WEIGHTS & MEASURES CONNECTION

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First Certificate of Type Approval for Electric Vehicle Supply Equipment Issued by the California Division of Measurement Standards

Byline: Juana Williams (NIST OWM) and Kristin Macey (CA)

The California (CA) Department of Food and Agriculture Division of Measurement Standards (DMS) took an important first step in the recognition of Electric Vehicle Supply Equipment (EVSE) for commercial use in the U.S. On February 25, 2021, the CA DMS issued the first CA Type Evaluation Program (CTEP) Certificate of Approval to the manufacturer of a specific model of EVSE. An EVSE is a device or system designed and used specifically to transfer electrical energy to an electric vehicle (EV) through either a physical or wireless connection. EVSEs have been installed at various locations throughout the U.S. for the public to fuel their electric vehicles for a fee. With the issuance of the first type evaluation certificate by CA DMS to an EVSE, state and local officials in a number of jurisdictions across the country may soon begin routine inspections to ensure commercially-used EVSEs are accurate, well-constructed, properly designed and installed, and suited for use in commercial transactions.

Most weights and measures jurisdictions in the U.S. require that commercial weighing or measuring devices such as gas pumps, grocery scales, and propane metering devices undergo a type evaluation before those devices can be used to buy or sell products and services. This includes EVSEs in fueling stations or parking lot facilities that are used to buy or sell electrical energy to fuel an EV. A certificate is issued to a device manufacturer when a specific model of weighing or measuring device has successfully completed rigorous evaluation to determine it conforms to a set of design and performance code requirements. This process takes place before the device is used commercially in the marketplace.

In 2012, the NIST U.S. National Working Group on Electric Vehicle Fueling and Submetering began work on legal metrology standards for EVSE equipment and a corresponding method of sale. CA DMS was at the forefront of this work, joining this group of experts, comprised of state and local weight and measures officials, manufacturers, members of the electrical energy community, federal government agencies, and other technical experts to develop what was incorporated into NIST Handbooks 44 (EVSE equipment) and 130 (method of sale/signage) in 2015 and later into a NIST Examination Procedure Outline (field test procedures).

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First Certificate of Type Approval for EVSE Issued…...

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CA DMS played a pivotal role in this process, not only bringing to the table its extensive expertise at the county and state levels, but also hosting the bulk of the Work Group meetings and championing the adoption of these standards across the country. This work serves as a great example of state and federal collaboration with stakeholders working together to build the weights and measures infrastructure to support this important alternative fueling application. Except for a few types of devices regulated by specific Federal agencies, the regulatory authority for commercial weighing and measuring devices rests largely with state and local weights and measures jurisdictions. Most states adopt and enforce the provisions of NIST Handbooks 130 and 44 as the requirements for commercial weighing and measuring devices and practices in their states.

The first EVSE to receive CTEP approval met California Code of Regulations (CCR) requirements which are closely based on NIST Handbook 44 Section 3.40 Electric Vehicle Fueling Systems – Tentative Code. The CCR EVSE regulation was adopted by CA in 2019 and became effective on January 1, 2020. The CCR permissible errors for the EVSE's delivery of electrical energy to an EV during type evaluation is ± 1.0 percent. Commercial EVSEs installed in California prior to certain installation dates do not have to comply with requirements. California has phase-in enforcement dates of:

- January 1, 2021 for all commercial EVSE AC Systems installed on or after January 1, 2021 making those devices fully subject to the regulation on January 1, 2021.
- All commercial EVSE AC Systems installed prior to January 1, 2021 shall comply with the regulation by January 1, 2031.
- All commercial EVSE DC Fast Charging Systems installed on or after January 1, 2023 will be fully subject to the regulation.
- All commercial EVSE DC Fast Charging Systems installed prior to January 1, 2023 shall comply with the regulation by January 1, 2033.

The type evaluation process for EVSEs assesses the: (1) accuracy and correctness of the displayed and recorded transaction information when the EVSE is charging an EV or in the event of a power loss; (2) security placed on components that can alter measurement results; (3) marking of electrical rating information; (4) method of sale (by the kilowatt-hour) for deliveries of electrical energy; (5) charge(s) for other services connected with the fueling process based on time (if an EVSE has this feature); and (6) the likelihood the device maintains proper operations and settings under conditions of typical commercial use. When the U.S. National Type Evaluation Program (NTEP) administered by the National Conference on Weights and Measures (NCWM) begins accepting EVSEs for type evaluation those devices must comply with all requirements in NIST Handbook 44 Sections 1.10 General Code and 3.40 Electric Vehicle Fueling Systems – Tentative Code and, where applicable, Section 5.55 Timing Devices.

