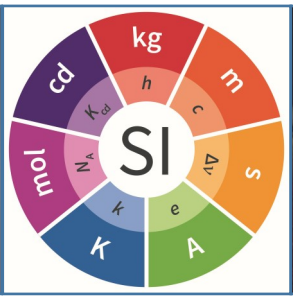
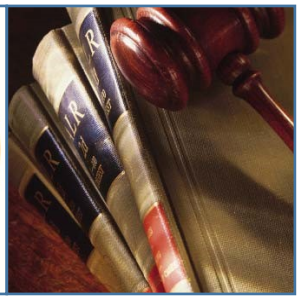
WEIGHTS & MEASURES CONNECTION





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Office of Weights and Measures

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New On-Demand Webinar on NIST HB130, Method of Sale, and NIST HB133, Test Procedure for Mulch and Soils Labeled by Volume

Byline: David Sefcik

The Office of Weights and Measures and the Mulch and Soil Council are pleased to announce an on-demand webinar on NIST Handbook 130, "Method of Sale" and NIST Handbook 133, "Section 3.10. Test Procedure for Packages of Mulch and Soils Labeled by Volume." The individual modules cover the method of sale and labeling requirements for packages of mulch and soil, as well as the test procedure. The test procedure is primarily used for verifying the net quantity of contents for packages of mulch, but it can also be used to verify the net quantity of contents of potting soil and other packaged soil products sold by volume.

The webinar contains individual learning modules and includes video demonstrations. You can choose to watch the complete webinar or specific modules, such as the method of sale or labeling requirements. If you are familiar with those, you can focus just on test equipment and test procedures. The webinar includes the following modules and is 1.5 hours in total length:

- **Introduction and Demonstration** of the Test Procedure for Mulch and Soils
- **Method of Sale** for Mulch and Soils (NIST Handbook 130 "Method of Sale of Commodities Regulation")
- **Labeling Requirements** for Mulch and Soils (NIST Handbook 130 "Uniform Packaging and Labeling Regulation")
- **Test Equipment** (NIST Handbook 133, Section 3.10. "Mulch and Soils Labeled by Volume")
- **Test Procedure** for Mulch and Soils Labeled by Volume (NIST Handbook 133, Section 3.10. "Mulch and Soils Labeled by Volume")
- **Evaluation of Test Results** (NIST Handbook 133, Section 3.10. "Mulch and Soils Labeled by Volume")

This on-demand webinar can be viewed at: **www.nist.gov/pml/weights-and-measures/laws-and-regulations/lr-resources.** Since this is an on-demand webinar, no registration is required. Students will not receive a certificate of participation.

Please contact David Sefcik at **david.sefcik@nist.gov** or Lisa Warfield at **lisa.warfield@nist.gov** or **OWM@nist.gov** for additional assistance and information.

Writing with the SI

Byline: Elizabeth Benham

Writing is a regular part of most jobs. But in the Science, Technology, Engineering, and Mathematics (STEM) fields, it's especially important that measurement results are communicated clearly and unambiguously. Avoiding measurement unit writing errors is critical. Even slight measurement unit oversights undermine confidence in the resulting products and services, or worse…result in costly mistakes or deadly mishaps. In weights and measures, a metrology laboratory communicates calibrated values and uncertainties to the regulatory official using a calibration certificate. In manufacturing, a product label communicates the net quantity of contents to consumers. In a retail environment, a store shelf label communicates the unit price to shoppers. In some instances, we may never meet the end users of our measurement results face-to-face. However, they will certainly form an opinion about our organization based on their experiences with these written communications.

The accepted convention of scientific and technical writing is to use the International System of Units (SI), commonly known as the metric system. Becoming more familiar with proper SI writing style will help add clarity to work correspondence and build confidence when communicating measurement results.

