defines latitude, longitude, height, scale, gravity and orientation throughout the U.S. in 2022, is the perfect time to move the U.S. toward a single, uniform definition of the foot.

"Our vision at NOAA's National Geodetic Survey is that everyone accurately knows where they are and where other things are at all times and in all places," said Brett Howe, geodetic services division chief at NGS. "To that end, working with NIST on removing this confusion is a step in the right direction for precise positioning applications."

NGS and NIST have issued the first of two public notices. Seventy two public comments were received from October 17, 2019 to December 2, 2019 **(www.federalregister.gov/documents/2019/10/17/2019-22414/deprecation-of-the-united-states-us-survey-foot).** This stakeholder feedback will be used to help ensure a smooth transition to the new standard. A second Federal Register Notice will be published by the end of June 2020. After this step is taken, American surveyors will be starting out on the right foot or, more precisely, the same foot. For more information visit: **www.nist.gov/pml/us-surveyfoot**.

On The Cover

Inside this issue

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NIST Handbook 105-1 REVISED! What Now?

Byline: Val Miller

After seeking input from interested parties for over five years, the NIST Office of Weights and Measures (OWM) revised and published NIST Handbook 105-1 (2019) (HB 105-1) *Specifications and Tolerances for Field Standard* Weights in May 2019. Field standard weights are used primarily to test commercial weighing devices for compliance with commercial requirements. Use of these field standards at all appropriate levels of manufacture, distribution, and Weights and Measures inspection will help promote accuracy and uniformity in commerce. NIST OWM has received a number of questions regarding the 2019 edition of HB 105-1. In particular, questions have arisen regarding the continued use of Class F weights.

Background. The 2019 revision of NIST HB 105-1 was brought about by significant changes taking place in the Weights and Measures Field environment. Improvements in technology and changes in the regulated marketplace have resulted in the rapidly increasing number of NIST Handbook (HB) 44 Class I and Class II weighing devices in the commercial marketplace. Typical applications for Class I and Class II are precision and other laboratory weighing; precious metals and gems weighing; and grain test scales.

Excerpt from EPO 5 (2014) Table 1   **Mass Standards Required**
Class I Scales: OIML E-2, ASTM 1, or standards of greater accuracy.
Class II Scales: OIML F-1, ASTM 3, or standards of greater accuracy.
Class III Scales: NIST Class F, or standards of greater accuracy.   Unmarked Scales:
Use standards of the proper level of accuracy that comply with NIST Handbook 44 Fundamental Consideration as detailed in footnote 1.

In 2014, Examination Procedure Outline Number 5 (EPO 5), *Jeweler and Prescription Scales, Part 1*, was updated to address the fact that weights designated under the classification of "NIST Class F" are not adequate to field test Class I and Class II scales. In that EPO, Table 1 provides basic guidance to field staff in selecting mass standards for the test of a commercial scale. While some weights and measures jurisdictions followed such guidance prior to the addition of this table, many weights and measures jurisdictions simply used "Class F" weights to test all commercial weighing devices, including Class I and Class II devices. As the use of these higher accuracy class (Class I and Class II) scales became more common in commercial applications, this prompted the need for field standard weights with a wider variety of classifications. This also required that Weights and Measures field staff be trained in the use of higher weight classifications that cannot be handled with bare fingers. The increased use of higher accuracy weighing devices also requires that more attention be given to the process of calculating and comparing commercial scale tolerances and, field standard weight errors and tolerances to ensure compliance with NIST HB 44 *Fundamental Considerations*.

Status of Class F Weights. There were many significant changes in the NIST HB 105-1 documentary standard, but the most challenging change for users of HB 105-1 seems to be the requirement that no new NIST Class F weights be placed into service for use in testing commercial weighing equipment after January 1, 2020.

[1] In accordance with NIST Handbook 44, Fundamental Considerations Section 3 paragraph 3.2., the combined error and uncertainty of any standard used for testing must be less than one-third the applicable device tolerance. The use of the mass standards indicated in the above table for each of the scale accuracy classes listed will ensure conformance with this fundamental consideration.

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Existing NIST Class F field standard weights may continue to be used, provided they demonstrate mass stability and are properly maintained. However, their suitability will still be limited to use as field standard weights for verification of NIST Handbook 44 weighing systems designated as Accuracy Classes III, IIIL and IIII.

