National Type Evaluation Technical Committee
Measuring Sector Annual Meeting
Agenda
October 3-4, 2008 Atlanta, GA

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Carry-over Items:

1. Table of Key Characteristics of Products in Family Products Table for Meters

Source: Carryover Item – 2007 Measuring Sector Agenda

Background/Discussion: At its 2006 annual meeting, the NTEP Director, Steve Patoray, submitted a number of comments concerning the Product Families for Meters table in NCWM Publication14. Steve noted that, while improvements had been made to the table in past years, there were still a number of areas where additional improvements are needed to ensure consistent application of the table. For example, the basis for viscosity values are not clear, there is a lack of reference temperatures for viscosity values, and when possible source documents are consulted for these values, there are differences in viscosity values listed for the same product. In addition, Steve noted that the numerous special notes and separate product categories make the table difficult to follow. As a result of discussions at its 2006 meeting, the Measuring Sector tasked a small work group to address these issues and report back to the Sector.

At its 2007 annual meeting, the work group gave a progress report to the Sector and presented a number of proposed revisions that were being considered (see the 2007 Final Summary of the Measuring Sector for details of that proposal). The work group noted that additional work was needed to list the various liquids, describing the viscosity, specific gravity, and conductance. After hearing comments on the proposed changes, the Sector agreed that the Work Group should continue developing this item and present its recommendations for discussion at the 2008 Measuring Sector meeting.

Recommendation: The Sector will be asked to consider the latest proposal from the Work Group. See Attachments #1 and #2 for revisions to the Product Families for Meters Table and Test Requirements proposed by the Work Group.

(Note: See also Agenda Items 7 - Categorization of Liquid CO2 in the Product Families for Meters Table and 8 - Product Families for Meter Table, Inclusion of Milk and Dairy Products Product Families for Meter Table, Inclusion of Milk and Dairy Products, which address topics related to the Family Products Table.)

2. NTEP Checklist for Hydrocarbon Gas Vapor Meters in Sub-metering Applications

Source: NTEP Director

Background/Discussion: At its 2006 meeting, the Measuring Sector was asked by the NTEP Committee to consider and develop a checklist for residential water meters. These devices will most likely be used for submetering. At that meeting, the Sector heard that several states had recently contacted NTEP regarding these devices. California already has evaluation and certification of these devices in their state. The Sector was asked to review the procedures used by California and rework them into a format acceptable for NCWM Publication 14.

The California type evaluation checklist for LPG vapor meters was included as the Appendix D of the 2006 meeting agenda.

At its 2006 meeting, Sector agreed the best approach for developing a Publication 14 checklist for LPG vapor meters would be the utilization of a WG made up of technical experts and other interested parties. Dan Reiswig, California NTEP Laboratory, will provide a list of vapor meter manufacturers to be contacted for participation in the WG.

At the time of development of the 2007 meeting agenda no information had been received from the WG. At the meeting, the Sector reviewed a recommendation and considered changes to Publication 14 deemed appropriate.

After reviewing a draft presented by the California NTEP laboratory, the Sector agreed that "LPG" in the title should be changed to "Hydrocarbon Gas" so that the measurement of natural gas would be included. The California NTEP laboratory and the NTEP director will continue to develop this checklist for presentation and discussion at the next Sector meeting.

Recommendation: The Sector will hear an update from the California NTEP Laboratory and the NTEP Director on the progress on this issue.

3. Testing Meters Made of Different Materials

Source: California NTEP Laboratory – Carryover from 2007 Measuring Sector Agenda

Discussion/Background: The Sector reviewed this issue at its 2007 meeting, but was unable to reach a consensus on the item. Consequently, the item was carried over for review at the 2008 MS Meeting. The Sector will be asked to revisit this issue and interested parties to report on any updates or new information that might assist the Sector in bringing this issue to a resolution. The background information and discussion from the Sector's 2007 Final Meeting Summary is included below for reference.

Excerpt from Item 5 of the 2007 Measuring Sector Final Meeting Summary:

Background/Discussion: The California NTEP Laboratory is conducting an NTEP evaluation of a family of meters using multiple products in different product families. The meter family includes meters made of aluminum and stainless steel. Because Publication 14 does not specifically address this scenario, the laboratory is asking for input from the Sector before testing starts.

At the 2006 meeting the Sector discussed the scenario described above. The following proposal was offered as a possible solution. The Sector reviewed the proposal for possible forwarding to the NTEP Committee for inclusion in Publication 14.

Proposal: Add a new Section F. to the Publication 14 Technical Policy as follows and renumber subsequent sections:

U. Meters Made of Different Materials within the Same Family

When multiple meters made of different materials within a meter family are submitted for evaluation all meters will be tested with at least one product from each product family to be included on the CC and at least one meter will be tested with the range of products required in the Product Family Table for the meter type (e.g., positive displacement, turbine, mass meter, etc.) submitted for evaluation.

The MMA provided the following white paper for Sector consideration during the discussion:

Meter Manufacturers Association

Speaking as experienced manufacturers of PD Meters, Turbine Meters, and Mass Meters, it is our experience that the materials of construction do not affect the quality of measurement over the specified

operating range of a particular metering technology, as these have been considered and accounted for during the design phase of the meter.

It is the manufacturer's responsibility to ensure that the meter meets type; additionally, material selection is the manufacturer's responsibility and is typically driven by the requirements of chemical compatibility with the liquid products that are being measured or by industry regulations (e.g., non-ferrous meters for aircraft refueling).

Materials are not selected or modified for reasons of accuracy. The market does identify and eliminate the inferior products through the normal surveillance process as well as the manufacturer's warranty process.

It is normal industry practice to include material varieties such as stainless steel, aluminum, cast iron, plastic, etc., into one meter; for example, some of our PD meters have cast steel outer housings, stainless steel bearings, cast iron rotors, anodized aluminum blades or cast iron blades or plastic blades. Non-ferrous aircraft meters will utilize aluminum cast components and SS bearings. We manufacturer turbine meters with stainless steel housings and aluminum rotors. The point being the measurement accuracy is a function of the manufacturing process, not the materials used.

It is not the intent of HB 44 to differentiate between measurement technologies, only the intended application.

Doesn't material selection fall under measurement technology?

Where do you draw the line on NTEP lab decisions on the materials of construction?

The manufacturers believe that the answer to the question is in the **LONG** history of meters themselves. There are hundreds of thousands of meters in service in the United States used for direct sales (e.g., home heating oil delivery, loading rack wholesale deliveries, aircraft refueling, agriculture chemical deliveries, etc.). These meters are verified routinely by the local W&M agencies, and if problems are detected (accuracy out of range) then they are taken out of service.

Summary: The meter manufacturers make determination of materials of construction. Meter manufacturers make the determination of what particular attributes of a meter enable it to be considered as part of a family.

Questions that need to be answered in order to make an informed decision:

1.) Is there a real world problem that requires a solution by the inclusion of a new section specifically aimed at materials in Pub 14?