The SI measurement system is built upon 7 base quantities, represented by 7 units and symbols: length (meter, m), mass (kilogram, kg), time (second, s), electric current (ampere, A), thermodynamic temperature (kelvin, K), amount of substance (mole, mol), and luminous intensity (candela, cd). The system also includes derived units, which are formed for convenience of notation by combining base units algebraically with other derived units. While there are 22 SI derived units with special names, there are additional commonly used derived quantities that do not have special names, such as area (square meter, m^2) and volume (cubic meter, m^3). Additionally, there are some units that can be used with SI units. For example, the second (s) is the SI base unit of time but the units of minute (min), hour (h), and day (d) are also permitted for use. There are units that are given special names, such as the liter (L) and hectare (ha).

A series of 20 prefix names and symbols are used to form the names and symbols of the decimal multiples and submultiples of SI units (**www.nist.gov/pml/weights-and-measures/metric-si-prefixes**). The scale of a quantity can be increased or decreased using powers of 10. Using SI prefixes helps an author represent units that are of an appropriate magnitude for their application but are particularly helpful when expressing very small or very large quantities. For example, a surveyor may choose kilometers (km) on a map legend, while an engineer would select millimeters (mm) on a mobile phone design specification diagram. It is important to remember that when a prefix is used, the prefix name and the unit name are combined to form a single word, and similarly the prefix symbol and the unit symbol are written without any space to form a single symbol (Figure 1). For example, write milligram (mg), not milli gram (m g). Compound prefix names or symbols are not permitted. For example, nm (nanometer) is correct, NOT mμm (millimicrometer).

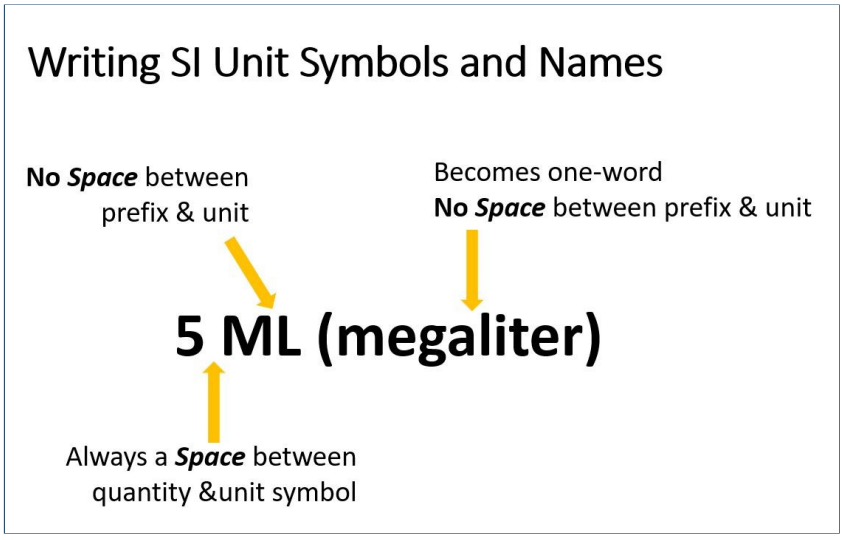

Figure 1. Basic SI quantity and unit symbol with prefix format

(Continued on page 3)

Writing with the SI

(continued from page 2)

One of the primary benefits of using the SI in written communication is that unit symbols are the same in all languages, while spelling of unit names and pronunciation are language dependent. Using the SI provides broad understandability of quantitative information across a wide audience who may read our communications. Because spelling varies among languages, it is essential to use SI symbols to facilitate the interpretation of written measurement results. It is important to note that spelling differences even exist between American and British English. For example, the American spelling of the prefix deka (da) uses a "k", not deca with a "c" and the element Cs is spelled cesium, not caesium, and the base unit of length is spelled meter, not metre. The National Institute of Standards and Technology (NIST) follows the American English writing practices found in Webster's *Third New International Dictionary*.

It's recommended to always consult NIST Special Publication (SP) 811, *Guide for the International System of Units,* when applying SI writing style rules and review written communications using the manuscript checklist (**www.nist.gov/pml/special-publication-811**). Here are a few writing best practices and tips.

