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From the Chief

NCWM: Under New Management

By Carol Hockert

Beginning September 1st, the National Conference on Weights and Measures (NCWM) will be operating out of its new office in Lincoln, Nebraska. Congratulations to Don Onwiler, the new Executive Director of NCWM, and to Jim Truex, the new NTEP Administrator. Don has been busy preparing to take on management of NCWM by finding office space, hiring staff, and doing a myriad of other tasks to make the transition go smoothly. They've hired two additional staff: Shari Tretheway, Office Manager, and Lindsay Hier, Project Coordinator, and are anticipating with enthusiasm the challenges of the coming months. All of us at the NIST Weights and Measures Division are excited about the change and look forward to working with Don, Jim, Lindsay and Shari.

At the same time, Beth Palys and her staff at Management Solutions (MSP) have been working with Don and Jim to assure a smooth transition. We will miss Beth, Linda Bernetich, Steve Patoray, Grace Jan, and the others at MSP, and thank them for the many years of collaboration and friendship.

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WELCOME THE COOL DAYS OF FALL

U.S. National Work Group (USNWG) for the Development of Commercial Hydrogen Measurement Standards

By Juana Williams

The USNWG Subcommittees met on June 17 - 19, 2008, at the Gas Technology Institute (GTI), Des Plaines, Illinois. The Subcommittees' meeting summaries will be made available on the NIST WMD web site in the next few weeks at http://ts.nist.gov/WeightsAndMeausres/index.cfm, under "W&M Resources" – click on the link to "Developing Commercial Hydrogen Measurement Standards." This article includes a preliminary summary of the Subcommittees' June 2008 discussions.

USNWG Device Standards and Test Procedures Subcommittee (DSTPS)

The DSTPS conducted an in-depth review of the specification requirements in Draft 3.0 of the Hydrogen Gas Measuring Devices Code. The DSTPS modified several specification paragraphs primarily to clarify how those design requirements apply.

The DSTPS also identified requirements needing further research and/or discussion to ensure they are appropriate and/or properly address the gaseous hydrogen application. The draft code includes a requirement for a non-resettable totalizer similar to those in NIST Handbook 44 Codes that apply to motor-fuel dispenser applications. However, equipment manufacturers questioned where to derive quantity values to achieve agreement between the totalizer and dispenser indications. The DSTPS discussed marking requirements for the "minimum measured quantity," (MMQ) which are a part of international requirements for all meter technologies and a NIST Handbook 44 requirement for mass flow meter technology. The MMQ is used to determine the limits for other requirements in international standards. Consequently, the DSTPS is looking for the best technical approach to include MMQ requirements in the draft code. The design of some refueling systems for pressurization of the hose and high pressure deliveries may affect the control of the flow rate during test. Also in question is whether or not to permit the venting of product from the standard after a test of the refueling equipment in highly industrial areas.

The location of USNWG meetings is somewhat driven by the technical tasks before the subcommittees. To date, these sites have provided the USNWG with opportunities to observe various types of device manufacturers' equipment. At GTI, the DSTPS observed the operation of a Greenfield Compression, Inc. hydrogen refueling dispenser and the associated test standard that uses the gravimetric test method to verify the system's performance.

With regard to accuracy requirements, the DSTPS is requesting performance data to demonstrate whether or not the proposed 1.5 % accuracy tolerance requirement in the draft code is appropriate.

The California Division of Measurement Standards reported on its observation of the set up and operation of a mobile station test apparatus that uses the gravimetric test method for determining the accuracy of hydrogen delivery. As a result of their report, a number of issues were raised about the procedure from a metrological standpoint (uncertainties, repeatability, etc.), which will be discussed by the USNWG.

Since the next steps for the DSTPS will be to develop test procedures, Diane Lee (NIST WMD) will request stakeholders such as OEMs, R&D laboratories, international standards developing organizations, etc. provide information on current test procedures/equipment.

USNWG Fuel Specifications Subcommittee (FSS)

Since its March 2008 meeting, the FSS has reviewed draft method of sale and fuel quality requirements. Ken Butcher, the FSS Technical Advisor, developed "The Starting Point: A Discussion Paper Describing a Proposed Method of Sale and Quality Specification for Hydrogen Vehicle Fuel." The background and discussions covered in the paper lay the foundation for the FSS to agree upon the correct usage of units of measurement and a starting point for a fuel quality standard. The FSS will conduct an in-depth review of the paper to determine the appropriate units for pressure and other relevant units of measurement, and reference standards for fuel quality.

At its next meeting the FSS will discuss whether or not the interim California Department of Food and Agriculture Fuel Specification should be the basis for its work on the fuel quality standard. The FSS will consider NIST Special Publication (SP) 330 "The International System of Units (SI)" and NIST SP 811 "Guide for the Use of the International System of Units (SI)" as the source for uniform implementation of SI units. Given the importance of SI units in science and technology the 2008 editions of the SPs provide guidance on international and U.S. conventions for SI units.

Currently, the operating pressures for many hydrogen refueling dispensers are marked in "bar" units. Since 1982 one bar has been used as the standard pressure for tabulating all thermodynamic data. The bar is expressed as a unit of pressure (in SI units, 1 bar = 0.1 megapascal (MPa)) or force divided by area. The FSS must agree on a conversion value when the bar value is derived from U.S. Customary units (psi). U.S. weather watchers will recognize the unit "millibar" from meteorological reports on the atmospheric air pressures in hurricanes (the lower the millibar value the more severe the storm). It is permissible to use the bar, a non-SI unit, where its use is part of an established practice. The bar is widely used in industry. However, the SI unit should be used first and

then followed by the bar value.

The FSS also discussed sampling procedures for hydrogen fuel quality. The FSS questions the ability of field officials to obtain samples from systems that operate at 700 bar pressure (approximately 10 000 psi). The California Division of Measurement Standards reported on the set up and operation of a hydrogen quality sampling apparatus it took possession of in March 2008. Questions were raised about the level of training necessary to properly use of the equipment under field conditions and advancements in technology that make equipment readily available that is capable of detecting contaminants/particulates at the levels specified in the interim standard.

More details are available on these topics in the discussion paper which is posted on the NIST WMD web site at http://ts.nist.gov/WeightsAndMeasures/index.cfm. Look for the link to "Developing Commercial Hydrogen Measurement Standards" under W&M Resources.

As this article goes to publication, the USNWG will have met August 26 – 27, 2008, in Allentown, Pennsylvania. The USNWG will be submitting a request to the 2009 NCWM Specifications and Tolerances and Laws and Regulations Committees to include an item on those Committees' Developing Items Agendas to make the weights and measures community aware of upcoming proposals to change NIST Handbook 44 and NIST Handbook 130 requirements to address hydrogen refueling applications. If you have questions about the USNWG or are interested in participating in the ongoing work to develop commercial hydrogen measurement standards please contact Juana Williams by e-mail at juana.williams@nist.gov or by telephone at 301-975-3989.

Specifications, Tolerances, Calibrations, OH MY!