With the adoption of requirements for EVSEs and the issuance of type evaluation certificates for these devices, the U.S. Weights and Measures community is moving into a new area of legal metrology. Instead of refueling a light duty vehicle with gasoline/diesel the trend is for battery/fuel cell vehicle fueling with alternative fuels such as electricity through Retail Electric Vehicle Fueling Systems (aka Electric Vehicle Supply Equipment (EVSE) or Electric Vehicle Chargers). State and local authorities have been operating programs set up to verify compliance of traditional fuel dispensers for over a century. Electrical energy commercial sales are new to most weights and measures jurisdictions except for California. For decades California county and state officials have routinely verified watthour type electric "submeters" used by landlords in apartment buildings, mobile home parks, campgrounds, marinas, and malls to bill tenants for power usage. Electricity metering and its verification has been under the domain of the utility companies and the public service/utility commissions, except for those "submeter" applications where weights and measures jurisdictions have exercised their regulatory authority. Nevertheless, public fueling of vehicles with electricity for a fee is new to the entire country and continues to grow. Once again California takes the lead on commercial electrical energy applications and there will be global benefits because of their actions. All signs point to more type approval certifications of EVSEs to come.

NIST Handbook 105-1 Revised! What Now? Part II

Byline: Micheal Hicks and Val Miller

NIST Handbook 105-1, Specifications and Tolerances for Field Standard Weights was published in 2019 by NIST OWM and has been implemented across the nation for going on two years. Within the Legal Metrology community, there have been some questions and challenges to come up for discussion during this period. The purpose of this article is to provide some guidance to the Legal Metrology community regarding these questions and challenges to make all aware. The recurring questions and challenges include the following:

- The conformity assessment of Class F Echelon III weights is a challenge to the implementation of the standard. NIST Handbook 105-1 (2019) clearly states that no new Class F weights are to be accepted into service after January 1, 2020 for legal metrology applications. Only existing, prior to January 1, 2020, Class F field standards may continue to be used provided that they demonstrate mass stability, are properly maintained, and are correctly evaluated to the 1990 version of the Handbook 105-1. However, their suitability will still be limited to use as field standards for verification of NIST Handbook 44 weighing systems meeting the requirements of Classes III, IIIL, and IIII. If a customer purchases new Class F weights from a manufacturer and requests them to be calibrated for Legal-for-Trade applications, the Metrologist should reject the work request in accordance to NIST Handbook 105-1 (2019). "NIST" Class F no longer exists as part of the 2019 version of Handbook 105-1. NIST Handbook 105-1 (1990) has been withdrawn and is maintained and available solely as a reference document. The above does not apply to customers purchasing new Class F weights for non-Legal-for-Trade applications. It will be up to the laboratory and the local policies as to whether the laboratory should provide service to a non-Legal-for-Trade customer with new Class F weights. If a laboratory provides service to a customer pursuing non-Legal-for-Trade applications, it is recommended for the following statement (or something similar) to be provided VISIBLY on the calibration certificate: "The weights included on this Calibration Certificate, labeled as Class F, do not comply with current regulatory requirements and may not be used within the state of ____ for legal calibration and testing of commercial weighing devices." The calibration of new Class F weights will have to be tracked with care to ensure they do not get mixed in with the prior to January 1, 2020 Class F weights acceptable for commercial Weights and Measures applications.

- The conformity assessment of ASTM E617 (2018) Class 6 and Class 7 weights is another challenge. These two classes have different listed maximum permissible errors (or tolerances) but their material specification is the same. The ASTM E617 standard does a poor job of prescribing the material requirements of Class 6 and Class 7 weight standards. It clearly specifies the material requirements for cylindrical weights less than 100 g and all weight types above 5 kg, but it omits requirements for non-cylindrical weights less than 100 g or nominal weights between 100 g and 5 kg. Therefore, for these two classes, it permits the manufacturing of small (less than 100 g) non-cylindrical weights made of material of lower hardness and/or resistance to corrosion than steel. The same goes for weight types between the nominals of 100 g and 5 kg. This is an issue and is not the true intent of the standard. OWM will work with the ASTM E41 committee to update the E617 standard to have, at minimum, ASTM Class 6 reflect the characteristics of the former Class F weights since Class 6 currently closely resembles the specifications of Class F (i.e., conforming with the 1990 version of Handbook 105-1 material limitations).

- In addition, NIST OWM is working to update the ASTM E617 (2018) Class 6 tolerances to match Class F (i.e., 1990 Handbook 105-1). This is being done due to the current ASTM Class 6 not listing maximum permissible error (or tolerance) values for small weight nominals. The currently listed tolerances for ASTM Classes were derived from the historical Circular 547 standard of 1954. There are some inconsistencies found in these tolerances where no explanations were recorded nor can be offered by the legal metrology community (e.g., at nominals less than 1 oz, ASTM Class 5 tolerances are greater than ASTM Class 6). The proposal is to align the

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NIST Handbook 105-1 Revised! What Now? Part II

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ASTM Class 6 tolerances closer to those of Class F over the full range and center ASTM Class 5 tolerances between the new ASTM Class 6 and current ASTM Class 4 tolerances, to make an approximate 2:1 relationship. The approval vote of these changes is scheduled to go out for ballot after disputes and justification of the changes are resolved within the ASTM E41 committee. OWM hopes that the ballot will go out for vote soon. ASTM members are encouraged to place their vote once the ballot is released.