2.) Is there an inequity in the market, facilitation of fraud?

One of the NTEP laboratories stated that during an evaluation of a mass flow meter the performance was different for two meters with different "tube" materials. Two mass flow meter manufacturers stated that if both meters were calibrated for the product being measured there should be no difference in performance due to "tube" material. Another laboratory stated that the permanence test of a meter conducted after 30 days is not a true indicator of long-term permanence. Another member stated that NTEP should be interested in testing key characteristics and metrologically significant components.

After further discussion at the 2006 meeting, the Sector agreed that the best approach for resolving the issue of what components are "metrologically significant" and require additional evaluation was to include the discussion and development of a proposal for Sector consideration in the tasks of the WG formed to develop a new Family Product table approach, as discussed in agenda Item 5.

Recommendation/ Discussion: At the time of development of the 2007 meeting agenda no information had been received from the WG nor was any formal update presented at the meeting. One industry member

suggested the item be withdrawn. The Sector technical advisor cautioned the group that withdrawing the item would not resolve the question as to whether or not a change in material used in the construction of a meter would require that the model be resubmitted for NTEP evaluation in order to maintain a valid CC. The manufacturers present at the meeting met following the conclusion of the first day's agenda and came back with some suggestions for resolving the problem. One suggestion was for the manufacturer to submit a drawing listing material used, similar to what is done with Underwriters Laboratories, Inc. (UL), who evaluates or tests what they consider to be the worst case. Another suggestion was to include ASTM specifications for the original material and any replacement material. Some of the NTEP laboratories believed that changing material constitutes a change of design and, therefore, requires a new model designation.

4. Add Testing Criteria to NTEP Policy U "Evaluating electronic indicators submitted separate from a measuring element"

Source: California NTEP Lab

Background/Discussion: At its 2007 meeting, the MS heard that Section U. of the NTEP Policy in NCWM Publication 14 allows for testing an indicator separate from a measuring element. However, specific test criteria had not been developed for this section. The Sector heard a recommendation to develop and add specific criteria for testing an indicator separate from a measuring element for this section. California recommended using Canada's test criteria as a guideline to develop the tests as outlined Appendices A, B, and C.

The Sector agreed the California NTEP laboratory should lead a WG to develop a specific test procedure for review at the next Sector meeting. Members of the WG are Dave Rajala (Veeder Root Company), Rich Miller (FMC Measurement Solutions), Maurice Forkert (Tuthill Transfer Systems), Dmitri Karimov (Liqid Controls), Rodney Cooper (Actaris Neptune), and Ralph Richter (NIST).

Recommendation: The Sector will hear an update on the progress of this work from the Work Group.

New Items:

5. Recommendations to Update to NCWM Publication 14 to Reflect Changes to NIST Handbook 44

Source: NIST/WMD

Background: The 93nd National Conference on Weights and Measures (NCWM) adopted the following item that will be reflected in the 2009 Edition of NIST Handbook 44 and NCWM Publication 14. This item is part of the agenda to inform the Measuring Sector of the NCWM actions and recommend changes to NCWM Publication 14.

Recommendation: The Sector will review and, if acceptable, recommend to the NTEP Committee adoption of the following changes to Publication 14 based on changes to NIST Handbook 44:

A. Checklist for Specific Criteria for Vehicle-Tank Meters, Section 28. Marking Requirements, Code Reference S.5.7. (LMD-49)

Add the following new code reference to Section 28. Marking Requirements:

Code Reference: S.5.7. Meter Size

28.5. Except for milk meters, if the meter model identifier does not provide a link to the meter size (in terms of pipe diameter) on an NTEP Certificate of Conformance, the meter shall be marked to show meter size. Yes ☐ No ☐ N/A ☐

6. G-S.8.1. Access to Calibration and Configuration Adjustments, Proposed Changes to Language

Source: Marc Buttler, Emerson Process Management

Background: In the 2008 NCWM Publication 16, the NCWM S&T Committee considered a new paragraph G-S.8.1. as shown below.

Original Proposed Language for G-S.8.1. from 2008 NCWM Publication 16:

G-S.8.1. Access To Calibration and Configuration Adjustments. - A device shall be so designed that access to calibration and configuration modes, including external and remote access, are only permitted when:

(a) The application of the physical security seal shall ensure that the access to the calibration and configuration modes is disabled, or

(b) The calibration and configuration adjustments are protected by an approved category 1, 2, or 3 audit trail, and the device shall clearly and continuously indicate and print, if equipped with a printer, that the calibration and configuration adjustment modes are enabled.

(Nonretroactive as of January 1, 2009)
(Added 2008)

In the addendum sheets published by the NCWM S&T committee at the 2008 Annual Meeting, changes were made to the proposed revisions to G-S.8. Provision for Sealing Electronic Adjustable Components, G-S.8.1. Access to Calibration and Configuration Adjustments. The revised paragraph would create a new requirement such that any device that does not automatically disable calibration and configuration mode when the physical security seal is applied must be a category 3 sealing device by requiring the device to have an approved audit trail. There are currently approved devices, which are not category 3, but that continuously indicate configuration mode is active or do not function, when the device is in configuration and calibration mode, preventing the accidental sealing of the device while still in configuration and calibration mode. These devices would no longer be allowed under the new wording.

The following is excerpted from the 2008 NCWM S&T Committee's addendum sheets.

310-1 I G-S.8. Provision for Sealing Electronic Adjustable Components, G-S.8.1. Access to Calibration and Configuration Adjustments, and G-S.8.2. Automatic or Semi-automatic Calibration Mechanism.

Add the following text to the discussion and amend the proposal as shown below:

The Committee agreed with the comments from the NTEP labs, CWMA, and WMD and amended the proposal so that the proposal will read as follows to:

- delete the references to the sealing categories of device,
- clarify printing requirements, and
- include an option that the device not operate or provide metrological indications that can be interpreted, or transmitted into memory or to recording elements while in this mode.

The Committee also heard from the NTEP participating laboratories that the proposal is urgently needed because of the various interpretations of existing language.