Proposed NIST Handbook 44 Requirements for Tare – Part 1, Background

By Steven Cook

If you have been following the agendas and reports of the NCWM S&T Committee agenda over the past two years on the subject of "tare," you likely are aware that there are several proposals to amend existing requirements, and to add new requirements, terms, and definitions for tare. These recommendations are applicable to both the Scales Code and Automatic Weighing Systems Code.

This is the first in a series of three articles (the first two parts appear in this edition of *W&M Quarterly*) to assist readers in analyzing the proposals by reviewing the background information, proposed definitions, existing type evaluation checklist procedures and requirements, and international differences and similarities. This article will discuss the reasons the NTETC Weighing Sector developed the proposals.

As early as 1986, the NTETC Weighing Sector developed criteria used to evaluate tare features on weighing devices in NCWM Publication 14, *Weighing Devices, Measuring Devices, Grain Analyzers, and NTEP Administrative Policy*. The evaluation criteria were based on General Code paragraph G-S.2. Facilitation of Fraud and other requirements that apply to indicating and recording elements and recorded representations and the policies, interpretations, and guidelines on tare design and applications in NCWM Publication 3 (no longer published) SECTION 3 - 3.2.11., Jan. 87 Specifications, Tolerances, and Device Inspection.

NTEP laboratories have since stated that it has become increasingly difficult to base compliance decisions solely on paragraph G-S.2. because the general nature of the language results in multiple interpretations. To compound the problem of multiple interpretations of tare, Publication 14 is not widely available to the weights and measures community. In addition, only a limited number of weights and measures officials, device manufacturers, and device owners and operators are regular participants in Weighing Sector meetings where tare evaluation criteria are developed and discussed. It is difficult for parties responsible for the design, use, and test of the tare feature to interpret and apply technical requirements published in Publication 14. This results in differing interpretations of NIST Handbook 44, *Specifications Tolerances, and Other Technical Requirements for Weighing and Measuring Devices* (HB 44), requirements and Publication 14 evaluations.

One example of conflicting interpretations included disagreements among the NTEP laboratories about how to round indicated and recorded tare values on multi-interval and multiple range scales where the tare weight was in a different weighing range or segment than the net weight value. Some believed that the scale should always round tare to the nearest division since General Code paragraph G-S.5.2.2.(c) Digital Indication and Representation states that a digital value "rounds off" to the nearest minimum unit that can be indicated or recorded. Others stated that when tare is rounded down (to the lower division), the scale will subtract too little tare, and will indicate and print a net weight that is higher than the actual net weight, which is in violation of the Uniform Weights and Measures Law Section 15. Misrepresentation of Quantity in Handbook 130, *Uniform Laws and Regulations in the areas of legal metrology and engine fuel quality (HB 130)*.

At the 2006 Weighing Sector meeting, a Tare Work Group (WG) was formed to review existing tare requirements and, among other things, develop recommendations for changes to HB 44. The WG was also asked to provide guidance to the Weighing Sector on type evaluation requirements relating to tare.

As a result of its deliberations, the WG developed proposals to amend HB 44 requirements to:

1. ensure that a tare feature operates in a manner that increases the accuracy of net weight determinations,
2. clearly state what information and values are permitted and required for indicated and recorded representations of net weight and tare weight, and
3. identify the types of tare weight values (e.g., semiautomatic and stored) determined at the time objects are weighed or when tare weight values are determined prior to the time objects are weighed.

The WG reviewed existing tare requirements and terminology (including dictionary definitions), previous discussions of tare in the NCWM Annual Reports, and other international recommendations for automatic and nonautomatic weighing devices that were under revision. This gave the WG and WMD an opportunity to offer suggested changes to the international recommendations on tare and to request clarifications, examples, and interpretations on other existing international tare requirements, rounding, and net weight calculations for multi-interval and multiple range scales. The WMD and the WG did receive several of the requests for clarifications and were successful in getting the U.S. recommendations adopted into the international standards.

It should be noted that most of the WG recommendations do not conflict with existing or revised recommendations on tare. However, the WG developed a proposal that was adopted at the 2008 NCWM Annual Meeting to allow an exception for multi-interval and multiple range scales regarding the calculation of net weight based on the indications and recorded representations. The new language in 2.20. Scales Code (HB 44) paragraph S.1.2.1. Weight Units allows multi-interval and multiple range scales to not round tare if the net weight value is in a different weighing range or segment. As a result, net weights (calculated as the difference between gross and tare weights) will be more accurate since tare is not rounded to a higher or lower division value. OIML R 76 allows a 1-division error in the calculation of net as on a multiple range scale as shown in the following example (PT is the proposed abbreviation for "Preset tare," which covers pushbutton, semiautomatic, keyboard and stored tare, and WR is the abbreviation for weighing range):

Capacity: WR1 = 0 - 4 kg x 2 g
WR2 = 4 - 10 kg x 5 g
WR3 = 10 - 20 kg x 10 g

	OIML R76	Pub 14 (08)	H44 (09)
	Displayed/Printed		
Gross	13.380 kg	13.380 kg	13.380 kg
PT	-3.814 kg	-3.810 kg*	-3.814 kg
Net	9.565 kg	9.570 kg	9.566 kg

**3.814 rounded to the nearest d for WR3*

As you can see in the OIML example, net does not equal gross minus tare (Net ≠ Gross – Tare) since the net weight value has been rounded to the nearest division in WR2. Prior to the adoption of this requirement, Publication 14 required that tare values be rounded to the division size of the WR for the gross weight so that the scale division was the same for gross, net, and tare weight values. In order for the net weight equation to be mathematically correct (Net = Gross – tare), both the tare and net weights must be rounded to a larger division size when tare was determined in a lower weighing range in order.

The proposals being considered by the S&T may, if adopted, be used to address some of the issues of the stored vehicle tare concerns raised in discussions on the accuracy and suitability of devices that store tare values in vehicle weighing applications. The proposal would require stored tare weights to be identified on a printed ticket thereby making it easier to determine whether the tare values are the result of a weighment at the time the gross weight was determined or that the tare has been electronically stored in memory or manually entered.

This is a brief summary of the background information for the item on tare in the S&T Committee agenda. You may review the 2005 to 2007 reports of the Weighing Sector for additional background information and reports from the Tare WG. The next article in the series will discuss the proposed revised definition of tare mechanism and many of the new definitions that may not be familiar to the reader such as "calculated net weights," "tare-balancing," "tare-weighing," and "preset tare" including "percentage" and "proportional" tare. The final article in this series will discuss the proposed new and amended HB 44 language relating to the specifications for tare and preset tare. You may contact Steve Cook by phone at 301-975-4003 by phone or by e-mail at owm@nist.gov if you have additional questions about this article.

Proposed NIST Handbook 44 Requirements for Tare – Part 2, Terminology and Definitions

By Steven Cook

This article is the second in a series of three articles on the discussion of the proposals to amend and add tare requirements in Handbook 44, *Specifications, Tolerances, and Other Technical Requirements for Weighing and Measuring Devices* (HB 44). This article will address the revised definition of tare mechanism and many of the new definitions that may not be familiar to the reader including "tare-balancing," "tare-weighing," and "preset tare" including "percentage" and "proportional" tare. The Tare Work Group (WG), established in 2006 by the NTETC Weighing Sector, believes that the definitions are necessary to facilitate an understanding of the terms and promote con-

sistent and uniform interpretation of the amended and proposed tare requirements.