Legal Requirements for Field Standard Weights. Retiring HB 105-1 was initially discussed. However, to minimize the impact to the many states and weights and measures jurisdictions who have the specific handbook cited in their legal documents, the revised NIST HB 105-1 has been maintained as a NIST Handbook. Field standard weights, regardless of accuracy classification, must still comply with the requirement of NIST HB 105-1. However, that document now directs the user to one of the following standards for the specifications and tolerances of new weights to be used for weighing device field tests.

- ASTM E617, *Standard Specification for Laboratory Weights and Precision Mass Standards*
- OIML R111-1, International Recommendation, *Weights of Classes E_1, E_2, F_1, F_2, M_1, M_{1-2}, M_2, M_{2-3} and M_3, Part 1*

Comparing Tolerances Among Standards. As a quick reference, Table 1 of the 2019 edition of NIST HB 105-1 lists the most common weight tolerance classifications that will be used for the various classes of weighing devices. For the purposes of this article and clarity, the table title has been editorially modified and the dates noted in the table; references are to the versions of these documents that are current as of the date of this publication.

Table 1: Appropriate Test Weight Designations for Tests of Commercial Weighing Devices to Maintenance Tolerances

Class of Weighing Device to be Tested	ASTM E617 Accuracy Classes (2018)	OIML R111 Accuracy Classes (2004)	NIST HB 105-1 (1990)
Class I	1	F_1	
Class II	1, 2	F_1, F_2	
Class III	3, 4, 5, 6	M_1, M_2, M_{1-2}, M_{2-3}	F
Class IIIL	3, 4, 5, 6	M_1, M_2, M_{1-2}, M_{2-3}	F
Class IIII	3, 4, 5, 6	M_3	F

The field inspector or service technician performing the verification or calibration of the weighing device is responsible for selecting the correct class of field standard weights for the test of a weighing device.

ASTM E617. ASTM E617 Class 6 tolerances are very similar to those of NIST Class F, though they are not the same for all nominal values. Additionally, there are some nominal values for which there is not a Class 6 tolerance specified in this Class. However, ASTM E617 paragraph 4.3 states that "for weight of denominations intermediate between those listed, the maximum permissible error (tolerance) shall be proportional to the values shown." So, even if a nominal value does not have a tolerance value assigned, one can typically be calculated by interpolating between the nominal values that are listed in the table. For example, the most likely encountered nominal value with no specified tolerance is $^1/_{32}$ oz, which is equivalent to 0.03125 oz.

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Nominal values and tolerances listed ASTM E617 for weights with nominal values adjacent to the value of 0.03125 oz are as shown below:

Nominal Value (oz)	Class 6 Tolerance (mg)*
0.03	0.091
0.03125 (1/32)	(0.091)
0.05	0.091

*Value in parentheses are possible tolerance values where none are specified

In this example, the tolerance specified for both the nominal values adjacent to 0.03125 ounces in the table are the same (0.091 mg). Thus, it is permissible to assign a tolerance of 0.091 mg to a test weight with a nominal value of 0.03125 oz.

If there are no bracketing options, then the best one can do is to assume that the tolerance of the next largest published nominal value will continue to those smaller nominal values, but this approach is not always the best as the tolerances may become unreasonably large for very small weights.

Nominal Value (lb)	Class 6 Tolerance (mg)*	Class 6 Tolerance (% of nominal)
0.001	0.091	0.020
0.0005	(0.091)	0.040
0.0003	(0.091)	0.067
0.000001	(0.091)	20.062

*Value in parentheses are possible tolerance values where none are specified

As shown in the example, it would likely be best to select a tolerance classification that has stated tolerances rather than attempting to extrapolate the tolerance of the larger weight to those smaller as you can see that the tolerance of the larger nominal value is likely not appropriate for those smaller nominal values.

If a weight having a special nominal value that is not included is desired, the tolerance of that weight can be calculated by interpolation. For example, a nominal value that has been identified by some laboratories is a 4 lb weight which is not shown in the tolerance table. However, we see that there is a 5 lb and a 3 lb nominal value with stated tolerances. Using the concept of proportionality, we can interpolate the tolerance that should be applied to the 4 lb nominal weight.