Formatting Best Practices for Writing Quantities. SI units should be written in an upright typeface with a space between the numeric quantity value and the unit symbol (see Figure 1). Unit symbols are a "shorthand" way of representing a unit name. They should not be confused with abbreviations, or a shortened form of a word or phrase. Abbreviations are commonly used in non-SI measurements (e.g., U.S. customary units). A unit symbol represents both the singular and plural tense, so an "s" should not be added at the end of a unit symbol to represent more than one (e.g., kg, not kgs). If the spelled-out name of a unit is used in a sentence, the normal rules of English grammar are applied. For example, "35-millimeter film." Punctuation is not used after a unit symbol. For example, "the bottle has a 123 mm radius," not "the bottle has a 123 mm. radius."

The decimal marker in the U.S. is commonly a dot on the baseline, while a comma is frequently used outside the U.S., but both methods are permitted by the *International Bureau of Weights and Measures (BIPM) SI Brochure* for use with the SI (**www.bipm.org/en/publications/si-brochure/**). When numerical values have more than four digits on either side of the decimal marker, it is a formatting best practice to separate the numbers into groups of three using a *thin nonbreaking space* (Ctrl + Shift + Space) counting from both the left and right of the decimal marker. For example, 12 345.678 91 is highly preferred to 12345.67891. Commas are not used to separate digits into groups of three. For numbers less than one, a leading zero is written before the decimal marker. Leading zeros help minimize the risk of magnitude errors. For example, accidently interpreting 0.1 g as 1 g (a ten-fold error).

Use formatting practices to make it clear to readers which unit symbol belongs with a numerical value or mathematical operation. For example, write 35 cm × 48 cm, not 35 × 48 cm. Write quantity ranges with the text "to" instead of a dash; a dash may be misinterpreted as a negative symbol. For example, 20 °C to 30 °C or (20 to 30) °C, but not 20 °C - 30 °C.

Measure	Best Practice	Unacceptable
Numerical Values (4 or more) Grouping	12 345.678 91	12345.67891
Leading Zero	0.1 g	.1 g
Space Between Quantity & Symbol	0.25 %	0.25%
Formatting Ranges	20 °C to 30 °C or (20 to 30) °C	20 °C - 30 °C

Table 1. Tips for writing values of quantities.

(Continued on page 4)

Writing with the SI

(continued from page 3)

SI Writing Tips

The written names of all SI units begin with a lowercase letter, except when grammar rules require capitalization, such as at the beginning of a sentence or capitalizing a proper noun. For example, the base unit for time is the second (lowercase) and s (lowercase) is the unit symbol. For those units named after a person, the unit name is still written in lowercase, but the unit symbol is capitalized like a proper noun. For example, the SI unit for pressure is the pascal (lowercase), represented by the unit symbol Pa (uppercase), in honor of the French mathematician and physicist Blaise Pascal. One exception involves writing "degree Celsius" where degree is lowercase and Celsius is capitalized. Another exception has been made for the liter (L), where an uppercase L is used for the unit symbol to avoid confusion between a lowercase l and the numeral 1; in some fonts (like the present) they are indistinguishable!

Capitalization also gives meaning to prefix symbols. For example, the prefix symbol M (uppercase) represents the prefix mega, while the symbol m (lowercase) represents the prefix milli. In this case, an accidental capitalization would cause a huge error in magnitude. NIST SP 811 describes several capitalization best practices (**www.nist.gov/pml/special-publication-811**).

To quickly improve SI writing practices, be aware of these very common SI unit symbol writing mistakes (Table 2). These tips and more are highlighted on the *Writing with Metric Units* webpage (**www.nist.gov/pml/weights-and-measures/writing-metric-units**). Please keep in mind that some variations of SI writing format are allowed by regulation or within certain industry sectors. For example, "mcg" is accepted substitute in some healthcare applications for "millionth" instead of using the symbol μ (mu) for the prefix micro. Weights and measures writers should look to the *Uniform Packaging and Labeling Regulation (UPLR)* in NIST Handbook (HB) 130 for accepted SI labeling practices (**www.nist.gov/pml/weights-and-measures/publications/nist-handbooks/other-nist-handbooks/other-nist-handbooks-2-1**).