The WG has recommended amending the following definition for "tare mechanism" by introducing the terms tare- balancing and tare-weighing, and providing additional notes describing how tare may or may not increase the weighing range of a device as follows:

tare mechanism. A tare-*balancing* or tare-*weighing* mechanism (including a tare bar) designed for determining or balancing out the weight of packaging material, containers, vehicles, or other materials that are not intended to be included in net weight determinations and for setting the net indication to zero when the tare object is on the load-receiving element (See also "preset tare," "tare-*weighing* mechanism," and "tare-*balancing* mechanism").

Notes:

1. Reducing the weighing range for net loads is known as subtractive tare (e.g., Net Weight +≤ Gross Weight Capacity).

2. Increasing the weighing range for gross loads without altering the weighing range for net loads on mechanical scales is known as additive tare (e.g., a tare bar on a mechanical scale with a beam indicator where Net Weight + Tare Weight ≥ Gross Weight Capacity).

Also included in the proposed amendment to the definition for "tare mechanism" are the following descriptions of the various ways a "tare mechanism" can operates as follows:

- A manual adjustment of a physical balancing mechanism or electronic adjustment of an electronic scale is defined as a "non-automatic tare mechanism." For example, sliding a poise on a beam scale, adding a counterbalance weight on a balance, or turning a potentiometer on an electronic scale with the purpose to set the scale indication or balance position of a pointer to zero.

- A single operation to initiate the setting or balancing the tare to achieve a zero net indication is defined as a semi-automatic tare mechanism which is also know as a pushbutton tare. For example, pressing a "TARE" button on an electronic scale will change the indication of weight value in the gross indicating mode to a zero indication in the net indicating mode and if equipped with a separate tare weight display, display the weight of the tare object.

- A programmed sequence of operations that set the tare to achieve a zero net indication without intervention by the operator is defined as an "automatic tare mechanism." Note that the proposed definition for automatic tare is limited to indirect sales to the customer. For example, a prepackaging scale with automatic tare enabled can be programmed to automatically balance or tare off the first weight placed on the load-receiving element (LRE). Net weight is determined by either a change in weight (product added to the container) or the second weight placed on the LRE (tare container removed from the scale, then filled with the product and placed back on to the LRE).

You will note that the proposed amendment includes a description of the terms subtractive and additive tare. The intent of the amendments is to clarify that the effect of a tare bar or poise on a mechanical scale can increase the gross nominal capacity of some mechanical scales since the net capacity is not reduced. The WG reviewed the existing HB 44 definition of "nominal capacity" to confirm that the amended language did not conflict with the existing definition. There are very few examples for this type of additive tare; examples include scales with un-graduated tare bars in which the tare capacity of mechanical scales with un-graduated (fractional) tare bars are limited to 2 ½ % of the sum of the capacities of the remaining reading elements.

The WG also agreed that the definition for "net weight" from NIST Handbook 130, *Uniform Laws and Regulations in the area of legal metrology and engine fuel quality* (HB 130) should be repeated in HB 44. The WG also developed a proposed definition for "tare" based on language included in the definition of "net weight" in HB 130. The proposed new definitions for the terms "net weight value," "tare weight value," and "gross weight value" are fairly straightforward and are consistent with similar terms in OIML 76 and R 51 international recommendations. The new proposed definitions for "tare-balancing mechanism," "tare weighing-mechanism," "preset tare," and "preset tare mechanism" described in the following paragraphs are based on NCWM Publication 3 guidelines and interpretations, OIML R 76, and OIML R 51 and are consistent with NCWM Publication 14, *Weighing Devices, Measuring Devices, Grain Analyzers, and NTEP Administrative Policy,* performance requirements for tare.

The "tare-*balancing*" and "tare-*weighing*" definitions have been recommended to help define these tare mechanisms as a metrological or weighing function of the scale. In using a "tare-*balancing* mechanism," the tare material has been actually placed on a scale and its weight is balanced-off to the internal resolution of an electronic scale. This is similar to a semiautomatic zero-setting mechanism found in most electronic scales. In a mechanical scale, the tare adjustment would be like adjusting the balance condition of the scale using only the zero-balancing mechanism (e.g., moving a poise on an un-graduated tare bar on a beam indicator or screw adjustment on a dial scale). In the case of a "tare-*weighing* mechanism," the tare material is actually weighed and its value is indicated as a separate tare weight indication on a digital display or by reading the scale graduation marks on a graduated tare bar on a beam indicator or dial indication. The main difference between these two types of tare is that the quantity of tare material becomes a known value with a "tare-*weighing* mechanism." The similarities with these mecha-

nisms are that tare is determined at the time of the transaction and only used once. As a result, accurate net weights are consistently achieved since there is little or no chance for the tare to change during the transaction. "Tare-*balancing*" and "tare-*weighing*" mechanisms are also considered as metrological or the "property of the result of a measurement" (defined by the International Bureau of Weights and Measures - BIPM). Additionally, a (metrological) tare from a "tare-*weighing*" mechanismbecomes a "preset tare" value when the tare value is stored in memory or is documented on a ticket, label, etc. and is used in the determination of net weight in subsequent or for multiple weighments. The following paragraphs provide examples for the types of preset tares.

The proposed definition for "preset tare" states the following:

> **preset tare.** A numerical value, representing a weight that is entered into a weighing device (e.g., keyboard, recalled from stored data, or entered through an interface) and is intended to be applied to weighings without determining individual tares.
>
> Types of preset tare mechanisms include:
> - keyboard tare. . .
> - digital tare. . .
> - programmable tare. . .
> - stored tare. . .
> - percentage tare. . .
> - proportional tare. . .

Because the previous definitions for "tare-*balancing*" and "tare-*weighing*" are directed to metrological values, the WG believed it necessary to include definitions for non-metrological (numerical) tare values that are used in net weight determinations. Examples on non-metrological tare include manually entering tare through a numeric keypad, which is frequently called "keyboard tare," or entering numerical values as a tare that is recalled from stored data on a scale, separable indicating element, or other software-based devices interfaced with a weighing system. The tares may be used for multiple net weight determinations. It has long been recognized that there are disadvantages to the use of this type of tare since the weight of the actual tare material may change or be different than the numerical value entered as tare; thus leading to errors in the tare values and uncertainties in the process. "Preset tare" inaccuracies and uncertainties are well documented in package checking programs and were highlighted in the conclusion of the 2005 - 2006 National Stored Tare Vehicle Study. The conclusion and additional background information on the study can be found on the NIST WMD web site (http://ts.nist.gov/WeightsAndMeasures/index.cfm) in the link to the National Stored Tare Vehicle Study and in two newsletter articles located in the Weights and Measures Quarterly Newsletter Archive (F19 and F20).