Nominal Value (lb)	Class 6 Tolerance (mg)*
5	230
4	(185)
3	140

*Value in parentheses are possible tolerance values where none are specified

The calculation for the tolerance of a 4 lb weight would be:

$$4\text{ lb } tolerance = \frac{(230\text{ mg} - 140\text{ mg})}{(5\text{ lb} - 3\text{ lb})}(4\text{ lb} - 3\text{ lb}) + 140\text{ mg}$$

with the result being 185 mg as shown in the table above.

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In 1997, an attempt was made to align ASTM E617 with the 1994 version of OIML R111; this resulted in the removal of a number of different units and tolerances, leaving only those for metric nominal values. The 2013 edition of ASTM E617 was created to provide alignment of technical specifications to those set forth in a more recent (and most current as of the publication of this article) 2004 edition of OIML R111, while at the same time bringing back the many different units and tolerances that had been removed in the 1997 edition of ASTM E617. A multitude of calculations were performed to set parameters such as material density limits so that performance criteria were met for the returning tolerances. The main criteria to be met was that a 10 % change in ambient air density would result in a mass error no greater than 25 % of the stated tolerance.

The documentary standards are written so that, regardless of the documentary standard selected, a user can properly select weight classifications with confidence to perform equally well for a NIST Handbook 44 scale verification. Since 2013, there have been several relatively insignificant edits made to ASTM E617 and, as of the date of this article, the current version of ASTM E617 is the 2018 version. ASTM documentary standards are reviewed on a five-year cycle by the responsible technical committee. So, if users of the documents have a desire to suggest changes to the standard (such as suggesting the addition of tolerances for nominal values of weights where no tolerance is currently specified) members can submit such changes to the responsible ASTM technical committee.

NIST Handbook 105-1. Handbook 105-1 (2019) recommends that NIST Class F weights ***not*** be reclassified to an ASTM or OIML accuracy classification. Reclassification would require that the artifacts be stringently evaluated to determine the actual material density; the surface finish; the magnetic susceptibility; and the permanent magnetization field. These tests are expensive and may be destructive to perform. Most calibration laboratories are not equipped to fully evaluate all parameters of the design of existing weights for reclassification. This level of testing is best left to the manufacturer to perform at the time of manufacture. Therefore, it is best if field standard weights manufactured to meet NIST HB 105-1(1990), "Class F" requirements remain identified as such and are used in applications where weights with a "Class F" designation are appropriate. Maintaining documentation of the original Class F classification will be required to ensure that these field standards are properly maintained throughout their useful life.

The earlier (1990) edition of NIST HB 105-1 will be maintained by the NIST Office of Weights and Measures (OWM). The superseded document is available for download from the NIST Research Library (**www.nist.gov/nist-research-library**) and will be provided upon request. It is expected that no new NIST Class F field standard weights will be manufactured and distributed after January 1, 2020. However, users and calibration laboratories may need information contained in the 1990 version of the handbook to reference and maintain existing Class F field standard weights for field use.

Summary. The 2019 revision of NIST Handbook 105-1 was significant, and it now applies the field standard weight designation to a number of precision weight classifications requiring special handling and historically used in a laboratory environment. A key goal of the 2019 edition is to simply provide weights and measures laboratory and field staff more tools to use in their quest to ensure the accuracy and traceability of the many varied weighing device types in commercial use. This in turn helps weights and measures officials, manufacturers, and service companies in their joint quest to create and maintain a level playing field in the U.S. weights and measures system.

For more information, please contact Val Miller at **val.miller@nist.gov** or (301) 975-3602.

Test Procedure for Checking the Area Measurement of Chamois Revised

Byline: David Sefcik

Introduction. Chamois is a natural leather made from skins of sheep and lambs that have been oil-tanned. Chamois are irregularly shaped, which makes it difficult to measure the area of the skin. In 1964, the Federal Trade Commission (FTC) issued an advisory opinion stating that using the word "chamois" on a product that is not made from oil tanned sheepskin is unlawful and deceptive. It is unlawful to use the name "Artificial Chamois," "Pig Chamois", "Synthetic Chamois," or "Man-Made Chamois" because they are not made from oil tanned sheepskin. Chamois is typically labeled in uniform sizes in terms of square decimeters and square feet, and sized in increments of 2.32 dm^2 ($^1/_4$ ft^2), 9.29 dm^2 (1 ft^2), 11.61 dm^2 ($1^1/_4$ ft^2), and 13.93 dm^2 ($1^1/_2$ ft^2).