G-S.8. Provision for Sealing Electronic Adjustable Components. *– A device shall be designed with provision(s) for applying a security seal that must be broken, or for using other approved means of providing security (e.g., data change audit trail available at the time of inspection), before any change that detrimentally affects the metrological integrity of the device can be made to any electronic mechanism. [Nonretroactive as of January 1, 1990]*

~~**A device may be fitted with an automatic or a semi-automatic calibration mechanism. This mechanism shall be incorporated inside the device. After sealing, neither the mechanism nor the calibration process shall facilitate fraud.**~~
(Added 1985) (Amended 1989 and **2008**)

Add new General Code paragraphs G-S.8.1. and G-S.8.3., and renumber previous G-S.8.1. to G-S.8.2. so that the proposal will read as follows:

G-S.8.1. Access To Calibration and Configuration Adjustments. - A device shall be so designed that:

(a) The application of the physical security seal automatically disables the access, including external and remote access, to the calibration and configuration mode, or

(b) The calibration and configuration adjustments, including external and remote access, are protected by an approved audit trail, and in addition:

- ***The device shall not provide metrological indications that can be interpreted, or transmitted into memory, or printed while it is in the calibration and/or configuration adjustment mode as a correct measurement value, or***

- ***The device shall clearly and continuously indicate that it is in the calibration and/or configuration adjustment mode and record such message if capable of printing in this mode.***

(Nonretroactive as of January 1, 2009)
(Added 2008)

G-S.8.~~1~~2. Multiple Weighing or Measuring Elements that Share a Common Provision for Sealing. - *A change to any metrological parameter (calibration or configuration) of any weighing or measuring element shall be individually identified.*
[Nonretroactive as of January 1, 2010]

Note: For devices that utilize an electronic form of sealing, in addition to the requirements in **G-S.8.~~1~~2.,** any appropriate audit trail requirements in an applicable specific device code also apply. Examples of identification of a change to the metrological parameters of a weighing or measuring element include, but are not limited to**:**

(1) a broken, missing, or replaced physical seal on an individual weighing, measuring, or indicating element or active junction box;

(2) a change in a calibration factor or configuration setting for each weighing or measuring element;

(3) a display of the date of calibration or configuration event for each weighing or measuring element; or

(4) counters indicating the number of calibration and/or configuration events for each weighing or measuring element.

(Added 2007)

G-S.8.3. Automatic or Semi-automatic Calibration Mechanism. - A device may be fitted with an automatic or a semi-automatic calibration mechanism. This mechanism shall be incorporated inside the device. After sealing, neither the mechanism nor the calibration process shall facilitate fraud.
(Added 1993)

Recommendation: The Sector will be asked to consider submitting a proposal to request that the S&T committee reinstate the previous wording from the original item in Pub 16 (2008) that also allows category 1 and 2 devices as long as they continuously and clearly indicate that the device is in calibration and configuration mode or do not provide a measurement value.

The S&T committee, by their comments on this item in the addendum sheets, seemed to be trying to eliminate references to sealing categories of the device. If the purpose of this was to reduce language, the references could still be removed as long as the additional reference to an approved audit trail is also removed, because this reference is specifically requiring a category 3 sealing device, whether intentional or not.

7. Categorization of Liquid CO_2 in the Product Families for Meters Table

Source: Marc Buttler, Emerson Process Management

Background: Liquid carbon dioxide is not clearly addressed in the Product Families for Meters Table in NCWM Publication 14 (See Technical Policy, Section C, LMD-3). Clarification is required regarding the correct product family for liquid CO_2 in order to guide correct certification for liquid CO_2. Categorizing liquid CO2 in the family of cryogenic products was considered, but the typical temperature of liquid CO2 is above the defined maximum temperature for cryogenic fluids of 120 Kelvin as defined in NIST Handbook 44.

Recommendation: The Sector will be asked to consider including liquid CO2 as a compressed liquid and to increase the maximum density for compressed liquids to 1.1 to include the typical density of liquid CO2.

8. Product Families for Meter Table, Inclusion of Milk and Dairy Products

Background: The product family for milk is not clearly identified in the Product Table in Pub 14. HB44 and Pub 14 have specific sections regarding milk meters, but it is unclear what the product family and test requirements are for milk.

The Sector may wish to consider the following points in its discussion of this issue:

- The "Mass Flow Meters" category in the current table does not include any additional guidance regarding "milk and dairy products" or any other food grade products.

    - Milk and dairy products would presumably fall under the test requirements category of "Normal Liquids" for mass flow meters since the remaining categories of "Heated Products," "Compressed Liquids," "Compressed Gases," and "Cryogenic Liquids and LNG" would clearly not include milk and dairy products.

- The majority of mass flow meters with NTEP CCs for dairy applications were tested with milk.

- Past Sector summaries and discussions do not appear to have any reference to discussions of how milk and other dairy products would fit into the product family table for MFMs or for any other meter technologies. Milk does not appear to be discussed in any recent discussions (in the past few years) on the product family table categories for MFMs.

- There is reference to various food grade oils and there are subcategories for Magnetic Flow, PD, and Turbine meters that include reference to "industrial and food grade liquid oils." However, no other reference is made in the table to other types of food products.

- The LMD Checklist is very sketchy on evaluation criteria for milk metering applications in general. So, a related Sector issue may be the need to strengthen the checklist criteria on milk meters. This point could be addressed with this agenda item or as part of a separate effort.

- A related issue (more for H44 than for NTEP) is that the MFM Code in H44 includes few references to milk meter applications. The MFM Code may need to be reviewed to determine if any additional requirements for milk meter applications from the NIST Handbook 44 Milk Meters Code might need to be proposed for inclusion in the MFM Code. It is questionable if this was done when the MFM Code was added to H44.

- Where does a food product such as high fructose corn syrup (which may sometimes be heated) fit in the existing table? There is a category for liquid feeds such as molasses, but not for corn syrup.

Recommendation: Identify clearly which product family milk falls into for each metering technology. Alternatively, the Sector might consider creating a separate product family just for milk and dairy products.

9. Next Meeting

Recommendation: The Sector will develop a proposed date and location for the next meeting.

Additional Items as Time Allows:

10. Temperature Compensation for Liquid Measuring Devices Code

Source: NCWM S&T Committee

Background/Discussion: The NCWM S&T Committee is considering a proposal to modify Section 3.30. Liquid-Measuring Devices (LMD) Code by modifying paragraphs S.2.6., S.2.7.1., S.2.7.3., N.4.1.1.(a) and (b), N.5., UR.3.6.1.1., and UR.3.6.1.2., to add new paragraphs S.1.6.8., S.2.7.2., S.4.3., UR.3.6.1.3., and UR.3.6.4., and to renumber other existing paragraphs as appropriate to recognize temperature compensation for retail devices as follows:

S.1.6.8. Recorded Representations from Devices with Temperature Compensation. – Receipts issued from devices or systems with automatic temperature compensation must include a statement that the volume of the product has been adjusted to the volume in liters at 15 °C for liters or the volume in gallons at 60 °F for gallons.
[Nonretroactive as of January 1, 200X] (Added 200X)

S.1.6.~~8~~9. Lubricant Devices, Travel of Indicator. – The indicator shall move at least 2.5 cm (1 in) in relation to the graduations, if provided, for a delivery of 0.5 L (1 pt).

S.2.6. Temperature Determination ~~and Wholesale Devices~~. *– For test purposes, means shall be provided to determine the temperature of the liquid either:*

(a) in the liquid chamber of the meter, or

(b) immediately adjacent to the meter in the meter inlet or discharge line.
[Nonretroactive as of January 1, 1985]
(Added 1984) (Amended 1986 **and 200X**)

S.2.7. ~~Wholesale~~ Devices Equipped with Automatic Temperature Compensators.