- NIST Handbook 105-1 (1990) directed Metrology laboratories to use lead as a filler/adjustment material for Class F weights:
  "6.2. The sealing cap shall be of soft, noncorrosive material so that it can easily be removed when adjusting a weight. Lead sealing caps are recommended for weights larger than 5 kg/10 lb. Aluminum is recommended for smaller weights. For weights above 50 kg/100 lb the sealing cap shall be at least 1/8 inch thick."
  7.1. Any metal in the form of shot or solid, may be used to adjust weights. Lead is preferred. Molten, poured metal is not acceptable. A grit size of 32 or larger is permitted for adjusting material."
  However, the ASTM E617 standard directs laboratories to adjust weights with the same material they are made of or with material as stable and of similar density as the base material (see section 5.8.2). Laboratories should consider using other filler material than lead or make sure the lead is not oxidizing and gaining weight at a quicker rate than the weight being adjusted, as was found to occur with lead of large grit size (i.e., the grit size of powder). Larger diameter shot are preferred because of the smaller ratio of surface area to mass that results.

- Laboratory Master Documents, Reference lists, and calibration certificates must correctly reference the documentary standards. All Class F weights in current service must clearly reference the NIST Handbook 105-1 (1990). New standards will need to reference the 2019 version. As such, both documents will need to be retained on laboratory reference lists. ASTM and OIML classes should reference the applicable title and year of publication for those documentary standards as well. It is especially important to note applicable dates of the documentary standards because tolerances have changed and as they become more standardized and change further, it is important to provide a distinction for all users of the calibration certificates.

Laboratories are reminded to never attempt to reclassify weights as emphasized in Handbook 105-1. This should be left for the manufactures to determine due to the complexity of the process. In addition, laboratories should continue to interpolate between nominal masses to determine intermediate tolerances when they are not assigned. For additional questions or concerns, please contact the OWM Laboratory Metrology Program (**micheal.hicks@nist.gov**).

NIST Handbooks 44, 130, and 133 and NCWM Annual Reports

Byline: Lisa Warfield

The NIST Office of Weights and Measures is not publishing 2021 editions of NIST Handbooks 44, 130, and 133 due to the postponement of the 2020 NCWM Annual Meeting. The 2022 versions of the Handbooks are expected to be available in the normal publication cycle at the end of calendar year 2021. These Handbooks are available free of charge from NIST at **www.nist.gov/pml/weights-and-measures/publications/nist-handbooks/other-nist-handbooks/other-nist-handbooks-2.** NCWM members receive hard copies of the NIST Handbooks as part of their membership fee.

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 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, contact NIST OWM at (301) 975-4004 or **owm@nist.gov**.

Calendar of Events

OWM Training Events

Date	Time (Eastern Time Zone)	Event Name	Online or Location	Class
April 14, 2021	11:00 a.m. to 1:00 p.m.	NIST Handbook 130 - Examination Procedure for Price Verification	Online webinar	5731
April 15, 2021	11:00 a.m. to 1:00 p.m.	NIST Handbook 130 - Overview of the Uniform Packaging and Labeling Regulation	Online webinar	5732
April 19, 2021	11:00 a.m. to 1:30 p.m.	NIST Handbook 133 - Overview of Handbook 133	Online webinar	5733
April 22, 2021	11:00 a.m. to 1:30 p.m.	Weights and Measures Inspections - Evidence, Search and Seizure, and Due Process	Online webinar	5734
April 28, 2021	11:00 a.m. to 1:00 p.m.	NIST Handbook 133 - How to Test Animal Bedding	Online webinar	5735
May 3 to 6, 2021	1:00 p.m. to 5:00 p.m.	Western Regional Assurance Program (WRAP)	Online webinar	5703
May 11 to June 3, 2021	12:00 p.m. to 4:00 p.m.	Fundamentals and LAP Problems Preparation - Summer	Online webinar	5730
May 20, 2021	2:00 p.m. to 4:00 p.m.	Basic Uncertainty Concepts	Online webinar	5710
June 10 and 24, 2021	2:00 p.m. to 4:00 p.m.	Software Validation and Verification	Online webinar	5709
July 1, 2021	2:00 p.m. to 4:00 p.m.	State Laboratory Annual Submission Process	Online webinar	5720
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 2, 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 April 1, 2021. Please refer to the OWM website for the most recent listing ***www.nist.gov/pml/weights-and-measures/about-owm/calendar-events****.*

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Calendar of Events

Meetings

NCWM and Regional Associations			
May 10 to 13, 2021	Wisconsin Dells, WI	Central Weights and Measures Association (CWMA)	**www.cwma.net**
May 17 to 20, 2021	online	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 9 to 12, 2022	Tampa, FL	NCWM Interim Meeting	**www.ncwm.com**
July 10 to 14, 2022	Tacoma, WA	NCWM Annual Meeting	**www.ncwm.com**

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