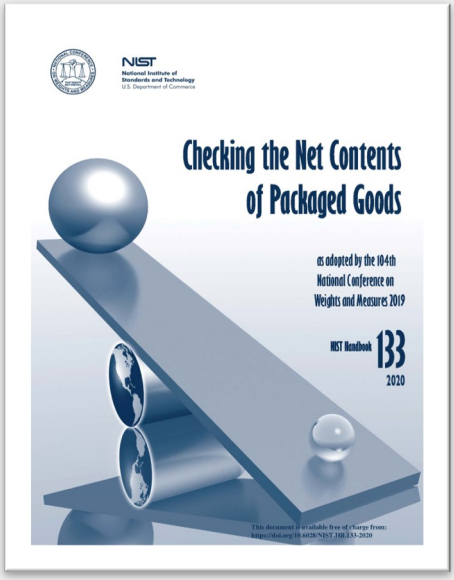
Image of Chamois Leather

Over the years the manufacturing and processing of chamois has changed. When the procedure was developed over 40 years ago moisture loss was a primary concern. With improvements in the distribution process (e.g., shorter shelf life), store environmental conditions, and tanning process, moisture loss is no longer the primary factor.

The current test procedure was adopted at the 2019 National Conference on Weights and Measures (NCWM) Annual Meeting and can be found in NIST Handbook 133 (2020 Edition), *Checking the Net Contents of Packaged Goods* (**www.nist.gov/pml/weights-and-measures/publications/nist-handbooks/handbook-133**).

Questions arose during a NIST OWM Handbook 133 training class on the test procedure led to a review, research, and analysis of the chamois test procedure. As part of this process, OWM sought the expertise and help of Hopkins Manufacturing Corporation (formerly Acme Sponge & Chamois Company) due to their leading role in the original development of the test procedure with NCWM in the 1970s. In addition, input was sought from eight companies that comprised of the majority of the chamois industry.

When water is applied to a chamois, as part of the hydration/conditioning process, the chamois reacts negatively causing the chamois to swell and pulling the fibers inward. This leads to shrinkage of the surface area, rather than the originally intended result of restoring area. As a result, the proposed test procedure adopted has removed the step.



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(AREA MEASUREMENT OF CHAMOIS REVISED. . . Continued from page 6)

In addition, several other changes also were made to clarify and improve the readability and usability of the procedure which includes:

- "Sample Conditioning" (which involves conditioning each sample with water before testing) will no longer be required during the Gravimetric Test Procedure. This means that a lab test is no longer necessary, and the test can be performed in the field.
- The Gravimetric Test Procedure was clarified to better explain the "ironing" process including the proper heat setting and technique for removing wrinkles.
- The "Audit Test Procedure" was revised to: a) clarify the sampling plan; b) improve the procedure for tracing the chamois on graph paper; c) explain how to calculate the area; and d) update the test equipment including the type of graph paper and ruler required.

Please contact David Sefcik at **david.sefcik@nist.gov** or Lisa Warfield at **lisa.warfield@nist.gov** or at (301) 975-4004 for additional assistance and information.

"What's measured improves." - Peter Drucker

Accepting Applications for the 2020 USMA/ Blake Family Metric Awards

Byline: Elizabeth Benham

The U.S. Metric Association (USMA) has partnered with the Blake Family Foundation to offer two awards to increase awareness and usage of the International System of Units (SI) in the United States (**www.usma.org/usma-blake-family-foundation-metric-awards#**).

The first award is a $2500 scholarship for U.S. high school senior students, which may be applied to two or four-year undergraduate degree tuition for the 2020 to 2021 academic year. The second is a $500 award for non-students, including K-12 educators as well as professionals from academia, industry, and government. All applicants are asked to explain their current efforts and future plans to promote the SI in the United States.

Applicants must complete and submit the application online beginning January 1, 2019 through March 31, 2020 (**www.tinyurl.com/wpwuzcp**). All judging and final award decisions are the sole responsibility of the USMA.