For more information, please contact Elizabeth Benham, NIST Metric Coordinator, at **elisabeth.benham@nist.gov** or **TheSI@nist.gov**.

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Reports of the National Conference on Weights and Measures 1905 - 2019

Byline: Lisa Warfield

The reports of the National Conference on Weights and Measures (NCWM) Annual Reports (1905 to 2019) are available free of charge, in a USB format. Click on "**USB Request**" link to request a USB that provides you with the NCWM Conference Annual Reports. You must provide your name, company affiliation, and mailing address. All requests will be fulfilled within two-business days. If you have questions or would like to contact NIST OWM: phone: (301) 975-4004 or e-mail: **owm@nist.gov**.

Writing with the SI

(continued from page 4)

Measure	SI Symbol	Unacceptable Examples	
		Symbol format	Abbreviation
Mass	kg	KG KG. Kg Kg.	Kgr kgs
	g	G G. g.	GR GRM Grms gr gms
Length	km	Km KM km.	kms
	m	M m.	mtr
	mm	MM Mm mm.	mmtr
Volume	L	L. l l.	ltr
	mL	ML Ml mL.	mls
	cm^3	cm^3	cc
Pressure	kPa	KPa KPA Kpa	
	mmHg	mm Hg	
Temperature	20 °C	20°C 20° C	20 deg C

Terminology	Acceptable	Obsolete
	micrometer	micron
	degree Celsius	degree centigrade

Table 2. Watch out for these common SI writing style missteps.

OWM Traceability Review Guidance

Byline: Georgia Harris and Micheal Hicks

The NIST Office of Weights and Measures maintains a laboratory Recognition program that "recognizes" the ability of State weights and measures laboratories (and a limited number of additional legal metrology laboratories) to provide metrologically traceable measurements and comply with the requirements of ISO/IEC 17025:2017 (through NIST Handbook 143 processes). The guidance provided in this article is specifically directed to the laboratories encompassed by the OWM legal metrology program; however, all laboratories that are accredited may benefit from considering guidance provided here.

The OWM Recognition Certificate states that weights and measures laboratories can provide metrologically traceable measurements. All laboratories claiming compliance to ISO/IEC 17025 should be able to do this and stand ready to provide objective evidence to customers and to onsite assessors of accreditation bodies! Any accredited or recognized laboratory must ensure that the laboratory documents support statements of traceability.

To provide objective evidence supporting metrological traceability, OWM requires laboratories under the Recognition program to submit a full "traceability assessment" and objective evidence any time there is a change in Scope requests. This assessment is also required for:

- Technical audits: Appendix C or D in NISTIR 6969 Good Measurement Practice (GMP) 13;
- Lab Quality Management System (QMS) documents;
- Internal Audits;
- Laboratory Auditing Program (LAP) Problems; and
- Future Annual Submissions.

Traceability Assessments: Reviewing Quality Management System (QMS) Documents

Laboratories need to be sure that all laboratory documents and their quality management system are up to date and use the latest applicable reference documents. Examples of items to review include the following:

- Terminology and Definitions - Laboratories need to be sure and use the latest definitions from the International Vocabulary of Metrology (VIM)! The latest definition is also published in GMP 13, Section 1.2. Laboratory document references and terminology must include the latest VIM (2008 with 2012 corrections).

- The correct reference to include is: "International Vocabulary of Metrology – Basic and General Concepts and Associated Terms (VIM 3rd edition), JCGM 200:2012 (JCGM 200:2008 with minor corrections)".