In the United States, "preset tares" are known under various names such as "keyboard tare," "digital tare," "programmable tare," "percentage tare," and "proportional tare" and depending on the term, indicative of the way the preset tare is entered into a net weight determination. Thumbwheel tare is also considered a preset tare but was not included in the proposed definition since the WG believed that there are very few, if any, devices using thumbwheel tare remaining in commercial field applications. The proposed definition for "preset tare" includes the descriptions of these "subtypes" of preset tare. Most of the "subtypes" of preset tare are fairly common in the marketplace. However, the terms "percentage tare" and "proportional tare" are fairly recent additions to the marketplace and are briefly described in the following paragraphs. It should also be noted that the terms "percentage tare" and "proportional tare" are not addressed in OIML recommendations. Therefore, WMD, NTEP, and Measurement Canada worked cooperatively to develop these terms, definitions, and applicable test procedures for type evaluation as part of the U.S./Canada Mutual Recognition Agreement.

A "percentage tare" is a type of "preset tare" where the tare for wrapped items for sale from bulk is a value, expressed as a percentage (i.e., 5.6 %), that represents the percentage of tare material compared to the gross or net weight of the commodity. The first example of percentage tare was an application where wrapped piece candy, such as salt water taffy, was weighed on a customer-operated computing scale. The customer would fill a bag with the candy and place the bag on the scale platform. The scale was preprogrammed with a unit price, a stored tare weight for the bag and a percentage factor related to the amount and type of wrapping material on the specific amount of candy. The program subtracted the preprogrammed weight of the empty bag and then multiplied the remaining weight of the candy, less the weight of the bag, by a percentage to obtain the net weight of the candy without the wrapping around each piece. Assuming the scale was programmed with the correct bag weigh and percentage value, the customer received the correct net weight of piece candy purchased. (Note: This is also an example of a consecutive tare transaction, which will be discussed in the next article in this series.).

"Proportional tare" is a value, automatically calculated by the scale, proportional to the gross weight indicated by the scale. A proportional tare can be a percentage tare or a fixed tare value proportional to a range of gross weights (i.e., a 10 g tare for gross weights between 0 and 2 kg, a 20 g tare for gross weights between 2 and 4 kg, etc.). A proportional tare is, therefore, not limited to being a percentage tare. Applications where a "proportional tare" might be used include automatic weighing systems where pre-wrapped poultry carcasses will have different percentage tare factors since larger carcasses will require more wrapping than smaller carcasses. Since the unwrapped carcasses have random weights, the packager will establish an appropriate "percentage tare" factor for a number of weight ranges to reduce the number of "percentage tare" factors that must be programmed into the weighing system. Hopefully, the

operator should be aware that the "percentage tare" for the weight range should be adequate for the heaviest carcass in the weight range.

This has been a brief discussion of the proposed definitions for Tare Mechanism, Gross Weight Value, Net Weight, Net Weight Value, Tare, Tare Weight Value, and Preset Tare. As stated earlier, the intent of the proposed definitions is to promote a consistent understanding of tare terminology and the uniform application of tare requirements in HB 44. The final article in this series will discuss the proposed new and amended HB 44 language relating to the specifications for tare and preset tare. You may contact Steve Cook by phone at 301-975-4003 by phone or by e-mail at owm@nist.gov if you have additional questions about this article.

Grain Moisture Meters

Grain Preparation, Maintenance and Storage of Grain Transfer Standards, Equipment and Apparatus, and Field Test Procedures

Grain Moisture Meter (GMM) Series Part 4

By G. Diane Lee

The most widely used test method for the inspection and testing of GMMs in the United States is the use of grain as a transfer standard. Unlike other commercial devices, these transfer standards are biological samples that require preparation and care to maintain. There are various types of equipment and apparatus needed to test GMMs, including storage and transport containers, temperature measuring devices, and refrigeration equipment. This article, which is the fourth in a series of six articles on Grain Moisture Meters, addresses grain preparation prior to field testing; maintenance and storage of grain transfer standards for field-testing; the equipment and apparatus needed to test grain moisture meters and field test procedures.

The reader is encouraged to review previous articles in this series, including Part 1 "Overview of GMM Series Topics," Part 2 "Economic Impact of Grain Moisture Meters," and Part 3 "Grain Moisture Meter Measurement Technology". The reader is also encouraged to review the May 2004 Weights and Measures Newsletter article for an overview of the process for testing GMMs. These articles can be found on the NIST WMD's web site at www.nist.gov/owm by selecting "Weights and Measures Quarterly Newsletter Articles" which is located under "Publications," and then selecting "Grain Moisture Meter/NIR."

Grain Preparation for Field Testing

The transfer standards used to test GMMs are grain samples. Samples of grain, which are typically purchased or sold within the State's Weights and Measures jurisdiction, are collected from various farms and elevators. "low" and "high" moisture samples of each grain type are collected. The laboratory staff cleans, labels, and stores the grain for laboratory testing. Laboratory testing is performed to determine which grain samples will be appropriate for use as a transfer standard. GIPSA air-oven test procedures are used to determine the official moisture value of the grain sample. After the official moisture of the grain is determined using the air-oven test method, the moisture of the grain sample is also determined on grain moisture meters in the laboratory. These laboratory meters, which include the same make and models as are used in commercial applications, are maintained in good operating condition, serviced as needed, and contain the most current meter calibrations. The laboratory maintains a meter type of each commercial grain moisture meter within the weights and measures jurisdiction. The difference between the air-oven moisture value and meter moisture value of the grain sample is calculated. If this difference exceeds 0.5% for a particular sample, that sample is considered an "outlier" for that specific meter, and that grain sample should not be used as a transfer standard for testing that specific moisture meter. Such samples are considered "outliers" for these meters because they may not provide an accurate moisture reading when used to test these meters. Outliers may exist because a particular variety of and/or growing seasonal change in a grain sample may not be represented in the pool of grain samples that were used to develop the calibration for the moisture meter. Non-NTEP meters may be more readily affected by outliers because the calibrations for these devices may not be based on a pool of samples that represent grains from across the United States. The calibration of NTEP meters are based on a national sample set of grains from the United States. Grain samples in the national sample set are annually collected using samples that are submitted on a voluntary basis from various States. The national sample set also includes grains that are collected by the NTEP laboratory from various locations within the United States. Along with the current-crop-year's grain moisture data, the national sample set data also includes the previous two years of grain data, for a total of 3 years of grain moisture data. Although less-frequently occurring in NTEP meters than in non-NTEP meters, outliers may still exist. This is because grains in the national sample set, which are used to develop the meter calibrations, may not include every type and variety of grain available across the country. As mentioned in previous articles, it is for this reason that NIST Weights and Measures Division encourages States to participate in the annual collection of grain that will be used in the pool of samples for the national grain sample set.