Congratulations to the 2019 award recipients: Genevieve (Jenna) Grade of Wanakee, WI (student, University of Wisconsin-Madison) and Jonathan Benskin of Boca Raton, FL (teacher, Boca Raton High School). The U.S. Metric Association (USMA), Inc., is a national non-profit organization that was founded in 1916 and advocates completing the U.S. conversion to the SI (**www.usma.org).**

Please contact Elizabeth Benham at **elizabeth.benham@nist.gov** or (301) 975-4690 for additional information.

National Measurement Outreach Opportunities

Byline: Elizabeth Benham

National holidays are ideal opportunities for anyone interested in sharing their passion for measurements and promoting legal metrology in their community.

Beginning on March 1 through March 7, 2020, NIST celebrated national *Weights and Measures Week* to commemorate the signing of the first United States weights and measures law on March 2, 1799 by President John Adams. On Thursday, April 23, 2020, workplaces, employees, parents, and children will be celebrating *Take Our Daughters and Sons to Work Day*, a program designed to expand future opportunities for children age 8 to 18 in their work and family lives.

By hosting or participating in an outreach event, students often learn about career opportunities they would otherwise never known existed. Students build connections between what they are learning at school and future careers. The Office of Weights and Measures will host a hands-on activity session at NIST's annual *Take Our Daughters and Sons to Work Day,* promoting metrology careers and the metric system. SI measurement system familiarity and fluency must be developed along the Science, Technology, Engineering, and Mathematics (STEM) career pipeline to produce an U.S. engineering workforce with these essential 21st century knowledge and skills.

The NIST Office of Weights and Measures and the Metric Program have resources to help enrich workplace, school, or community outreach events (**www.nist.gov/pml/weights-and-measures/education-resources-metric-system-si**).

Tina Butcher helps students estimate measurements during a NIST outreach event.

The *Get What You Pay For* video series explains topics important to consumers, including:

- Tare - why it's important that grocery stores not charge for this material - or tare (**www.nist.gov/video/get-what-you-pay-tare**).
- Seafood - how weights and measures inspectors remove that glaze to make sure you're getting what you paid for (**www.nist.gov/video/get-what-you-pay-seafood);** and
- At the Grocery Store - how weights and measures inspectors calibrate scales at the grocery store. (**www.nist.gov/video/get-what-you-pay-grocery-store**).

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The *League of SI Superheroes* is a comic book-style video animation series has been developed to help middle school students learn about the seven SI base measurement units. Videos are available on the NIST YouTube Channel.

- Episode 1: *Desperate Measures!* The SI Superheroes use the power of measurement to help a stranded soccer player get home (**https://youtu.be/5ZHpOojFtH8**).
- Episode 2: *Running Out of Time!* The SI Superheroes battle archvillain Major Uncertainty in a race to keep the world's satellite navigation system "on time" (**https://youtu.be/FP86qG1bjMY**).
- Episode 3: *Mass Hysteria!* The nefarious Major Uncertainty has kidnapped Monsieur Kilogram, putting the world's measurements of mass in jeopardy. (**https://youtu.be/7Hy-xCzWg6k)**

NIST has developed a *Metric Trivia Quiz*, in both an Alexa voice personal assistant and online format. The Alexa quiz will ask you a series of five questions. Every question relates to the International System of Units (SI), commonly known as the metric system (**www.nist.gov/quiz/nist-metric-trivia-quiz**).

It's not too late to celebrate the historic change to the SI that that occurred in 2019. Both the NIST *SI Redefinition* website resources, *Metric Makeover* and *We Did It!* videos will help explain these significant updates to high school and secondary audiences (**www.nist.gov/si-redefinition; www.nist.gov/video/we-did-it; https://youtu.be/21vElKsU3K4**). *The Metrology Career* website highlights career pathways, video and audio interviews with scientists and engineers, scholarship opportunities, and much more (**www.MetrologyCareers.com**).

Let OWM know how you plan to share metrology and weights and measures with the next generation!

Please contact Elizabeth Benham, Metric Coordinator to discuss ideas for measurement activities, handouts, and job aids that are available for measurement science education outreach (301-975-3690, **elizabeth.benham@nist.gov**).