S.2.7.1. Automatic Temperature Compensation. – A device may be equipped with an automatic means for conversion of the indication and registration of the measured volume of product to the volume at 15 °C **for liters or ~~(~~**60 °F**~~)~~ for gallons.**

S.2.7.2. Display of Net and Gross Quantity. – A device equipped with automatic temperature compensation shall indicate or record, both the gross (uncompensated) and net (compensated) volume for testing purposes. It is not necessary that both net and gross volume be displayed simultaneously.
[Nonretroactive as of January 1, 200X]

S.2.7.3. Display of Temperature. – For test purposes, on a device equipped with automatic temperature compensation means shall be provided to indicate or record the temperature determined by the system sensor to an accuracy of 0.2 °F ,
[Nonretroactive as of January 1, 200X]

S.2.7.~~2~~4. Provision for Deactivating. – On a device **or system** equipped with an automatic temperature-compensating mechanism that will indicate or record only in terms of **liters** compensated to 15 °C **or gallons compensated to ~~(~~**60 °F**~~)~~**, provision shall be made for deactivating the automatic temperature-compensating mechanism so that the meter can indicate, **~~and record if it is equipped to~~ or** record, in terms of the uncompensated volume.
(Amended 1972 **and 200X**)

S.2.7.~~3~~5. Provision for Sealing Automatic Temperature-Compensating Systems. – Provision shall be made for applying security seals in such a manner that an automatic temperature-compensating system cannot be disconnected and that no adjustment **that detrimentally affects the metrological integrity of the device** may be made to the system without breaking the seal **or providing a record of the action**.
(Amended 200X)

S.2.7.5.1. Provision for Seal the Temperature Sensor. – Provision shall be made for applying security seals in such a manner that the temperature sensor cannot be removed or disabled without breaking the seal or providing a record of the action.
[Nonretroactive as of January 1, 200X]

S.2.7.4.6. Temperature Determination with Automatic Temperature-Compensation. – For test purposes, means shall be provided (e.g., thermometer well) to determine the temperature of the liquid either:

(a) in the liquid chamber of the meter, or

(b) immediately adjacent to the meter in the meter inlet or discharge line.

(Amended 1987)

S.4.3.~~2.~~2. Temperature Compensation. – If a device or system is equipped with automatic temperature compensation, the primary indicating elements, recording elements, or recorded representation shall be clearly and conspicuously marked to show that the volume delivered has been adjusted to the volume at 15 °C for liters or ~~(~~60 °F~~)~~ for gallons.
(Amended 200X)

S.4.~~3~~4. Wholesale Devices, Discharge Rates. – A wholesale device shall be marked to show its designed maximum and minimum discharge rates. However, the minimum discharge rate shall not exceed 20 % of the maximum discharge rate.

S.4.45. Retail Devices.

S.4.45.1. Discharge Rates. *– On a retail device with a designed maximum discharge rate of 115 L (30 gal) per minute or greater, the maximum and minimum discharge rates shall be marked in accordance with S.4.4.2. The marked minimum discharge rate shall not exceed 20 % of the marked maximum discharge rate.*
[Nonretroactive as of January 1, 1985]
(Added 1984)(Amended 2003)

Example: With a marked maximum discharge rate of 230 L/min (60 gpm), the marked minimum discharge rate shall be 45 L/min (12 gpm) or less (e.g., 40 L/min (10 gpm) is acceptable). A marked minimum discharge rate greater than 45 L/min (12 gpm) (e.g., 60 L/min (15 gpm) is not acceptable.

S.4.5.2. Location of Marking Information; Retail Motor-Fuel Dispensers. *– The marking information required in the General Code, paragraph G-S.1. Identification shall appear as follows:*

N.4.1.1. ~~Wholesale~~ Devices Equipped with Automatic Temperature-Compensating Systems. – On ~~wholesale~~ devices equipped with automatic temperature-compensating-systems, normal tests shall be conducted:

(a) by comparing the **net (**compensated**)** volume indicated or recorded to the actual delivered volume **~~corrected~~ adjusted** to 15 °C **for liters or 60 °F for gallons, and**

(b) **~~with the temperature-compensating system deactivated,~~** comparing the **gross (**uncompensated**)** volume indicated or recorded to the actual delivered volume. **(For some devices this may require that the temperature compensator be deactivated.)**

The first test shall be performed with the automatic temperature-compensating system operating in the "as found" condition. On devices that indicate or record both the compensated and uncompensated volume for each delivery, the tests in (a) and (b) may be performed as a single test.
(Amended 1987 **and 200X**)

N.5. Change in Product Temperature ~~Correction on Wholesale Devices.~~ – ~~Corrections~~ **Adjustments** shall be made for any changes in volume resulting from the differences in liquid temperatures between time

of passage through the meter and time of volumetric determination in the prover **or test measure**. When adjustments are necessary, appropriate petroleum measurement tables should be used.
(Amended 1974 **and 200X**)

UR.3.6. Temperature Compensation.

UR.3.6.1. Automatic.

UR.3.6.1.1. ~~When to be~~ Use~~d~~ of Automatic Temperature Compensation. – If a device is equipped with **~~a mechanical~~** automatic temperature **~~compensator~~ compensation**, it shall be connected, operable, and in use at all times. An electronic or mechanical automatic temperature-compensating system may not be removed, nor may a compensated device be replaced with an uncompensated device, without the written approval of the **~~responsible~~** weights and measures jurisdiction **with statutory authority over the device**.
[**Note**: This requirement does not specify the method of sale for product measured through a meter.]
(Amended 1989 **and 200X**)

UR.3.6.1.2. Recorded Representations (Invoices, Receipts, and Bills of Lading.)

(a) A**n** **~~written~~** invoice based on a reading of a device **or recorded representation issued by a device or system** that is equipped with an automatic temperature compensator shall show that the volume delivered has been adjusted to the volume at 15 °C **for liters or ~~(~~60 °F~~)~~ for gallons and decimal subdivisions or fractional equivalents thereof.**

(b) The invoice issued from an electronic wholesale device equipped with an automatic temperature-compensating system shall also indicate: (1) the API gravity, specific gravity or coefficient of expansion for the product; (2) product temperature; and (3) gross reading.

(Amended 1987 **and 200X)**

UR.3.6.1.3. Temperature Determination. – Means for determining the temperature of measured liquid in an automatic temperature-compensating system shall be so designed and located that, in any "usual and customary" use of the system, the resulting indications and/or recorded representations are within applicable tolerances.
(Added 200X)

UR.3.6.4. Temperature Compensated Sale. – All sales of products, when the quantity is determined by an approved measuring system with temperature compensation, shall be in terms of the liter at 15 °C or the U.S. gallon of 231 in^3 at 60 °F.
(Added 200X)

Prior to the 2007 NCWM Interim Meeting, the Committee recognized via reports from the regional L&R committees and other sources that there was increasing support within the weights and measures community to address temperature compensation features for the retail sale of petroleum products in the Liquid-Measuring Devices Code. In response to these concerns and to encourage uniformity in applications where temperature compensation is being used, the Committee developed this proposal to provide design and performance requirements and testing criteria for retail metering systems that incorporate temperature compensation capability. The Committee was also concerned that if the current L&R Committee proposed language for the Method of Sale of Commodities in NIST Handbook 130 is adopted, retail motor-fuel devices could be placed in service with no guidelines in NIST Handbook 44 for type approval and field testing. The L&R proposed language would permit the temperature-compensated sale of petroleum products at all levels of distribution.