Maintenance and Storage of Field Grain Transfer Standards

A set of transfer standards may contain three or more 1-quart or 1-pint jars of each grain type that is representative of the grains

grown and sold in a weights and measures jurisdiction at a "high" and "low" moisture for each grain type. Some NTEP meters will need samples of about one quart and Non-NTEP meters will need samples of about one pint for testing. Since both NTEP and non-NTEP meters are typically present in a weights and measures jurisdiction, many laboratories will prepare a transfer standard set with one-quart sample jars so that both NTEP and non-NTEP meters can be tested with the same transfer standard set.

One of the transfer standards for each grain type and moisture level will serve as a back-up standard. The back-up standard is not opened or dropped as often as the other grain transfer standards. Since the back-up standard is use less frequently, it will serve as verification for the grain transfer standard in use. If it is suspected that a particular transfer standard may not be accurate or if a device fails the initial test, the back-up standard can be used to verify the test results.

The grain should be stored in glass containers (see picture of transfer standard storage containers below). The use of tinted glass containers can reduce the effects of environmental conditions on the grain sample. Each one-quart or one-pint sample is labeled with the official air-oven moisture percentage and weight per bushel, grain type, sample identification, and space to record the number of times the sample was opened, warmed and dropped. Drops are when the sample is placed in and run through the meter for testing. Because grain transfer standards are biological samples that will change over time, the use of this transfer standard is limited in the number of times it can be used. Some state studies show that the moisture level of grain samples may begin to change after 18 drops for high moisture (over 18 %) corn and soybeans or 24 drops for other grain types and moistures. Therefore, it is recommended that grain transfer standards should not be used for more than the number of drops noted above, unless your jurisdiction has data to show that the number of drops may be increased without affecting the integrity of the sample. Once an inspector begins using a sample to test meters, time may also become a factor in monitoring the integrity of the grain sample.

The grain transfer standards are to be stored in a refrigerator and maintained at 2 ºC (35 °F) to 4 °C (40 °F) until needed (see "Equipment and Testing Apparatus" section in this article). Approximately two hours before use (consider travel time in this two-hour period), the grain transfer standards that will be used for testing that day should be removed from the refrigerator and gently shaken several times (for homogeneity) and placed in a transport cooler (see "Equipment and Testing Apparatus" section in this article) WITHOUT ICE. This will allow them to stabilize to ambient temperature without undergoing temperature extremes. The samples should be spread out to allow the air to move freely about them. Upon arrival at the test site, take the cooler containing the grain transfer standards into the room where the moisture meter is located, and remove the grain transfer standards from the transport cooler. Then, place them in racks near the moisture meter to allow them to equilibrate to room temperature (to within -12 ºC (10 ºF) of the room temperature) before the jar is opened. To verify that the sample has reached the appropriate temperature, the temperature of the grain sample should be taken with the least amount of exposure to the environment. One method is to replace the lid on the sample with a holed rubber stopper or with a holed lid so that a thermometer can be inserted into the sample. Another method is to use a separate container with a holed lid or holed rubber stopper.

1-quart and 1-pint Transfer standard storage containers with label.

Equipment, Apparatus and Documentation

From Top Right – Portable refrigerators; Digital thermometer; Coolers, Documentation and Grain transfer standards; Rack; and Liquid-in-glass thermometers.

Appropriate test equipment, apparatus, and documentation is needed to test grain moisture meters. A general description of the equipment used to test these devices are as follows:

Certified digital thermometer or *certified liquid-in-glass thermometer* - A certified digital thermometer or certified liquid-in-glass thermometer that meet NIST HB 105-6 requirements is used to monitor the refrigerator and grain sample temperatures.

Cooler – A cooler of adequate size is used in tempering the official grain samples (Note: Grain samples must not be stored on ice).

Portable refrigerator – A portable refrigerator is used for transporting and maintaining the condition of the sam-

ples; a connection to an energy source is needed to maintain refrigerant conditions when transporting the samples from location to location (e.g. some portable refrigerators may be attached to the cigarette lighter in a motor vehicle).

Racks – Racks are used to carry standard grain samples from meter to meter during testing.

Jar lid with a hole or *rubber stopper with a hole* – A Jar lid with a hole or rubber stopper with a hole is needed to measure the temperature of the grain to determine if the grain sample temperature is appropriate before using the sample to test the meter.

Additional containers may be needed to safely carry any hand tools and mercury-in-glass thermometers.

Documentation - The documentation needed during meter testing includes weights and measures jurisdictional policy and inspection procedures, moisture meter operating instructions, current Certificates of Conformance, and a list of moisture meters within the jurisdiction and the locations, type of meter(s), and type(s) of grain purchased by establishments in the jurisdictions.

Field Test Procedures

The following is an overview of the field test procedures for inspecting and testing a grain moisture meter. For additional information please review NIST HB 44 Section 5.56b.

Prior to testing a grain moisture meter, verify that the meter is functioning properly, check to make sure all moving parts are moving smoothly and correctly, ensure that all displays are indicating properly, and ensure that there are no broken parts on the meter. Proceed with inspecting the meter in accordance with NIST HB 44, Sections 5.56(a) for NTEP meters and 5.56(b) for non-NTEP meters prior to and during testing as appropriate. The following are step-by-step procedures for testing a grain moisture meter for accuracy.

1. Follow the meter operating instructions and select the grain type to be tested on the GMM.
2. Fill the grain hopper with the grain transfer standard which represents the grain type that was selected on the GMM, starting with the high moisture sample first.
3. Drop the grain through the meter and record the results. Repeat the test for a total of three moisture readings.
4. Repeat step 3 with the other meters at the location in assembly-line fashion as quickly as possible with the same grain transfer standard.
5. Return the sample to its original clean jar, seal the jar with the lid, mark the jar with the number of drops and return the jar to the cooler.
6. Analyze the test results only after the selected grain type and selected corresponding grain transfer standard at the selected moisture level are tested in all the meters at the device location and the sample has been resealed and returned to the cooler.
7. Average the three moisture readings for each meter and compare each of the results with the official transfer standard moisture and determine the error, then compare the results with the applicable tolerance.
8. If the meter is in tolerance, proceed to the lower moisture transfer standard of that grain and repeat steps 1 through 7.
9. If the meter is not in tolerance repeat steps 1 through 7 with the back-up sample for that meter. If the results from the back-up sample agree with the results from the primary sample, record the results and return the back-up sample to the cooler and continue to use the primary sample as the standard.
10. If the results from the back-up sample are different, return the primary sample to the portable refrigerator for return to the laboratory. Use the back-up sample as the primary from then on.
11. Repeat steps 1 through 10 for each grain and each moisture level.
12. If appropriate, test the test weight per volume (e.g., test weight per bushel) indications with at least the lowest moisture sample. To do this, drop the lowest moisture sample through the meter 3 times and record the results. **Note:** Evaluation of the test weight per bushel indications can be performed while testing the moisture indications or weights and measures jurisdictions may choose to use a separate low moisture sample to test the test weight accuracy.
13. Compare the meter results with the official weight per volume of the transfer standard then compare the results with the applicable tolerance for meter test weight per bushel.
14. As appropriate, follow the NTEP certificate "Field Inspection Notes" and review the audit trail of the GMM device for compliance with NIST HB 44.
15. Complete the report form and explain the results to the device owner.
16. As you are conducting the tests, mark each sample label with the number of times each sample is dropped and the number of times the sample was warmed and verify that the seals of the jars are tight before returning the samples to storage.
17. Return the samples to the portable refrigerator as soon as testing is completed for the day.
18. When a sample reaches 18 drops for corn and soybeans above 18% or 24 drops for all other grain types or moistures, or a greater number of drops, as specified by the jurisdiction, (specified by the jurisdictions based on data that shows that the number of drops can be increased without affecting the integrity of the grain sample), the sample must be returned to the laboratory and retested.