- The laboratory needs to make sure all implementation of standards hierarchies, calibration intervals and due dates, and inventory files are complete, referenced, and up to date in QMS documents. Adoption of GMP 11 and GMP 13 as written are not enough. NOTE: OWM has observed examples of "traceability assessment" or "LAP problems" submissions where files appear complete at the time of review, but are not part of the full set of laboratory QMS documents (QM, SAP, Appendices) and/or not referenced as Records. All relevant documents must be incorporated into the QMS. Also, failure to have up to date calibrations will result in a nonconformity in the traceability assessment for those parameters/ranges. When referencing these files as Records, they are examples of Objective Evidence for applicable sections of the Internal Audit and need to be noted in the QMS or Standard Administrative procedures (e.g., "see Traceability-20xx.XLSX file" or "see QM Appendix MX").

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OWM Traceability Review Guidance

(continued from page 6)

What is a full "traceability assessment"? What "objective evidence" is submitted for OWM review?

To complete a full traceability assessment, it is a best practice to use Appendix C or D of GMP 13 as a technical audit and an outline to identify all objective evidence that must be referenced/included in the QMS or referenced. The following list of seven essential elements of traceability looks at the GMP 13, section 1.5, and provides guidance for each item. The list of seven essential elements correlates with the requirements of ISO/IEC 17025, sections 6.4, 6.5, and Annex A. Table 3, Seven Essential Elements of Metrological Traceability provides a graphic representation and handy resources at a glance.

Item	Title	Description	17025:2017	NIST or OWM Resource
1	Realization of the SI	*Define: Measurand (VIM)* BIPM SI Brochure	Section 6.5.2 Annex A.2.1, a)	NIST SP 811 – Units, Symbols, Conversions
2	Unbroken Chain of Calibrations	*Define: Calibration (VIM)* *Illustrate Hierarchy*	Section 6.5.1 Annex A.2.1, b)	GMP 13 – Definitions and Example Hierarchies
3	Calibration Program	*Traceability of Standards and Equipment* *Supplier Evaluation* *Note: suitable intervals and current status; ILAC AB accreditation or compliance evaluation*	Sections 6.4, 6.5, 6.6 Annex A.2.1, b) Annex A, A.3.1	GMP 13 – Process GMP 11 – Calibration Intervals
4	Documented Measurement Uncertainties	*Use: Guide to the Expression of Uncertainty in Measurements (GUM)* *Option: Compliance Assessments*	Section 6.5.1 Section 7.6 Annex A.2.1, c)	SOP 29 SOPs – Each have Uncertainty Budget Tables
5	Documented and Validated Procedures	*Selection hierarchy; validation*	Section 7.2 Annex A.2.1, d)	GMP 12 SOPs – Validated to ensure traceable results GLP (Method Validation)
6	Technical Competence Evidence	*Training, Proficiency Testing, Demonstrations*	Section 6.2 Annex A.2.1, e)	GLP 1 State Labs: training and PT requirements AB: PT Plans
7	Measurement Assurance	*Statistical validation of standards and process; input to uncertainties*	Section 7.7	GLP 1 SOP 30, 9, 17, 20

Table 3. Seven Essential Elements of Metrological Traceability

- 1.5.1 - Realization of SI Units. Laboratories must reference use of the International System of Units in the quality manual, on calibration certificates (show example certificates as part of the objective evidence) and traceability hierarchies (included in QMS files). NOTE: In all places where units are represented, follow the manuscript review checklist in NIST Special Publication 811. The definition of traceability requires evidence of traceability to the SI unit (not to NIST or another national metrology institute). Example hierarchies are provided in GMP 13, but it is important to note that the hierarchies presented are examples and hierarchies specific to each laboratory requires essential objective evidence.
  - Laboratories submit the following for OWM evaluations: measurement hierarchies that outline traceability to the SI units (either within the QMS or as a QMS referenced record) and sample calibration certificates that would be issued to customers or weights and measures officials.