At the Interim Meeting, the L&R Committee moved forward with a Method of Sale proposal containing permissive language for retail sales of petroleum products using automatic temperature compensation (see L&R Item 232-1). Although the Committee recognized that this S&T item was still not fully developed, it felt it could resolve the remaining issues in time for the NCWM Annual Meeting in July 2007; therefore, the Committee unanimously voted to make this item a "priority" voting item as described in Section H of the Introduction of Handbook 44. It did this because it felt strongly that if the L&R item passed it was very important for there to be a corresponding S&T item that provided HB 44 guidance as described above. Following the Committee vote the Committee chairman went before the NCWM Board of Directors (BOD) for their input. The BOD instructed the Committee to make this an information item. Irrespective of the concerns about the timing of adoption of language in Handbook 130, the Committee, after further deliberation, concurred with the BOD and added the proposal to its agenda as an information item. The BOD further informed the Committee of its plan to form a steering committee to provide guidance and give support to both the S&T and L&R Committees on temperature compensation issues. The Committee looks forward to working with the steering committee on this important issue.

This item is still in development. Below are some of the issues the Committee is currently working on.

Recorded Representations (S.1.6.7.): What, if any, abbreviations are acceptable for devices equipped with ATC (e.g., gal at 60 ºF)?

API Gravity: How should the API gravity be entered in the device and what API gravity should the inspector use during test? Should an average API gravity be used (National or State)? The Committee will work on gathering API data in order to resolve this issue.

Difference between Net and Gross (T.4.): Is the current tolerance of 0.1 % (electronic) appropriate for field-testing of retail devices with ATC? Will maintaining our current tolerances mean taking extra drafts to obtain a stable temperature? The Committee will work on gathering data concerning temperature measurement.

The Committee will continue work on this issue and will seek input from the regions and other interested parties in the weights and measures community.

Recommendation: If time allows the Sector will be asked for input on the proposed changes and to provide any comments and recommended changes to the NCWM S&T Committee.

11. Water Meters – S.1.1.3. Value of the Smallest Unit

Source: Western Weights and Measures Association

Background: This item appeared as a Developing Item on the 2008 NCWM S&T Agenda and was originally submitted to the S&T Committee by the Southern Weights and Measures Association. At its September 2008 Annual Meeting, the Western Weights and Measures Association voted to forward recommend that the S&T Committee elevate the status of the item from "Developing" to "Information."

The item, including the WWMA position on this issue is included below for reference:

Part 5, Item 1 Water Meters: S.1.1.3. Value of the Smallest Unit

Source: Southern Weights and Measures Association (SWMA)

Proposal: Harmonize HB44 value of the smallest unit requirements and indicator specifications with AWWA standards.

Amend paragraph S.1.1.3. as follows.

S.1.1.3. Value of Smallest Unit. - The value of the smallest unit of indicated delivery and recorded delivery, if the device is equipped to record, shall not exceed the equivalent of:

(a) 50 L (10 gal**, 1 ft^3**) on utility type meters**, sizes 1" and smaller,** or

(b) **500 L (100 gal, 10 ft^3) on utility type meters, sizes 1.5" and 2"**, or

(c) 0.2 L (1/10 gal, **1/100 ft^3**) on batching meters delivering less than 375 L/min (100 gal/min, **13 ft^3/min**),

(d) 5 L (1 gal, **1/10 ft^3**) on batching meters delivering 375 L/min (100 gal/min, **13 ft^3/min**) or more.

Add new paragraph S.1.1.6. as follows:

S.1.1.6. Proving indicator: Utility type meters shall be equipped with either a mechanical-type proving indicator, or a high-resolution digital proving indication. The individual graduations on a mechanical proving indicator shall indicate volumes no larger than 1/100th of the value of the smallest unit of indicated delivery required in S.1.1.3. For digital proving indications, the smallest unit of volume displayed shall be no larger than 1/1000th of the value of the smallest unit of indicated delivery required in S.1.1.3.

Background/Discussion: At its 2007 Annual Meeting, the SWMA received a request from a meter manufacturer for clarification of the intent of S.1.1.3. Along with the request, the manufacturer stated that, "our assumption is that this refers to the value of each graduation of the primary indicating element. If this is indeed the intention of S.1.1.3., then the S.1.1.3.(a) requirement of 10 gal would pose no problem for utility type meters. However, this would represent very poor resolution for smaller water meters. Again, if S.1.1. is indeed referring to the values for individual graduations, values for utility type meters under S.1.1.3. should instead be separated into three cateogries: 0.1 gal for meters 1 in and smaller, 1.0 gal for meters 1½ in through 3 in and 10 gal for meters 4 in and larger. Similarly, metric "smallest unit" values would also be in three categories: 1 L for meters 1 in and smaller, 10 L for meters 1½ in through 3 in, and 100 L for meters 4 in and larger.

Utility type water meters 1 in and smaller have 10 gal test circles with 100 graduations (i.e., 0.1 gal increments). Utility meters 1½ in through 3 in have 100 gal test circles with 100 graduations (i.e., 1 gal increments), and utility meters 4 in and larger have 1000 gal test circles with 100 graduations (i.e., 10 gal increments). See comparable registration details for metric offerings (with 0.1 m^3, 1.0 m^3, and 10 m^3 test circle offerings for progressively larger meter sizes)."

The SWMA also heard comments from the manufacturer that several other water meter manufacturers were having difficulty meeting HB 44 requirements for repeatability that were added in 2002. Additionally part of the problem was the determination of what constitutes the smallest unit of measure for various sizes of their utility meters. The manufacturer is requesting a change to the test draft requirements and/or smallest unit of measure requirements to be more appropriate for the meters they and others manufacture. The SWMA agreed to forward the proposal to the NCWM S&T Committee for consideration.

Just prior to the 2008 NCWM Annual Meeting, the NCWM S&T Committee received a proposal for

changes to this item from Scott Swanson, with Sensus Metering Systems on behalf of five water meter manufacturers, including Badger Meter, Inc., Elster Metering, Master Meter, Neptune Metering, and Sensus Metering. During the Committee's open hearings, the S&T Chairman notified NCWM members that copies of this information were available to interested parties and noted that the above proposal will be included in the Committee's final report.