Look for Part 5 in this series of articles on grain moisture meters, which will address the evaluation of grain moisture meters including a review of the evaluation procedure outline contained in the Grain Moisture Meter field manual.

Laboratory Metrology

NCSLI Legal Metrology Committee (134) Report from the 2008 NCSLI Workshop & Symposium

By Val Miller

The NCSLI Legal Metrology Committee had a very good 2008 NCSLI Workshop & Symposium in Orlando, Florida. One topic of note centered on staffing problems, which are becoming a major issue in the field of metrology. Due to the aging workforce, the number of available trained staff is decreasing at the same time that the importance of metrology is being recognized and available positions increasing. Also, impacting the number of available metrologists is the decrease in the number of individuals that are being trained in metrology by the U.S. military. Few colleges offer metrology training, which also creates an impact. Thus, management of state metrology laboratories is competing with industry laboratories for trained staff, and the states are typically at a disadvantage due to the lower pay scales that prevail in the state metrology laboratories.

Congratulations are extended to Dan Newcombe of the State of Maine Metrology Laboratory whose paper titled "A Measurement Standard for Evaluating Metrology Positions" was awarded Best Paper in the Education and Development Track at the 2008 NCSLI Workshop & Symposium. Dan's paper detailed his effort to have the positions in his laboratory correctly identified and evaluated for the technical knowledge and abilities required of metrologists. From his paper, "HR professionals commonly use methods known as *Comparable Worth Based Job Evaluation Systems*. This approach is similar to a Metrologist comparing an artifact to a standard when assigning a value to an unknown. This report describes the development and application of a method to evaluate a Metrologist's job using comparisons to occupations that Human Resource (HR) professionals are much more familiar with. Developing an evaluation tool that HR would find credible and reliable depended upon finding clear, reasonable "standards" from an independent and highly regarded source." Managers of all state laboratories will find Dan's paper very useful as they work with their individual human resources departments to properly classify and fill metrology positions in the current metrology marketplace. An electronic copy of the paper can be requested directly from Dan Newcombe (Danny.Newcombe@maine.gov, 207-287-7587).

NCSLI is co-sponsoring an effort to add metrology job classifications to the proposed U.S. Department of Labor 2010 Standard Occupational Classification (SOC) System. The three proposed job classifications were initially rejected by the Bureau of Labor Statistics because it was feared that the number of metrology professionals was too small to track. However, the coordinated efforts of NCSLI, co-sponsors, and U.S. stakeholders has resulted in more than 200 written responses addressing the rejection, making it much more likely that the metrology job classifications will be reconsidered.

On Monday evening, August 4, the Legal Metrology Committee hosted a Question and Answer session with Dr. Richard Davis, NCSLI Keynote Speaker who spoke earlier that day on the effort to redefine the kilogram in terms of a fundamental constant of nature. During the evening session, all questions presented regarding the redefinition of the kilogram were answered. This was an excellent session, as Dr. Davis was very open to discussion of issues related to the topic. A number of misconceptions were corrected, among them the idea that the new definition will result in high precision mass standards that are instantly out of tolerance due to a significant shift in the value of the kilogram. In fact, the new value will certainly be based on the current definition and the existing International Prototype Kilogram (IPK). It is true, however, that the IPK will acquire an uncertainty with respect to the new definition. Future experiments will result in refinement of that value but no large shifts should occur, provided that the process is managed carefully. Dr. Davis explained extensively the relationship of the various projects for redefinition of the kilogram and provided insight into the process that will be followed, up to final adoption of the new definition. Twenty individuals participated in the Q&A session.

On Wednesday, August 6, nineteen 134 Committee members met and viewed a presentation by Luis Omar Becerra, CENAM, on the new SIM (Sistema Interamericano de Metrologia [Inter-American Metrology System]) Guideline on the Calibration of Non-automatic Weighing Instruments, which was released earlier this year. This document is modeled after Euramet cg-18/v.01 and provides a nearly complete process for the traceable calibration of analytical balances and other weighing devices, including testing processes and uncertainty calculations. This guidance is most needed in industries that are not under the jurisdiction of local or state weights and measures regulations.

Other business conducted in the August 6 meeting included a review of issues with NIST Volume Field Standard Handbooks 105-3 and 105-4 that are used internationally and are undergoing review this year. Feedback was requested regarding the revisions and comments should be forwarded to Georgia Harris (georgia.harris@nist.gov) and Val Miller (val.miller@nist.gov) of NIST Weights and Measures Division.

Planning was conducted for the 2008 State Laboratory Program Workload Survey to be conducted early in 2009. Ken Fraley will once more head this effort with assistance from Van Hyder (NC) and Richard Gonzales (OK). The survey questionnaire will be sent to laboratories in February 2009 with the final report presented at the 2009 NCSLI Workshop & Symposium in San Antonio, Texas. This survey will be similar to the last survey with some refinements to the questions and the requested

data will be for only one year (2008).
Suggestions to make revisions to three survey questions follows:

1. Better identify the square footage used in state laboratory activities. Specifically, what square footage is used for office and storage spaces, and what square footage is actively used for calibration operations including artifact equilibration? This information, when coupled with a laboratory's Scope of Recognition, would provide survey readers with information that could be used in planning for new laboratory facilities.
2. Asking for the number of years until each staff member is eligible to retire, providing choices of zero to two years, two to five years, and more than five years. This information is intended to indicate retirement eligibility not when staff members are planning to retire. The gathered information will be used by Weights and Measured Division staff to plan training for possible replacement staff members. Based on the 2005-2006 State Laboratory Survey report, 25 % of state metrology staff members are expected to have more than 20 years of metrology experience by the time the 2008 Survey Questionnaire released. Approximately 12 % of the metrologist can be identified as having spent those 20 years in state service, and they are likely eligible to retire in five years or less. How these metrologists will be replaced is a matter of great concern.
3. Requesting that weights and measures programs identify their ability and/or willingness to accept calibration reports from ISO/IEC 17025 accredited industry calibration laboratories for field standards used in enforcement and registered service agent activities.

Steven Harrington (MN Metrology Laboratory) volunteered to serve as 134 Legal Metrology Committee co-chair. His offer was quickly accepted by the current Committee Chair and the process to add Steven's name to the NCSLI Committee Chair roster has been started.

