National Type Evaluation Program (NTEP)
Measuring Sector

Annual Meeting
October 9-10, 2013 Charleston, WV

Meeting Agenda

Attachments Distributed with Agenda:

Attachment A: Electronic Indicators Checklist Draft [Agenda Item 1]
Attachment B: Proposed Permanence Criteria for Markings, LMD Checklist [Agenda Item 2]
Attachment C: NCWM S&T Committee Item 330-3, 2013 Annual Report, Excerpt [Agenda Item 3]
Attachment D: Product Families Table, Units for Viscosity [Agenda Item 4a]
Attachment E: Receipt Requirements - Card Activated RMFDs [Agenda Item 4b]
Attachment F: Receipt Requirements - Cash Activated RMFDs [Agenda Item 4c]
Attachment G: Receipt Requirements - ECRs Interfaced with RMFDs [Agenda Item 4e]

Glossary of Acronyms			
CC	Certificate of Conformance	OIML	International Organization of Legal Metrology
DMS	Division of Measurement Standards	OWM	Office of Weights and Measures (NIST)
ECR	Electronic Cash Register	PD	Positive Displacement
HB 44	NIST Handbook 44 "Specifications, Tolerances, and Other Technical Requirements for Weighing and Measuring Devices"	Pub 14	NCWM Publication 14
LMD	Liquid Measuring Devices	RMFD	Retail Motor-Fuel Dispenser
mA	milliamp	SI	International System of Units
NCWM	National Conference on Weights and Measures	S&T	Specifications and Tolerances
NIST	National Institute of Standards and Technology	VTM	Vehicle Tank Meter
NTEP	National Type Evaluation Program	W&M	Weights and Measures
NTETC	National Type Evaluation Technical Committee		
This glossary is meant to assist the reader in the identification of acronyms used in this agenda and does not imply that			

these terms are used solely to identify these organizations or technical topics.

Carry-over Items:

1. **Add Testing Criteria to NTEP Policy U "Evaluating Electronic Indicators Submitted Separate from a Measuring Element"**

Source: California NTEP Lab

Background: At its 2007 meeting, the Measuring Sector heard that Technical Policy U in Pub 14 allows for testing an indicator separate from a measuring element. However, specific test criteria had not been developed for this practice. The Sector heard a recommendation to develop and add specific criteria for testing an indicator separate from a measuring element.

From 2007 to 2010, the California NTEP laboratory worked to develop a checklist, but had received limited input on the drafts. At the 2009 Sector meeting, Dan Reiswig provided an update to the Sector on progress to develop criteria for separate electronic indicators. He reported that the draft checklist provided to the Sector follows the general format of Pub 14 and the main test procedures are at the end of the document. At the 2010 Sector meeting, Mr. Reiswig presented a list of the areas of the checklist that specifically needed further attention and review. Attachments 1 and 2, submitted by Mr. Reiswig, contain the draft checklist and proposed revisions to Technical Policy T.

At its 2011 meeting, the Sector agreed that additional work is needed to finalize the checklist. Mr. Rich Miller (FMC) volunteered to serve as Chair of the Work Group and Sector Technical Advisor, Mr. Marc Buttler (NIST OWM), will assist as needed and monitor progress of work. Work Group members are listed below:

Electronic Indicators Checklist Work Group	
Chair:	Rich Miller, FMC
Members:	Dmitri Karimov, Liquid Controls
	Mike Keilty, Endress and Hauser
Review & Comment:	Mike Frailer, MD W&M
	Allen Katalinic, NC DMS
Technical Advisor:	Marc Buttler, NIST OWM
Established at the October 21-22, 2011 Measuring Sector Meeting	
Technical Advisor's Note, August 2013: Mr. Michael Frailer, MD W&M retired June 2013.	
Mrs. Tina Butcher, NIST, OWM has replaced Marc Buttler, as NIST Technical Advisor.	

The Work Group was asked to address the highlighted sections in the draft checklist from Dan Reiswig (Attachment 1) along with the five points below and submit the finished checklist to the two lab representatives listed above for review and comment.