The five water meter manufacturers state that the vast majority of utility-type water meters sold in the United States are designed to comply with ANSI/AWWA meter standards. All AWWA utility-type meter designs share a common meter proving resolution of 100 scale divisions pre revolution of the pointer to verify meter accuracy. All utilities use the odometer indicating device on dial face the meter for billing purposes. These utility-type meter designs are quite different than those used for batching-type meters. HB44 currently addresses the value of the smallest unit for utility-type meters as being 50 L regardless of the size of the meter. As a result, larger utility-type meters are required to be more sensitive than smaller utility-type meters.

For utility-type meters 1" and smaller, meter registration test hands (proving indicators) have graduations with resolution down to 0.1 gallons or 0.01 cubic feet. For meters 1-1/2" and 2", test hands have graduations with resolution down to 1.0 gallons or 0.1 cubic feet. The smallest unit of indicated deliver is then given by one full revolution of the test hand (amounting to 100 graduations).

The WWMA voted to add the following text to the discussion:

During the WWMA open hearing, the water meter manufacturers gave a presentation on their justification for the proposed changes which included reducing the uncertainty in testing procedures by increasing the test draft size, clarifying the values for the smallest unit of measure based on utility type meter size, and limiting the number of graduations of the sweep hand to≥100 graduations. Additionally, the proposals are intended to align HB44 test requirements with AWWA standards and test criteria.

The Committee discussed the difference between the smallest unit and the value of the proving indication. The intent is that the proving indicator only be used in the verification of the device and the "Value of the Smallest Unit" applies the meter reading for billing purposes (e.g., beginning and ending readings on a utility bill). This would be analogous to Scales Code verification division sizes where d (smallest division that can be indicated) can be different than e (verification scale division by which tolerance values apply). It was noted that similar language and terminology for "Values of the Smallest Unit" and "Proving Indicator" exists in the Vapor Meter Code.

The Committee recommends that this should forward to the NCWM S&T Committee as a **voting** item.

Recommendation: If time allows the Sector will be asked for input on the proposed changes t and provide comments and recommended changes to the NCWM S&T Committee.

12. Water Meters – N.4.1.1. Repeatability Tests and T.1. Tolerance Values

Source: Southern Weights and Measures Association

Background: This item appears as a Developing Item on the 2008 NCWM S&T Agenda and will be carried over for the 2009 NCWM cycle. The WWMA reviewed this item at its 2008 Annual Meeting and recommends that it be retained as a Developing Item. The item, including the WWMA position on this issue is included below for reference.

Part 5, Item 2 D Water Meters: N.4.1.1. Repeatability Tests and T.1. Tolerance Values

Source: Southern Weights and Measures Association (SWMA)

Proposal: Amend repeatability requirements in Section 3.36., Water Meters as follows by changing the

test draft quantities of Tables N.4.1. and N.4.2. of HB 44, Section 3.36 in order to meet the repeatability requirements as given in N.4.1.1. and T.1.1. for utility-type meters as follows:

N.3. Test Drafts. - ~~The normal test of a meter shall be made at the maximum discharge rate developed by the installation. Meters with maximum gallon per minute ratings higher than the values specified in Table N.4.1. Flow Rate and Draft Size for Water Meters Normal Tests may be tested up to the meter rating, with meter indications no less than those shown.~~
~~(Amended 1990, 2002, and 2003)~~

(a) Non-Utility Type Water Meters. - Test drafts should be equal to at least the amount delivered by the device in 2 minutes and in no case less than the amount delivered by the device in 1 minute at the actual maximum flow rate developed by the installation. The test draft sizes shown in Table N.4.1., Flow Rate and Draft Size for Non-Utility Type Water Meters Normal Tests, and in Table N.4.2 Flow Rate and Draft Size for Non-Utility Type Water Meters Special Tests, shall be followed as closely as possible.

(b) Utility Type Water Meters. - The test draft sizes shown in Table N.4.X and N.4.Y shall be followed as closely as possible. Testing shall be done in like volumes (meters with gallon registration tested in gallon volumes, meters with cubic feet registration tested in cubic feet volumes).

Table N.4.1. Flow Rate and Draft Size for Non-Utility Type **Water Meters**
Normal Tests

Meter size (inches)	**Rate of flow (gal/min)**	**Maximum Rate**	
		Meter Indication/Test Draft	
		gal	**ft^3**
Less than 5/8	8	50	5
5/8	15	50	5
3/4	25	50	5
1	40	100	10
1 1/2	80	300	40
2	120	500	40
3	250	500	50
4	350	1 000	100
6	700	1 000	100

(Table Added 2003) (Amended 200X)

Table N.4.X. Flow Rate and Draft Size for Utility Type **Water Meters**
Normal Tests

Meter size (inches)	**Rate of flow (gal/min)**	**Maximum Rate**	
		Meter Indication/Test Draft	
		gal	**ft^3**
Less than 5/8	**8**	**100**	**10**
5/8	**15**	**100**	**10**
5/8 x 3/4	**15**	**100**	**10**
3/4	**25**	**100**	**10**
1	**40**	**100**	**10**
1 1/2	**50**	**300**	**40**
2	**100**	**500**	**40**

(Table Added 200X)

Table N.4.2. Flow Rate and Draft Size for Non-Utility Type **Water Meters**
Special Tests

Meter size (inches)	Intermediate Rate			Minimum Rate		
	Rate of flow (gal/min)	Meter indication/Test Draft		Rate of flow (gal/min)	Meter indication/Test Draft	
		gal	ft^3		gal	ft^3
Less than or equal to 5/8	2	10	1	1/4	5	1
3/4	3	10	1	1/2	5	1
1	4	10	1	3/4	5	1
1 1/2	8	50	5	1 1/2	10	1
2	15	50	5	2	10	1
3	20	50	5	4	10	1
4	40	100	10	7	50	5
6	60	100	10	12	50	5

(Table Added 2003) **(Amended 200X)**

Table N.4.Y. Flow Rate and Draft Size for Utility Type **Water Meters**
Special Tests

Meter Size (inches)	Intermediate Rate			Minimum Rate		
	Rate of Flow (gal/min)	Meter Indication/Test Draft		Rate of Flow (gal/min)	Meter Indication/Test Draft	
		gal	ft^3		gal	ft^3
Less than 5/8	2	10	1	¼	10	1
5/8	2	10	1	¼	10	1
5/8 x 3/4	2	10	1	¼	10	1
¾	3	10	1	½	10	1
1	4	10	1	¾	10	1
1 ½	8	100	10	1 ½	100	10
2	15	100	10	2	100	10

(Table Added 200X)

T.1.1. Repeatability. – When multiple tests are conducted at approximately the same flow rate, the range of the test results shall not exceed 0.6% for tests performed at the normal and intermediate flow rates, and 1.3% for tests performed at the minimum flow rate, and each test shall be within the applicable tolerances. **Test draft sizes shall comply with Tables T.1.1 and T.1.2. Repeatability Testing for Utility Type Water Meters is to be applied only during type evaluation testing when performing repeatability tests on utility type water meters,**
(Amended 200X)