It was encouraging to see a number of industry and international participants at the 2008 meetings of the NCSLI 134 Legal Metrology Committee. It is hoped that participation from these sectors of NCSLI membership will continue to grow as the 134 Committee matures. This broader participation directly lines up with the 134 Committee charter and strategic plan to become a clearinghouse for information to the International Legal Metrology community which includes measurement areas beyond Weights and Measures enforcement.

PLEASE NOTE

The *Weights & Measures Quarterly* is distributed only by e-mail and available online from the NIST Weights and Measures webpage at: http://www.nist.gov/owm. To update your contact information, e-mail WMD at owm@nist.gov or call (301) 975-4004.

. . . in the field

Ideas for Obtaining Retailer Compliance Through Education and Outreach

By David Sefcik

Weights and Measures officials play a key role in ensuring equity in the marketplace by promoting retailer compliance with laws and regulations related to legal metrology. They accomplish their mission primarily through inspection, education, and enforcement.

This newsletter will be focusing on the educational aspect and its value to both the officials and retailers. This article is written from the viewpoint of having had 25 years of retail food sector experience and is intended to provide some insight into the world of retail and offer some ideas on how weights and measures officials can be more effective.

First, officials have a wealth of knowledge and experience about the retail trade. Officials have seen both the successes and shortfalls of retail compliance programs. By sharing this knowledge, experience, and expertise with industry as an official inspects stores and meets with retailers, he or she can provide an invaluable service to his or her business community.

Second, with resources becoming increasingly limited, weights and measures programs are consequently being challenged and limited in their ability to make routine inspections to ensure compliance and equity in the marketplace. One tried and true approach in the field of weights and measures has been its historical effort to obtain voluntary compliance. Government, business, and consumers would benefit if new ways were found to help retailers become more self-compliant through a greater sense of self-responsibility and self-ownership.

Increasing efforts to obtain voluntary compliance does not minimize an official's need or ability to take enforcement action as deemed necessary but will help build a win-win relationship between industry, the consumer, and weights and measures officials by fostering compliance through outreach and education.

Below are areas for consideration that can be shared and discussed among field officials. It is hoped this article prompts readers to send in their ideas and experience on promoting voluntary compliance. The WMD would like to share these experiences with readers in future newsletter editions and in training and outreach efforts.

Retailer Motivation

Officials should help retail employees, both at store level and headquarters, understand that they, the store leadership, and/or the company could be held liable for violations, resulting in

civil or criminal action, as well as disciplinary action by the company.

Retailers are also motivated by dollars and cents. Anytime an official can convey to a retailer the risk of negative impact, such as reputation, loss of consumer trust, lost sales, or negative media attention it will likely strike a chord. Think of it as speaking the retailer's language.

For example, without naming names, an official could give retailers examples of how the failure to use NIST HB 44 (*Specifications, Tolerances, and Other Technical Requirements for Weighing and Measuring Devices)* compliant weighing or measuring devices or devices that were not properly maintained, have cost retailers money in the past. He should look for opportunities to explain how sales and profits can be maximized through better package weighing practices, and how they can avoid short weighing their customers by ensuring accurate tare deductions are made in the meat packing room and at the point-of-sale terminal. Having the right motivation, along with the proper checks and balances to ensure compliance with weights and measures requirements, saves both time and money, and reduces the possibility of consumer complaints.

Outreach by Officials

Officials should get to know key contacts at each retail corporate office and headquarters. These relationships are built over time. He shouldn't wait for the retailer to come to him or for a major problem to arise, but should reach out and offer to meet with them and educate them about the state's program and requirements. This should include discussion about retailer responsibilities and an offer to provide feedback on the store's compliance history and a review of their internal programs and controls.

An official may even offer to tour some of their stores with them in an effort to further assist in developing a quality internal weights and measures program. Any time he can show a retailer how to improve customer service, save money, and reap other benefits through a compliance program, an official will be amazed how quickly he gets their attention.

Officials should be sure to let retailers know the things they do well, in addition to the areas where they fall short. Retailers understand that officials have a specific job to do. By conveying that he is protecting the interests of both the consumer and the retailer, the official provides a professional atmosphere of mutual trust and respect.

Retail Follow Through on Regulatory Inspections

Officials should take every opportunity to ensure store personnel resolve and correct all problems immediately following inspection results. They should be sure to review inspection results with store management and relate the seriousness of each offense, address all the issues, and encourage their timely resolution.

Officials must also help retailers to understand that they need to get to the root cause of the problems. Preventive maintenance should be part of their vocabulary. He should ask questions to ensure the retailer understands his or her responsibility and should provide suggestions to assist the retailer in putting measures in place to prevent problems from re-occurring. If an official perceives that the store manager is not taking the situation seriously or thinks a fine or penalty is going to result if a future inspection fails to show improved compliance, he should be sure the corporate point of contact is notified and involved. While store personnel will not be pleased that upper management is notified of problems, sometimes it is necessary to get everyone to focus on the concerns raised by inspection findings.

Retailer Checks and Balances

Retailers should have programs in place to ensure ongoing accuracy and compliance. At no time should a store manager or corporate compliance officer be surprised by the results of an inspection. Self-audits and close supervision by the store manager, and routine visits by corporate auditors to audit and inspect price accuracy and tare weight usage, to conduct package inspections and to check weighing and measuring device compliance is basic to any successful program. In retail jargon there is a saying that "retailers must inspect what they expect" meaning store managers and department supervisors must both teach their employees how to do their jobs in accordance with the law and requirements of the company. Then follow-up through audits and other internal controls to ensure the results meet expectations.

In some companies, results related to compliance in these areas have been tied to performance reviews. Officials who have seen what works in other situations to solve compliance issues can provide retailers with insight and ideas on the types of checks and balances needed to ensure success.

Retailer Training

This is usually the greatest area of opportunity for retailers at all levels. Lack of training focus, emphasis, and support at the store level and the corporate office is generally the number one reason problems occur. Compliance from the corporate office or headquarters, as well as the store and department level, must be monitored daily and the findings used as an opportunity to provide training. A daily focus and awareness must be shared by all. Training never ends. Department managers and store leadership must be involved in monitoring and educating their employees daily. This needs to be part of their culture.

As an example, a retail company could hold mandatory meetings involving all department, assistant and store managers, along with category managers, data control specialists and other key personnel at the headquarter level. State Weights and Measures Directors could be invited in for the entire day to help educate and train employees on the laws and regulations, while seeking to impart personal and corporate self-responsibility and ownership for compliance. From there,

weights and measures training could be built into each department's overall training program and audits could become part of a daily routine. This could become the cornerstone of the program moving forward.

Emphasizing training and eliminating the root causes of mistakes should become part of every official's exit strategy when they are reviewing inspection results with store leadership. Officials should try to find "the individual" that has a passion for ensuring compliance. This person can then become an advocate in assisting the official and making the changes necessary to be successful in the future.

Weights and Measures officials have the opportunity to provide an invaluable service and exercise influence within the marketplace in the name of consumer protection. The suggestions above are not intended to add to an official's burden or to imply that states currently don't do similar services. The intent is to provide suggestions and encourage officials to think about how they view and approach their job on a daily basis. Sharing experiences about how officials approach their work could help others be more effective and efficient in what they do while educating the retailer too.