1) A minimum of 10,000 pulses must be collected. To ensure that there will be a change in the displayed indication for each pulse received, the electronic indication should be scaled such that the value of the smallest indicated division should equate to less than or equal to the value associated with one input pulse.
2) It is important to validate whether ±1 pulse is an appropriate tolerance, taking into consideration applicable OIML requirements.
3) The number of different temperature inputs and API gravity values that would need to be tested to adequately verify the temperature compensation function of an electronic indicator must be determined. Spot checking of three random tables at three different temperatures would be adequate to verify an indicator's temperature compensation feature is functioning properly.
4) The Work Group should add a step in the checklist for checking multipoint calibration along with associated guidance. This guidance should emphasize the necessity of working with the manufacturer of each device in order to set up tests to properly check multipoint calibration using simulated pulses.
5) Addressing various different input signal formats including pulses, analog, and digital communication will be challenging. Analog (4-20 mA) input devices are to be excluded from the scope at this time. The Work Group

is asked to address pulse (frequency) signals in the final version of the checklist and is asked to consider whether or not to also include digital communications.

Also at that meeting, Mr. Miller reported that FMC had a new electronic indicator with frequency input (serial communication was not part of the scope) nearing release and anticipated submitting it for evaluation by the end of 2012. He proposed using the evaluation, applying both the current standards and proposed checklist, to help refine the checklist and CA volunteered to serve as the evaluating laboratory. The Sector agreed with this proposal. During that meeting, Mr. Jack Kiefert volunteered to join the work group.

At the 2012 Sector meeting, FMC reported that, due to a heavy backlog, the CA laboratory was not available to conduct an evaluation prior to the end of January 2013. However, plans are in place for the NC laboratory to conduct an evaluation sometime in December 2012. The Sector agreed to maintain the item on its agenda to allow this work to be completed.

In August 2013, Work Group Chairman, Rich Miller, informed the Technical Advisor that the NC laboratory conducted an evaluation on FMC's new indicator. During the evaluation, Mr. Miller and the NC laboratory evaluators reviewed the checklist and identified some suggested areas for revision.

Recommendation: The Sector will hear an update on the Work Group's progress. Suggested areas for revision and discussion are shown in the version of the draft checklist found in Attachment A to this agenda.

New Items:

2.   Permanence of Markings, LMD Checklist

Source: NTEP Measuring Labs

Recommendation: Modify Section 1. General in the Liquid Measuring Devices Checklist as shown in Attachment B to include specific procedures for evaluating the permanence of marking

Background: At the spring 2013 NTEP Laboratory meeting, the measuring labs noted that the checklist for Digital Electronic Scales of Pub 14 provides detailed information about how to test the permanence of markings on the device. The labs propose replicating this language in the LMD checklist to add clarity for manufacturers and NTEP evaluators.

3.   N.4.2.4. Wholesale Devices, 2013 NCWM S&T Committee Item 330-3

Source: NCWM S&T Committee

Recommendation: At the 2013 NCWM Annual Meeting, the S&T Committee requested assistance and input from the NTEP Measuring Sector on a proposal recommending changes to the requirements for special tests of wholesale meters. The Sector is asked to consider the proposals currently under consideration by the S&T Committee and to provide suggestions on how the Committee might best address the concerns expressed. Attachment C includes an excerpt from the 2013 S&T Committee's Annual Report with full details of the item. An abbreviated summary of the item is included below in the "Background" information.

Background: At the 2013 NCWM Interim and Annual Meetings, the S&T Committee considered a proposal under Item 330-3 on its agenda to modify the requirements for special tests of wholesale meters. The purpose of the proposal is to better align the special test requirements in NIST Handbook 44 with the current testing procedures, measuring practices, and technology changes while maintaining the integrity of the special test.

The Item Under Consideration as currently shown on S&T Committee's agenda is as follows:

Amend paragraph N.4.2.4. as follows:

N.4.2.4. Wholesale Devices. - "Special" tests shall be made to develop the operating characteristics of a measuring system and any special associated or attached elements and accessories.