Table T.1.1. Flow Rate and Draft Size for Utility Type **Water Meters**
Normal Tests for Repeatability

Meter Size (inches)	Rate of Flow (gal/min)	Maximum Rate	
		Meter Indication/Test Draft	
		gal	ft^3
Less than 5/8	8	100	10
5/8	15	100	10
5/8 x 3/4	15	100	10

¾	25	100	10
1	40	100	10
1 ½	50	400	40
2	100	500	40

(Table Added 200X)

Table T.1.2. Flow Rate and Draft Size for Utility Type **Water Meters**
Special Tests for Repeatability

Meter Size (inches)	Intermediate Rate			Minimum Rate		
	Rate of Flow (gal/min)	Meter Indication/Test Draft		Rate of Flow (gal/min)	Meter Indication/Test Draft	
		gal	ft^3		gal	ft^3
Less than 5/8	2	40	4	¼	20	2
5/8	2	40	4	¼	20	2
5/8 x 3/4	2	40	4	¼	20	2
¾	3	40	4	½	20	2
1	4	40	4	¾	20	2
1 ½	8	400	40	1 ½	200	20
2	15	500	40	2	200	20

(Table Added 200X)

Background/Discussion: At its 2007 Annual Meeting, the SWMA received a proposal from a meter manufacturer with two options for modifying Section 3.36. as shown above. The manufacturer provided the following justification for the modification:

For proposal A: Water meter "transaction" volumes are based on billing cycles of monthly or quarterly "reads." As such, each transaction for a residential meter may be on the order of 3000 to 30 000 gal. Commercial/industrial accounts with larger meters may have transaction volumes that are one or two orders-of-magnitude larger than this. Meter repeatability over the course of a pattern approval test volume (currently as little as 5 gal for a residential meter, for example) is, therefore, not relevant. Utility water meters are not designed to provide the resolution required to meet the Section 3.36. repeatability requirements under typical test drafts.

For Proposal B: The graduations on the primary indicating element for the meter under test can normally be read within an uncertainty of roughly ⅓ of a graduation. This is the result of limits in optical discernment, minor parallax, minor asymmetries in mechanical gear trains, minor asymmetries in graduation printing, etc.. Combining the meter's reading uncertainty at the start of any single test run with the uncertainty at the end of this same test run, total meter reading uncertainly is, therefore, roughly ⅔ of a graduation. Keeping in mind there are other resolution/repeatability concerns for any given test series (resolution in reading the reference volume/mass, ability to duplicate parameters such as flow rate, water temperature, water pressure, evaporative losses, etc.), the uncertainty limitations for reading the meter under test should not "consume" more than ¼ of the total repeatability requirement. For the 1.3 % repeatability requirement at the minimum flow rate, this corresponds to a test draft equal to roughly 200 graduations of the primary element. For the 0.6 % repeatability requirement at the intermediate rate, this corresponds to a test draft equal to roughly 400 or 450 graduations of the primary element. Test draft volumes for the maximum flow rate must be even larger since these drafts must address other sources of error unique to testing at higher flow rates (for example, errors due to ramping up and ramping down the flow rates at the beginning and end of the test, which must be done slowly enough so as to not cause water hammer, or mechanical impulse loading of the meter registration device).

The SWMA also heard comments from the manufacturer that several other water meter manufacturers were having difficulty meeting HB 44 requirements for repeatability that were added in 2002. Additionally part of the problem was the determination of what constituted the smallest unit of measure for various sizes of their utility meters. The manufacturer is requesting a change to the test draft requirements and/or smallest

unit of measure requirements to be more appropriate for the meters they and others manufacture. The SWMA agreed to forward the proposal to the NCWM S&T Committee for consideration.

Just prior to the 2008 NCWM Annual Meeting, the NCWM S&T Committee received a proposal for changes to this item from Scott Swanson, with Sensus Metering Systems on behalf of five water meter manufacturers, including Badger Meter, Inc., Elster Metering, Master Meter, Neptune Metering, and Sensus Metering. During the Committee's open hearings, the S&T Chairman notified NCWM members that copies of this information were available to interested parties and noted that a copy of the following three proposals will be included in the Committee's final report.

The five water meter manufacturers recommend that paragraph N.4. Testing Procedures be amended to address specific issues related to utility type water meters. The three related proposals are to add subsections under paragraph N.3, change the title of tables N.4.1 and N.4.2, and to incorporate two new tables to N.4 that speak directly to utility type water meters.

1. The first proposal is to amend paragraph N.3.

2. The second proposal is to amend the title of Table N.4.1 and Table N.4.2, changing the words "for Water Meters" to read "for Non-Utility Type Water Meters."

3. The third proposal is to include in sections N.4.1 and N.4.2 two new tables that harmonize test flow rates and draft sizes listed in section 3.36 with that of the AWWA specification found in the AWWA M6 manual, Table 5.3. The two proposed tables are attached.

The submitter provided the following justification:

Erroneous test results can be produced when agencies use inadequate test draft quantities. These erroneous test results have and are continuing to have serious financial consequences to manufactures and distributors.

The vast majority of utility-type water meters sold in the United States are designed to comply with ANSI/AWWA meter standards. All AWWA utility-type meter designs share a common meter proving resolution of 100 scale divisions pre revolution of the pointer to verify meter accuracy. All utilities use the odometer indicating device on dial face the meter for billing purposes. These utility-type meter designs are quite different than those used for batching-type meters.

For utility-type meters 1" and smaller, meter registration test hands (proving indicators) have graduations with resolution down to 0.1 gallons or 0.01 cubic feet. For meters 1-1/2" and 2", test hands have graduations with resolution down to 1.0 gallons or 0.1 cubic feet. In visually reading the test hand position relative to these graduations, resolution is limited to a range of roughly 1/3 or 1/2 of an individual graduation (at both the start of each test and at then at the end of each test).

As a result, a test draft equal to only 50 graduations will result in large meter reading uncertainties (cumulative uncertainty range on the order of 1.2% or worse). Compared to the accuracy tolerances for water meters, this level of reading uncertainty is unacceptable, and larger test drafts must be used. See AWWA M6 for examples of the larger test drafts that are required, given these reading resolution limitations.

During the Committee's open hearings, Jeff Humphreys, Los Angeles County, provided some additional data to consider in conjunction with this item. This information will also be included in the Committee's final report. Additionally, concerns were expressed regarding whether or not the size of the test draft size for larger meters is realistic. A manufacturer of test equipment noted that the largest prover being manufactured at present is 2000 gallons.

The WWMA voted to add the following text to the discussion:

During the WWMA open hearing, water meter manufacturers gave a presentation on the justification for the proposed changes which included reducing the uncertainty in testing procedures by increasing the test draft size, clarifying the values for the smallest unit of measure based on utility type meter size, and limit the number of graduations of the sweep hand to 100 graduations or more. Additionally, the proposals are intended to align HB44 test requirements with AWWA standards and test criteria.