If you have additional ideas about improving compliance through education and outreach, feel free to contact me at 301-975-4868 or by e-mail at dsefcik@nist.gov.

For additional information contact WMD at 301-975-4004 or by e-mail at owm@nist.gov. The Weights and Measures Division provides informational and educational resources through our publications and training courses. Technical publications are available for electronic download from the WMD website, www.nist.gov/owm, and a list of training classes are available in the newsletter calendar.

Finally! Here Is What You Have Been Waiting for…

By Urvi Shah

In September 2008, NIST Weights and Measures Division (WMD) plans to launch a new, interactive database for members of the Weights and Measures community. The database will allow you to:

1. Manage your own account so that you can change your user name, password, and security information.
2. Maintain your personal profile and select your areas of interest by subject. Your areas of interest selections will assist WMD providing the latest information on those topics.
3. Submit comments on draft publications such as one of the Handbook 105 series or an OIML document.
4. Request training on devices, operating procedures, lab metrology, and in other weights and measures subjects. The database will also allow you to view your training record.
5. Request documents such as handbooks, special publications, or the Audit Trail CD and view whether your request has been processed, and its status.

With this new database, we hope to be more responsive to requests and be more proficient in providing information to the right audiences.

You will receive an e-mail from us in the near future that will contain a link to the database. We encourage you to register and try it out!

Calendar of Events

2008

OCTOBER 2008

5 – 8
Southern Weights & Measures Association (SWMA) Annual Meeting
Doubletree Hotel Atlanta Airport
Atlanta, GA
Contact: Marvin Pound, 404-656-3719 or
mpound@agr.state.ga.us

6 – 10
MidMAP (Regional Members only)
Bismark, ND
Contact: Kevin Hanson, 701-328-3337 or kjhanson@nd.gov

6 – 10
OH Regional Training Seminar
NIST HB 133, Checking the Net Contents of Packaged Goods
Wilmington, OH
Contact: Ken Wheeler, 614-728-6290 or
KWheeler@agri.ohio.gov

18 – 22
NCSLI Board Meeting
Gatlinburg, TN
Contact: NCSLI, 303-440-3339 or www.ncsli.org

20 - 24
Basic Mass for Indusry (Course is full)
NIST, Gaithersburg, MD

Contact: Val Miller, 301-975-3602 or val.miller@nist.gov
Applications at: http://www.nist.gov/labmetrology

20 - 31
Basic Metrology - States (Course is full)
NIST, Gaithersburg, MD
Contact: Val Miller, 301-975-3602 or val.miller@nist.gov
Applications at: http://www.nist.gov/labmetrology

22 – 24
Asia Pacific Legal Metrology Forum Meeting
Sydney, Australia
Contact: Chuck Ehrlich at 301-975-4834 or
charles.ehrlich@nist.gov

27 – 31
13th OIML Conference and 43rd CIML Meeting
Sydney, Australia
Contact: Chuck Ehrlich at 301-975-4834 or
charles.ehrlich@nist.gov

NOVEMBER 2008
12 – 14
Scale Manufacturers Association (SMA) Fall Meeting
Big Cedar Lodge
Ridgedale, MO
Contact: Bob Reinfried, 239-514-3441 or
bob@scalemanufacturers.org

17 – 21
OH Regional Training Seminar
NIST HB 133, Checking the Net Contents of Packaged Goods
Akron, OH
Contact: Ken Wheeler, 614-728-6290 or
KWheeler@agri.ohio.gov

DECEMBER 2008
1 – 5
OH Regional Training Seminar
NIST HB 133, Checking the Net Contents of Packaged Goods
Reynoldsburg, OH
Contact: Ken Wheeler, 614-728-6290 or
KWheeler@agri.ohio.gov

8 – 12
Intermediate Metrology
NIST, Gaithersburg, MD
Contact: Val Miller, 301-975-3602 or val.miller@nist.gov
Applications at: http://www.nist.gov/labmetrology

2009

JANUARY 2009
11 – 14
NCWM 94th Interim Meeting
Daytona Beach, FL
Contact: NCWM, 240-632-9454 or www.ncwm.net

FEBRUARY 2009
2 – 6
Advanced Mass Seminar
NIST, Gaithersburg, MD
Contact: Val Miller, 301-975-3602 or val.miller@nist.gov
Applications at: http://www.nist.gov/labmetrology

9 – 13
Advanced Mass Hands-On
NIST, Gaithersburg, MD
Contact: Val Miller, 301-975-3602 or val.miller@nist.gov
Applications at: http://www.nist.gov/labmetrology

MARCH 2009
2 – 13
Basic Metrology – States
NIST, Gaithersburg, MD
Contact: Val Miller, 301-975-3602 or val.miller@nist.gov
Applications at: http://www.nist.gov/labmetrology

23 – 24
MSC Mass Short Course
Anaheim, CA
Contact: 866-672-6327 or http://www.msc-conf.com

25 – 27
Measurement Science Conference (MSC)
Anaheim, CA
Contact: 866-672-6327 or
http://www.msc-conf.com

APRIL 2009
19 – 24
Combined Regional Measurement Assurance Program
(C-RMAP)
Concord, CA
Contact: Georgia Harris, 301-975-4014 or gharris@nist.gov

MAY 2009
4 – 8
Basic Mass for Industry
NIST, Gaithersburg, MD
Contact: Val Miller, 301-975-3602 or val.miller@nist.gov
Applications at: http://www.nist.gov/labmetrology

JULY 2009
12 – 16
NCWM 94th Annual Meeting
San Antonio, TX
E-mail: info@ncwm.net

26 – 30
NCSL International Workshop & Symposium
San Antonio Convention Center
San Antonio, TX
Contact: NCSLI, 303-440-3339 or https://www.ncsli.org

OCTOBER 2009
26 – 30
Basic Mass for Industry
NIST, Gaithersburg, MD
Contact: Val Miller, 301-975-3602 or val.miller@nist.gov
Applications at: http://www.nist.gov/labmetrology

NOVEMBER 2009
2 – 6
Intermediate Metrology
NIST, Gaithersburg, MD
Contact: Val Miller, 301-975-3602 or val.miller@nist.gov
Applications at: http://www.nist.gov/labmetrology

For meetings and events for the **American Petroleum Institute (API**), please check the API website at www.api.org and click on the Meetings and Training Section under the "Energy Professional Site" bullet on the left-hand portion of the home page. Information for **American Society for Testing and Materials (ASTM)** meetings is available at www.astm.org on their Internet website. Click on the "Meetings" bullet on the left-hand portion of the home page. These meetings and seminars are updated on a continuous basis.

For information regarding **American National Standards Institute (ANSI)**, click on the "Meetings and Events" bullet on their website at www.ansi.org. For information regarding the National Conference on Weights and Measures (NCWM), please check the NCWM website at www.ncwm.net.

If you want your meeting, conference or training session included in the Calendar of Events, please contact WMD at 301-975-4004 or owm@nist.gov.