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OWM Traceability Review Guidance

(continued from page 7)

- 1.5.2 - Unbroken chain of comparisons. Laboratories must show an unbroken chain of calibrations as a part of the measurement hierarchies. Demonstration of unbroken chains of calibrations are essential for all measurements on a laboratory scope. Hierarchies are also needed for equipment and things like environmental standards that are used for corrections during other calibrations. Supporting evidence includes ensuring that calibration certificates are readily available for each set of standards and levels presented on the measurement hierarchy. Supplier evaluations are also required to support evaluation and compliance to the standard for each outside provider. Measurements completed internally require supporting evidence for the capability, even if it is not included on the published Scope.
  - Laboratories submit the following additional items to OWM for evaluation: calibration certificates for standards that are used, along with supplier evaluations to show that all suppliers are compliant with ISO/IEC 17025:2017.

- 1.5.3 - Documented "calibration program". Laboratories must have a suitable calibration program for standards and equipment used to provide calibrations. Adoption of GMP 11 includes having a clear process for evaluating due dates on a regular basis to ensure no past-due standards are used, ensuring appropriate calibration intervals for all equipment and standards, and extending calibration intervals ONLY with supporting data and evidence/analysis. GMP 11 also notes that it is a template and may reference laboratory documents (or databases) according to section 4.1. An example inventory job aid is posted with both GMP 11 and GMP 13 that shows example items, calibration dates, calibration intervals, due dates, supplier references, and so on. It includes conditional formatting to clearly identify standards or equipment that is past due. A regular review of these records and a system for preventing use of past due standards is also required. That might include a review of the standards prior to issuing each calibration certificate, or a monthly or annual review of calibration due dates where items are flagged in the laboratory calendar to ensure that no standards are used after their calibration due dates. GMP 11 and the sample Excel file includes environmental standards and equipment like balances because section 6.4 of the ISO/IEC 17025:2017 standard places laboratory equipment in the same category as measurement standards that must be assessed and monitored. Appendix B of GMP 13, the Excel file job aid, or a suitable database system can be used for inventory tracking. However, there must be a document or record available and it needs to be provided as evidence when proving traceability. If the calibration program files are part of a record, it needs to be referenced in the QMS. OWM will not put measurements on a laboratory Scope if standards are out of date. Expanding a laboratory Scope often requires adding standards and equipment to the inventory with appropriate suppliers and due dates.
  - Laboratories submit the following additional items to OWM for evaluation: Up to date inventory of standards and equipment that shows suitable calibration dates, intervals, and due dates. Best practice is to include suppliers and accreditation codes, maybe even dates of supplier reviews. If a database is used in the lab, an exported report of the standards/equipment may be submitted.

- 1.5.4 - Documented measurement uncertainty. Calibration uncertainties are a critical essential element of the definition of traceability and are required to comply with the Guide to the Expression of Uncertainty in Measurement (GUM), as noted in ISO/IEC 17025:2017. Uncertainties must be provided for each measurement parameter and nominal value for the laboratory Scope. Laboratory uncertainty files and records should be referenced in the QMS (e.g., "Lab Uncertainty 20XX.XLSX".)
  - Laboratories submit the following additional items to OWM for evaluation: Updated uncertainty files; ensuring that all applicable components are addressed, components are compliant with the standard operating procedure uncertainty budgets, calculations are performed according to the GUM, appropriate degrees of freedom and coverage factors are used, and appropriate documentary standards and tolerances are used to assess conformity assessment and decision risk rules, using passing P_n values. (The P_n assessment uses a

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OWM Traceability Review Guidance

(continued from page 8)

ratio of Uncertainty divided by the applicable tolerance to calculate a value that must be less than one to pass. It is also used in all OWM proficiency tests as a component of pass/fail statistics.)

- 1.5.5 - Reference documented and validated procedures used to conduct calibrations (e.g., NIST SOP or internally developed SOP with a record of its validation). NOTE: many laboratory administrative procedures for method validation do not adequately cover traceability assessments. Weights and measures laboratories in the OWM program are expected to use the NIST OWM published calibration procedures that are also covered in OWM training seminars. The latest version of the procedures also must be referenced in the laboratory QMS documents.
  - Laboratories submit the following additional items to OWM for evaluation: if the laboratory is using a lab-developed method, they must submit the SOP, the validation procedure or reference NISTIR 8250 GLP 14 (if using GLP 14), and record of their validation per the GLP 14 appendix. If a laboratory is using the NIST SOP, they can simply reference it on their assessment. If the laboratory needs minor instructions or clarification of the NIST procedures, they can simply write a Supplement that may not need full validation. However, validation of the ability to implement the procedures is still required through successful completion of proficiency testing.