N.4.2.4.1. Special Test, Type Evaluation. - "Special" tests shall **be made during type evaluation** ~~include a test~~ at the slower of the following rates:

(a) 20 % of the marked maximum discharge rate; or

(b) The minimum discharge rate marked on the device.

Add a new paragraph N.4.2.4.2. as follows:

N.4.2.4.2. Special Test, Field Evaluation. - "Special" tests shall be made during field tests at or near the minimum discharge flow rate developed under the conditions of installation, but not less than the minimum discharge rate marked on the device.

In its deliberations of this item, the S&T Committee heard from the submitter, Mr. Constantine Cotsoradis, Flint Hills Resources, who noted that the current language in NIST Handbook 44 is very restrictive. Even in systems where the flow can be reduced, it is difficult to set the flow and maintain it at the target flow rate over the course of an entire test.

During the 2013 NCWM Interim Meeting, the S&T Committee heard comments expressing concern that, without a test conducted near the minimum flow rate marked on the device, an official or device owner cannot adequately assess the condition of the meter and determine if the device is being properly maintained. The official also needs to be able to verify performance at other flow rates within the range of the meter.

At the 2013 NCWM Annual Meeting The Committee heard similar comments along with comments from NIST OWM regarding the purpose of the special test. The Committee heard additional comments suggesting that details of testing might be better addressed in the NIST Examination Procedure Outlines. The Committee heard additional comments suggesting that details of testing might best be addressed in the NIST Examination Procedure Outlines. Mr. Dmitri Karimov, speaking on behalf of the MMA, expressed concern about testing at flow rates which create pressures exceeding the rated pressure of the meter.

The Committee received the following alternate proposal from Mr. Randy Jennings, TN through the NCWM Online Comment Forum:

N.4.2.4.1. Special Test, Type Evaluation. - "Special" tests shall include a test at the slower of the following rates:

a. **Approximately** 20 % of the marked maximum discharge rate; or
b. The **approximate** minimum discharge rate marked on the device.

At the 2013 Annual Meeting, the Committee received the following alternate proposal from the submitter of the item; this proposal was also supported by Mr. Jennings.

N.4.2.4.2. Special Test, Field Evaluation. – A "Special" test shall be made during field tests at or near the minimum discharge flow rate developed under the conditions of installation, but not less than the minimum discharge rate marked on the device. Additional "Special" tests may be conducted at flow rates down to and including the maximum discharge rate marked on the device.

Given the wide range of questions and concerns raised about the most appropriate way to address this issue, Mr. Michael Keilty (Endress + Hauser), chairman of the NTEP Measuring Sector, recommended that the item be moved to an information status. He suggested asking the Sector to review this issue and provide suggestions to the Committee on how to best address special tests on wholesale devices. This suggestion was supported by several other NCWM members as well as the S&T Committee.

4. Corrections/Editorial for 2014 Pub 14

Source: NTEP Administrator

Background: Several changes that were recommended by the 2013 Measuring Sector and approved by the NCWM NTEP Committee were not correctly implemented in the 2013 Pub 14. These proposed changes are outlined in the following subitems.

    a. Product Families Table, NTEP Technical Policy C – Units Correction

        Recommendation: Modify Technical Policy C. Product Categories and Families for Meters to correct the viscosity units for turbine meters as shown in Attachment D.

        Background: At its 2012 meeting, the Sector agreed to make changes correcting the unit labeling of all references to kinematic viscosity under the turbine meter columns of the Product Families Table in Technical Policy C to centistokes (cSt). Several changes that were recommended by the 2013 Measuring Sector and approved by the NCWM NTEP Committee were not correctly implemented in the 2013 Pub 14. This item is included to correct these inadvertent omissions.

    b. LMD Checklist References for Card Activated Retail Motor-Fuel Dispensers

        Recommendation: Consolidate references to "credit- or debit-card activated" retail motor-fuel dispensers in the "Checklist and Test Procedures for Retail Motor-Fuel Dispensers" and correct references to printed receipt requirements to reflect NIST Handbook 44 language by making the following modifications:

- Delete Sections 7.18 through 7.21 and move this text (with some minor modifications to reflect current NIST Handbook 44 language) to "LMD – Additional Checklists and Test Procedures for Card-Activated Retail Motor-Fuel Dispensers" Section 40. Card-Activated Retail Motor-Fuel Dispensers.

  o Move the preamble to Sections 7.18 through 7.21. to the beginning of the "NTEP LMD Additional Checklists and Test Procedures for Card-Activated Retail Motor-Fuel Dispensers."

  o Create a new "Code Reference G-S.5.1. Indicating and Recording Elements" under "NTEP LMD Additional Checklists and Test Procedures for Card-Activated Retail Motor-Fuel Dispensers," and move the text currently in Sections 7.20 and 7.21 to this new code reference.

  o Create a new Code Reference heading for LMD Code paragraphs S.1.6.7. Recorded Representation and S.1.6.8. Recorded Representations for Transactions Where a Post-Delivery Discount(s) is Provided and insert text from 7.18 through 7.19., modified to reflect current NIST Handbook 44 language in this new reference.

- Delete Section 15. Card Activated Retail Motor-Fuel Dispensers, which is redundant to "LMD – Additional Checklists and Test Procedures for Card-Activated Retail Motor-Fuel Dispensers" Section 40.1 through 40.4

- Delete Section 16. Test Methods for Card-Activated Retail Motor-Fuel Dispensers, which is redundant to"LMD – Additional Checklists and Test Procedures for Card-Activated Retail Motor-Fuel Dispensers" Section 41., Test Methods

See Attachment E for specific proposed changes to the checklist.

c.   LMD Checklist – Checklist and Test Procedures for Cash-Activated RMFDs

Recommendation: Add the following new section at the end of Publication 14 LMD Checklist, Checklist and Test Procedures for Cash-Activated RMFDs to include references to receipt requirements for LMD Code paragraph S.1.6.7. as shown in Attachment F.

Background: In reviewing the references to printed receipt requirements in the LMD and associated checklists, the technical advisor noted that there are no references to the requirements for printed receipts in the section of the Checklist addressing Cash-Activated Dispensers. The proposed changes will make this section consistent with the sections on card-activated RMFDs and for ECRs interfaced with RMFDs.

d.   LMD Checklist – Post-Delivery Discounts – Formatting Change

Recommendation: Modify Publication 14 LMD checklist Code Reference S.1.6.8. as follows to create separate checklist items for each piece of information required on the receipt and to include specific checklist line items for systems that are capable of providing electronic receipts.

Code Reference: S.1.6.8. Recorded Representations for Transactions Where a Post-Delivery Discount(s) is Provided

7.44.   Except for fleet sales and other price contract sales, w~~W~~here a post-delivery discount(s) is(are) applied, the sales receipt must provide: ☐ ~~Yes~~ ☐ ~~No~~ ☐ ~~N/A~~
~~the total quantity, unit price, and total computed price that were displayed on the dispenser at the end of the delivery prior to any post-delivery   discount(s);~~

~~an itemization of the post-delivery discounts to the unit price; and~~

~~the final total price of each fuel sale after all post-delivery discounts are applied~~

7.44.1. the product identity by name, symbol, abbreviation, or code number;

7.44.~~1~~2. the total quantity, unit price, and total computed price that were displayed on the dispenser at the end of the delivery prior to any post-delivery discount(s);   ☐ Yes ☐ No ☐ N/A

7.44.~~2~~3. an itemization of the post-delivery discounts to the unit price; and   ☐ Yes ☐ No ☐ N/A

7.44.~~3~~4. the final total price of each fuel sale after all post-delivery discounts are applied.   ☐ Yes ☐ No ☐ N/A

7.44.5. For systems that are capable of generating electronic receipts, the customer must be given the alternative option of receiving a hard copy receipt in lieu of or in addition to the electronic receipt.   ☐ Yes ☐ No ☐ N/A

Indicate the option(s) available:

☐   Hard Copy or Electronic
☐   Hard Copy and Electronic

Background: The proposed change would assist NTEP laboratories in identify specific areas to be evaluated as part of reviewing the requirements for a receipt specified in NIST Handbook 44 LMD Code paragraph S.1.6.8. These changes also make this checklist item consistent with LMD Checklist Item 7.19.2.