The Committee also reviewed the a letter and test data submitted by Los Angeles County Weights and Measures about the comparison of failure rates on for utility-type meters between current test 5-gallon draft size and the a test draft of 20 gallons for 5/8 inch utility-type meters. They summarized their results as follows:

"The enclosed information also shows that very few positive displacement meters fail tolerance tests at any of the current HB 44 flow rates. The claim has been made that the tests as currently being conducted have seriously impacted meter sales for several water meter manufacturers. Our tests show that manufacturers of positive displacement meters should not be negatively impacted by being tested at the current established flow rates."

According to the data from Los Angeles County, the average error for the 28 new meters that failed the test using the 5-gallon test draft was -4.45%, and -4.32% for the 10-gallon test draft. There was no data for repeatability in this series of data.

The Committee also received two letters from water manufacturers supporting the items that were not in attendance at the WWMA.

The Committee acknowledges that there is an increased potential for the uncertainty with the current test draft. Manufacturers state that the test should include at least one complete revolution of the dial indicator. However, the data submitted by Los Angeles County suggested that the increase in the test draft size is not justified.

One meter manufacturer submitted test data for five new 5/8" positive displacement meters to the Committee. Results showed that three tests out of fifteen failed the accuracy test with a 5-gallon test draft size for low flow. When draft size was increased to 10-gallons, all meters passed and the range of results decreased by a factor of two. When testing repeatability at low flow, two out of five failed with a 5-gallon draft; none failed with a 10-gallon draft. At intermediate flow, fifteen out of fifteen passed at 10-gallon draft size for accuracy, and four out of five meters failed repeatability at the current 10-gallon draft size.

Another meter manufacturer submitted test data for four new 5/8" positive displacement meters. Results showed that three out of eight failed the accuracy test with a 5-gallon test draft size for low flow. When draft size was increased to 10-gallons, all meters passed and the range of results decreased dramatically. When testing repeatability at low flow, four out of four failed with a 5-gallon draft; zero failed with a 10-gallon draft. At intermediate flow, eight out of eight passed at 10-gallon draft size for accuracy, and one out of four meters failed repeatability at the current 10-gallon draft size.

The Committee recommends renaming the item to "N.4. Testing Procedures". It further recommends the item be given **developmental** status and requests additional data from industry, California DMS and other jurisdictions comparing test results between the current and proposed test draft sizes. Data submitted should include information on the proving methods (e.g., narrow neck prover, gravimetric, etc). Additionally, the Committee is interested in the requirements and test methods used by Measurement Canada and additional information on International Activities. It should be noted that the AWWA M-6 Manual has guidelines for accuracy testing but no guidance on repeatability.

The Committee also recommends that the proposed language for paragraph N.3. and Tables N.4.1., N.4.X., and N.4.Y. should remain **developmental** due to insufficient test data that justifies the proposed change. Additionally, the Committee recommends that the repeatability and test draft sizes in tolerance paragraph in T.1.1. and Tables T.1.1. and T.1.2. be separated as a separate item as shown in **WWMA S&T-8** since the data submitted by the California CTEP lab indicates a high failure rate with the current tests for

repeatability.

Recommendation: If time allows the Sector will be asked for input on the proposed changes and to provide any comments and recommended changes to the NCWM S&T Committee. Note that the WWMA is requesting additional data from industry as well as weights and measures jurisdictions.

13. Water Meters T.1.1. Repeatability, Tables T.1.1. and T.1.2.

Source: Western Weights and Measures Association (WWMA)

Background: This item is a new proposal that is being submitted to the NCWM S&T Committee for consideration by the WWMA. The item, as it appears in the WWMA S&T Committee's final report is included below.

PROPOSAL: Amend T.1.1. Repeatability and Add New Tables T.1.1. and T.1.2. in HB 44 Section 3.36

Add the following text to the discussion and amend the proposal as shown below:

T.1.1. Repeatability. – When multiple tests are conducted at approximately the same flow rate, the range of the test results shall not exceed 0.6% for tests performed at the normal and intermediate flow rates, and 1.3% for tests performed at the minimum flow rate, and each test shall be within the applicable tolerances. **When repeatability tests are performed, test draft sizes shall comply with Tables T.1.1 and T.1.2. Repeatability Testing for Utility Type Water Meters. Repeatability tests shall be conducted during type evaluation testing.**
(Amended 200X)

Table T.1.1. Flow Rate and Draft Size for Utility Type Water Meters
Normal Tests for Repeatability

Meter Size (inches)	Rate of Flow (gal/min)	Maximum Rate Meter Indication/Test Draft	
		gal	ft^3
Less than 5/8	8	100	10
5/8	15	100	10
5/8 x ¾	15	100	10
¾	25	100	10
1	40	100	10
1 ½	50	400	40
2	100	500	40

(Table Added 200X)

Table T.1.2. Flow Rate and Draft Size for Utility Type Water Meters
Special Tests for Repeatability

Meter Size (inches)	Intermediate Rate			Minimum Rate		
	Rate of Flow (gal/min)	Meter Indication/Test Draft		Rate of Flow (gal/min)	Meter Indication/Test Draft	
		Gal	ft^3		gal	ft^3
Less than 5/8	2	40	4	¼	20	2
5/8	2	40	4	¼	20	2
5/8 x ¾	2	40	4	¼	20	2
¾	3	40	4	½	20	2
1	4	40	4	¾	20	2
1 ½	8	400	40	1 ½	200	20

2	**15**	**500**	**40**	**2**	**200**	**20**

(Table Added 200X)

Background/Discussion: It was noted that repeatability tests of utility type meters are currently being conducted during the type evaluation process, but are seldom performed in field tests. See Developing Item Part 5, Item 2 Water Meters: N.4.1.1. Repeatability Tests and T.1. Tolerance Values for additional information.

Recommendation: If time allows the Sector will be asked for input on the proposed changes and to provide any comments and recommended changes to the NCWM S&T Committee.

14. Draft Code Section 3.3X. Hydrogen Gas-Measuring Devices

Source: NCWM S&T Committee

Background: The NCWM S&T Committee's Agenda added a new item to its Developing Item to recognize work being done to develop a code for commercial hydrogen gas-measuring devices by the U.S. National Work Group for the Development of Commercial Hydrogen Measurement Standards. The Work Group, which presently includes weights and measures officials, manufacturers and users of hydrogen measuring devices, and federal agency representatives, is looking for input and participation from the weights and measures community in the development of the code and associated test procedures. The most current version of the draft code can be found on NIST WMD's home page at http://ts.nist.gov/WeightsAndMeasures/Developing-Commercial-Hydrogen-Measurement-Standards.cfm.

This web page will be the U.S. weights and measures and hydrogen communities' source for the latest information and status of ongoing work to develop uniform and appropriate legal metrology standards for commercial hydrogen measurements.

This item is included on the Sector's agenda to make the Sector aware of the work and to encourage input and participation from Sector members.