- 1.5.6 - Accredited technical competence. Laboratories must be able to demonstrate that they have adequate staff, that staff are trained, and that they have demonstrated competency. Laboratory personnel demonstrate competency through performing procedures during training seminars, as demonstrations for assessors during on-site assessments, and as a part of proficiency tests.
  - Laboratories submit the following additional items to OWM for evaluation: Training records (training logs or databases, transcripts, on-the-job training (OJT) worksheets) and successful proficiency testing results. For unique measurement areas that are not covered by OWM training or PTs, the laboratory needs to have further discussions with OWM staff.

- 1.5.7 - Measurement assurance. Laboratories are required to demonstrate how they ensure the validity of measurements they conduct. All the NIST OWM procedures incorporate measurement assurance methodologies that include things like replicate measurements, control charts, standard deviation charts, use of check standards, and periodic review of the measurement processes. Additional OWM SOPs cover measurement assurance methodologies.
  - Laboratories submit the following additional items to OWM for evaluation: A completed Measurement Assurance System Assessment (2010) form (posted with SOP 30), applicable control charts and/or standard deviation charts that demonstrate measurements processes, and standards that are in control or appropriate action items pending completion in a timely manner.

As noted earlier, laboratories are required to have objective evidence for each of the seven essential elements to prove that they can provide metrological traceability for measurements they provide to laboratory customers or other weights and measures officials. Laboratories seeking accreditation are required to demonstrate the same essential elements during their accreditation assessment process. Laboratories recognized by the NIST Office of Weights and Measures must complete this traceability assessment and submit their request and objective evidence to OWM any time there is a requested Scope addition or change with the latest Recognition application. Laboratories that are accredited by ILAC signatory accreditation bodies must follow the detailed procedures required by their accreditation bodies for demonstrating metrological traceability. If you have any questions regarding OWM Traceability Review, please contact Mike Hicks at **micheal.hicks@nist.gov**.

NIST
National Institute of Standards and Technology
U.S. Department of Commerce

Calendar of Events

OWM Training Events

Date	Time (Eastern Time Zone)	Event Name	Online or Location	Class
January 12, 2021 to February 4, 2021	12:00 p.m. to 4:00 p.m.	Fundamentals and LAP Problems Preparation	Online webinar	5674
January 26, 2021 February 23, 2021	11:00 a.m. to 1:30 p.m. 11:00 a.m. to 1:30 p.m.	Weights and Measures Inspections - Evidence, Search and Seizure, and Due Process	Online webinar	5713 5717
February 16, 2021	11:00 a.m. to 1:00 p.m.	NIST Handbook 130 - Examination Procedure for Price Verification	Online webinar	5714
February 17, 2021	11:00 a.m. to 1:00 p.m.	NIST Handbook 130 - Overview of the Uniform Packaging and Labeling Regulation	Online webinar	5715
February 18, 2021	11:00 a.m. to 1:30 p.m.	NIST Handbook 133 - Overview of Handbook 133	Online webinar	5716
February 24, 2021	11:00 a.m. to 1:00 p.m.	NIST Handbook 133 - How to Test Animal Bedding	Online webinar	5718
March 4, 2021	2:00 p.m. to 4:00 p.m.	Document Control and Record Keeping	Online webinar	5707
March 11, 2021	2:00 p.m. to 4:00 p.m.	Contract Review	Online webinar	5708
March 22 to 25, 2021	1:00 p.m. to 5:00 p.m.	Southeast Measurement Assurance Program (SEMAP)	Online webinar	5702
April 8 and 22, 2021	2:00 p.m. to 4:00 p.m.	Software Validation and Verification	Online webinar	5709
May 3 to 6, 2021	1:00 p.m. to 5:00 p.m.	Western Regional Assurance Program (WRAP)	Online webinar	5703
May 20, 2021	2:00 p.m. to 4:00 p.m.	Basic Uncertainty Concepts	Online webinar	5710
June 7 to 11, 2021	8:00 a.m. to 5:30 p.m.	Volume Metrology Seminar*	Gaithersburg, MD	5711
June 14 to 18, 2021	8:00 a.m. to 5:30 p.m.	Volume Metrology Seminar*	Gaithersburg, MD	5712
June 21 to 25, 2021	8:00 a.m. to 5:30 p.m.	Fundamentals of Metrology*	Gaithersburg, MD	5719
July 1, 2021	2:00 p.m. to 4:00 p.m.	State Laboratory Annual Submission Process	Online webinar	5720
July 12 to 23, 2021	8:00 a.m. to 5:30 p.m.	Mass Metrology Seminar*	Gaithersburg, MD	5721
July 26 to 30, 2021	8:00 a.m. to 5:30 p.m.	Fundamentals of Metrology*	Gaithersburg, MD	5722