OIML: Revision of "D 31: General Requirements for Software-Controlled Measuring Instruments"

Byline: Katya Delak

In December 2019, the International Committee on Legal Metrology (CIML) approved a new revision of the International Organization of Legal Metrology (OIML) document, *D 31: General Requirements for Software-Controlled Measuring Instruments*. This document is the culmination of three years of meetings of the project group, and the first such revision since 2008.

Software is increasingly essential to the operation of numerous metrological instruments, and typically, type approval or inspection guidelines have not taken into account considerations for this evolution in instrumentation. Additionally, those responsible for testing and evaluating measuring instruments often do not have the expertise to delve deeply into software analysis. The guidelines provided in D 31 attempt to reconcile some of these gaps, while also providing manufacturers guidelines as to how instruments should be configured so that the appropriate testing can be carried out. The document covers such things as risk assessments, software identification, protection from alteration, requirements for configurations, protection of data, examination of software traceability, and the means for updates.

At this time, a new project group is forming to carry on further revision of D 31. The conveners and members of the previous project agreed that there are still numerous issues related to the rapidly developing landscape in software-controlled instruments, most of which were not addressed in this most recent revision. Areas being considered for inclusion in the next revision are formal verification of software; the impact machine learning and statistical analysis tools; data storage and processing, such as cloud-based systems; options for new display technologies, such as smartphone apps; a more explicit consideration of risk levels and vulnerabilities of software; operating systems and the degree of legal control to be considered in verification; and finally, formal verification requirements.

Representation to the OIML project group on the D 31 revision is being coordinated by Katya Delak of the NIST Office of Weights and Measures.

Interested parties may contact Katya Delak at **katya.delak@nist.gov** or 301-975-2520.

New To NIST– Office of Weights and Measures

Micheal Hicks

Micheal Hicks, OWM
Laboratory Metrology Program

Micheal Hicks serves as a Metrologist in the Laboratory Metrology Program at the National Institute of Standards and Technology (NIST), Physical Measurement Laboratory, Office of Weights and Measures (OWM) Division. He received training in Metrology with the National Oceanic Atmospheric Administration (NOAA) where he worked in the Standards Laboratory in Sterling, VA for the National Weather Service (NWS). There he managed the NWS Pressure Standards Laboratory where over 600 transfer standards were calibrated nationwide annually.

These transfer standards were used to validate the performance of close to 1000 Automated Surface Observing Systems (ASOS) stations across the country at airports and the performance of balloon borne-radiosonde devices at over 100 NWS upper air observing sites. He also managed the NWS Hygrothermometry and Wind Speed Standards Laboratories which operated on a smaller scale to calibrate NWS Standards and perform tests on contingent for purchase atmospheric observing instrumentation.

Micheal has a B.S. degree in Mathematics and a PhD in Atmospheric Sciences. He is a published author in several peer-reviewed journals in the use of observing methods to measure atmospheric conditions. In his current role with the NIST, Micheal supports the OWM mission of ensuring the traceability of the U.S. legal metrology laboratories to the international system of units (SI) through training, proficiency tests, and Recognition of compliance to documentary standards. Micheal Hicks joined OWM in April 2019.

Breyanna Blackwell

Breyanna Blackwell, OWM
Administration Program

Breyanna Blackwell is a Marketing Communications professional who specializes in writing and communication management. She currently works as the Publications Coordinator for the Office of Weights and Measures at the National Institute for Standards and Technology (NIST). She is responsible for the editing of publications in the Office of Weights and Measures (OWM) such as NIST handbooks, the OWM Connection newsletter, and other written materials. Prior to her current role, she worked as a Technical Writer at Walter Reed Army Institute of Research (WRAIR) for the Commander and her Chief of Staff, tasked with drafting policy memos and editing marketing materials for WRAIR stakeholders.

Breyanna attended the Graduate School at East Tennessee State University and received her Master of Arts in Professional Communication with a specialization in Marketing Communications. Breyanna published her thesis, "To Share or Not to Share: A Study of an Individual's Self-Representation on Instagram in Accordance with Impression Management Theory" in 2017, which has been downloaded and cited over 500 times. Breyanna Blackwell joined OWM in April 2019.