e.   **ECRs Interfaced with RMFDs Checklist, Section 3. Recorded Representations**

Recommendation: Modify the ECRs Interfaced with RMFDs checklist to:

- Make changes to the preamble and other text to be consistent with corresponding requirements for card- and cash-activated RMFDs;
- Add specific references to receipt requirements specified by LMD Code paragraph S.1.6.7, including the option of an electronic receipt;
- Create individual numbered checklist items for each of the three sub-bullets under the requirements for post-delivery discount receipts as specified in LMD Code paragraph S.1.6.8.; and
- Reorganize the order of items by moving the references to paragraph S.1.6.8. to follow those for S.1.6.7.

Specific proposed changes are outlined in Attachment G.

Background: The proposed changes are to ensure consistency with corresponding changes in corresponding sections of the LMD checklist for RMFDs.

5.   **Product Families Table Addition - Dimethylether (DME)**

Source: John Roach (CA NTEP Laboratory)

Background: NTEP has received requests to evaluate metering systems for Dimethylether (DME), which is not currently referenced in the Product Families Table of NCWM Publication 14. The CA NTEP laboratory reports the following regarding this product:

- DME seems to have similar characteristics of propane.
- CA has one client that has an LPG (propane) RMFD which is approved for several different PD meters. PD meters are viscosity sensitive in cP centipoise.
- Pub. 14 states that Propane is 0.098 cP at 60 degrees F.
- DME is not currently referenced in the Pub. 14 and it should be added
- This product may be very popular.
- CA DMS chemists note that DME is being used in other counties for fuel and cooking. You can fill a propane container just like propane with DME.
- The submitting manufacturer provided the following data regarding DME along with relative values for Commercial Propane:
  - Liquid specific gravity at 60 deg = 0.66   Propane = 0.510
  - Vapor specific gravity @ 60F = 1.59   Propane = 1.5
  - Centipose viscosity @ 60F = 0.15   Propane = 0.11

Because this is the first NTEP evaluation of this product and this will set a precedent for how to address this product with regard to any resulting Certificate and its associated coverage, the CA NTEP laboratory wants to ensure that adequate testing is conducted. The CA Laboratory has informed the applicant that testing will need to be conducted

with DME as well as LPG product unless the Measuring Sector and NTEP Committee determine otherwise. However, the question has been posed of whether or not the testing with both products is necessary.

Recommendation: The CA NTEP laboratory has asked that the Measuring Sector review the properties of this product; determine where it best fits within the Product Families Table of NCWM Publication 14; identify required testing parameters; and provide any additional guidelines for evaluating laboratories and manufacturers regarding the NTEP evaluation of meters used in this application.

Additional Items as Time Allows:

If time permits, the NCWM S&T Committee and the NTEP Software Sector would appreciate input from the Measuring Sector on the measuring-related issues that are outlined in the remaining agenda items below. A copy of any regional association modifications or positions will be provided to the Sector when these are made available by the regions.

6. **Appendix D – Definitions: Remote Configuration Capability, NCWM S&T Committee Item 360-7**

Source:
2013 NCWM S&T Committee (2012 Grain Analyzer Sector Meeting Summary)

Background / Discussion:
At its 2012 meeting, the Grain Analyzer Sector agreed to forward a proposal to amend the definition of "remote configuration capability" in NIST Handbook 44 to the S&T Committee for consideration. The following changes were proposed:

> **remote configuration capability. –** The ability to adjust a weighing or measuring device or change its sealable parameters from or through some other device that ~~is not~~ **may or may not** itself **be** necessary to the operation of the weighing or measuring device or ~~is not~~ **may or may not be** a permanent part of that device.[2.20, 2.21, 2.24, 3.30, 3.37, 5.56(a)]

> (Added 1993, **Amended 20XX**)

The Sector noted in their proposal that removable digital storage devices containing the latest grain calibrations can be used in grain moisture meters (GMMs) as either data transfer devices that are not necessary to the operation of the GMM or as data storage devices which are necessary to the operation of the GMM. If removable data storage devices are necessary to the operation of the device, they are not covered by the current definition of remote configuration capability.