**Event scheduled at Gaithersburg, MD. Contingent upon NIST re-opening and allowing visitors on campus.*

(Continued on page 11)

Calendar of Events

OWM Training Events (*continued from page 10*)

Date	Time (Eastern Time Zone)	Event Name	Online or Location	Class
August 2 to 5, 2021	1:00 p.m. to 5:00 p.m.	Northeastern Measurement Assurance Program (NEMAP)	Online webinar	5704
August 9 to 13, 2021	8:00 a.m. to 5:30 p.m.	Fundamentals of Metrology*	Gaithersburg, MD	5725
August 16 to 20, 2021	8:00 a.m. to 5:30 p.m.	Fundamentals of Metrology*	Gaithersburg, MD	5726
August 30 to September 3, 2021	1:00 p.m. to 5:00 p.m.	Southwest Assurance Program (SWAP)	Online webinar	5705
September 13 to 17, 2021	8:00 a.m. to 5:30 p.m.	Fundamentals of Metrology*	Gaithersburg, MD	5727
September 20 to 30, 2021	8:00 a.m. to 5:30 p.m.	Advanced Mass Seminar*	Gaithersburg, MD	5723
October 4 to 7, 2021	1:00 p.m. to 5:00 p.m.	MidAmerica Measurement Assurance Program (MidMAP)	Online webinar	5706
October 18 to 29, 2021	8:00 a.m. to 5:30 p.m.	Mass Metrology Seminar*	Gaithersburg, MD	5724

**Event scheduled at Gaithersburg, MD. Contingent upon NIST re-opening and allowing visitors on campus.*

Shown are OWM training events as of January 1, 2021. Please refer to the OWM website for the most recent listing ***www.nist.gov/pml/weights-and-measures/about-owm/calendar-events****.*

Calendar of Events

Meetings

NCWM and Regional Associations			
January 10 to 12, 2021	online	NCWM Annual Meeting (Conclusion)	**www.ncwm.com**
January 13 to 15, 2021	online	NCWM Interim Meeting	**www.ncwm.com**
May 10 to 13, 2021	Wisconsin Dells, WI	Central Weights and Measures Association (CWMA)	**www.cwma.net**
May 2021 (date TBD)	location TBD	Northeastern Weights and Measures Association (NEWMA)	**www.newma.us**
July 18 to 22, 2021	Rochester, NY	NCWM Annual Meeting	**www.ncwm.com**
September 26 to 30, 2021	Golden, CO	Western Weights and Measures Association (WWMA)	**westernwma.org**
October 10 to 13, 2021	New Orleans, LA	Southern Weights and Measures Association (SWMA)	**www.swma.org**
January 7 to 12, 2022	Tampa, FL	NCWM Interim Meeting	**www.ncwm.com**

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