Calendar of Events—Training and Meeting Events

Training

Course	Date/Location
Volume Metrology Seminar Class No. 5620	April 20 to 24 NIST, Gaithersburg, MD
NIST Handbook 133 - Checking the Net Contents of Packaged Goods - Basic "Overview Class No. 5632	May 4 to 6 Saratoga Springs, NY
Western Regional Assurance Program (WRAP) Class No. 5624	May 4 to 7 Sparks, NV
Retail Motor-Fuel Dispensers and Consoles Class No. 5645	May 11 to May 15 TBD, LA
NIST Handbook 130 - Uniform Packaging and Labeling Regulation Class No. 5604	May 18 to 20 Sacramento, CA
High Precision Scale (Class I & II) Class No. 5643	May 19 to May 21 Wisconsin Dells, WI
Advanced Mass Seminar Class No. 5611	June 1 to 11 NIST, Gaithersburg, MD
Liquefied Petroleum Gas (LPG) Liquid-Measuring Systems Class No. 5642	June 8 to June 12 Sioux Falls, SD
Balance and Scale Calibration and Uncertainties - IAAO Participants Only Class No. 5628	July 13 to 16 NIST, Gaithersburg, MD
Fundamentals of Metrology - IAAO Participants Only Class No. 5631	July 20 to 24 NIST, Gaithersburg, MD
Northeastern Measurement Assurance Program (NEMAP) Class No. 5625	September 14 to 17 Hartford, CT
Southwest Assurance Program (SWAP) Class No. 5626	September 28 to October 1 Las Cruces, NM
MidAmerica Measurement Assurance Program (MidMAP) Class No. 5627	October 5 to 8 Indianapolis, IN
Mass Metrology Seminar Class No. 5615	October 19 to 30 NIST, Gaithersburg, MD

Webinar Training

Course	Date/Time
NIST Handbook 130 - Examination Procedure for Price Verification Class No. 5633	March 25 (2 hours)
NIST Handbook 130 - Overview of the Uniform Packaging and Labeling Regulation Class No. 5634	March 26 (2 hours)
NIST Handbook 130 - Examination Procedure for Price Verification Class No. 5635	July 22 (2 hours)

NIST Handbook 130 - Overview of the Uniform Packaging and Labeling Regulation Class No. 5636	July 23 (2 hours)
NIST Handbook 133 - Overview of Handbook 133 Class No. 5637	August 5 (2.5 hours)
Measurement Systems for Legal Metrology Class No. 5603	August 12 (2 hours)
State Laboratory Annual Submission Process Class No. 5641	September 3

NCWM & Regional Meetings

Event	Date/Location
NTEP Lab Meeting	March 24 to 26 Annapolis, MD
Northeastern Weights and Measures Association (NEWMA) Annual Meeting **(www.newma.us/page-1075185)**	May 4 to 7 Saratoga Springs, NY
National Type Evaluation Program (NTEP) MDMD Meeting **(www.ncwm.com/events-detail/20-mdmd-meeting)**	May 5 to 6 Reynoldsburg, OH
Central Weights and Measures Association (CWMA) Annual Meeting **(www.cwma.net/Events)**	May 18 to 21 Wisconsin Dells, WI
105th NCWM Annual Meeting **(www.ncwm.com)**	July 12 to 16 Tacoma, WA
NTEP Grain/Software Meeting	August 11 to 12 Kansas City, MO
NTEP Weighing Meeting **(www.ncwm.com/events-detail/2020-ntep-weighing-meeting)**	August 18 to 19 San Antonio, TX
NTEP Measuring Meeting	September 22 to 23 San Antonio, TX
Western Weights and Measures Association (WWMA) Annual Meeting **(www.westernwma.org/Events)**	September 27 to October 1 Golden, CO
Southern Weights and Measures Association (SWMA) Annual Meeting **(www.swma.org/events)**	October 4 to 7 Washington, D.C.
2021 NCWM Interim Meeting **(www.ncwm.com/events-detail/2021-interim-FL)	January 10 to 13, 2021 St. Pete Beach, FL

- Course descriptions can be viewed on the Office of Weights and Measures website at **www.nist.gov/pml/weights-and-measures/about-owm/calendar-events** and clicking on the name of the course.
- For more information, contact Yvonne Branden at **yvonne.branden@nist.gov.**

We Would Love to Hear From You!

Any exciting W&M news, events, tips or fun facts to share?

Send your submissions to the Editor, Breyanna Blackwell, at **breyanna.blackwell@nist.gov.**

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