A USB flash drive is most likely to be used as a data transfer device. In a typical data transfer application, the USB flash drive is first connected to a computer with access to the GMM manufacturer's web site to download the latest grain calibrations that are then stored in the USB flash drive. The USB flash drive is removed from the computer and plugged into a USB port on the GMM. The GMM is put into remote configuration mode to copy the new grain calibration data into the GMM's internal memory. When the GMM has been returned to normal operating (measuring) mode the USB flash drive can be removed from the GMM.

Although a Secure Digital (SD) memory card could also be used as a data transfer device it is more likely to be used as a data storage device. In a typical "data storage device" application, the SD memory card stores the grain calibrations used on the GMM. The SD memory card must be plugged into an SD memory card connector on a GMM circuit card for the GMM to operate in measuring mode. To install new grain calibrations the GMM must be turned "off" or put into a mode in which the SD memory card can be safely removed. The SD memory card can either be replaced with an SD memory card that has been programmed with the new grain calibrations or the original SD memory card can be re-programmed with the new grain calibrations in much the same way as that described in the preceding paragraph to copy new grain calibrations into a USB flash drive. In either case, the SD memory card containing the new calibrations must be installed in the GMM for the GMM to operate in measuring mode. In that regard, the SD memory card (although removable) can be considered a permanent part of the GMM in that the GMM cannot operate without it.

Note: In the above example SD memory card could be any removable flash memory card such as the Secure Digital Standard-Capacity, the Secure Digital High-Capacity, the Secure Digital Extended-Capacity, and the Secure Digital Input/Output, which combines input/output functions with data storage. These come in three form factors: the original size, the mini size, and the micro size. A Memory Stick is a removable flash memory card format, launched by Sony in 1998, and is also used in general to describe the whole family of Memory Sticks. In addition to the original Memory Stick, this family includes the Memory Stick PRO, the Memory Stick Duo, the Memory Stick PRO Duo, the Memory Stick Micro, and the Memory Stick PRO-HG.

During its Open Hearings at the 2013 NCWM Interim Meeting, the Committee heard comments from Ms. Juana Williams (NIST OWM). OWM suggested the Committee consider this item as a Developing item to allow other Sectors to discuss how a change to the definition may affect other device types of similar design and to consider changes if needed. OWM recognizes that the current definition for "remote configuration capability" may <u>not</u> address those grain moisture meters (GMMs) which can only be operated with a removable data storage device, containing, among other things, the grain calibrations intended for use with the GMM, inserted in the device (as was described by the Grain Analyzer Sector). As such, OWM noted that current sealing requirements were developed at a time when such technology likely didn't exist, nor could be envisioned, and are based on the current definition of remote configuration capability. Because the current definition was never intended to apply to this "next generation" technology, OWM suggested that those charged with further development of this item may wish to revisit the five philosophies of sealing and consider whether a new paragraph, completely separate from current sealing requirements, might be appropriate and a better option, than the one currently proposed. The five philosophies of sealing are included in the 1992 Report of the 77th National Conference on Weights and Measures (Report of the Specifications and Tolerances Committee). Another option, preferred over the changes currently proposed, would be to add a separate statement to the current definition of "remote configuration capability" to address removable storage devices. For example, the following sentence might be considered as an addition to the current definition for "remote configuration capability:"

> **<u>Devices which are programmed using removable media (such as SD cards, flash drives, etc.) that may or may not be required to remain with the device during normal operation are also considered to be remotely configured devices.</u>**

The Committee also heard comments from Dmitri Karimov (LC), speaking on behalf of the MMA, who made two points: (1) Flow computers may already have these capabilities, thus it may be more appropriate to consider adding requirements to the General Code so that the requirements will be uniformly applied to all device types; and (2) the Committee should look ahead and consider other capabilities that may or already have emerged such as wireless communication and configuration.

The Committee acknowledged the comments indicating that the current definition of "remote configuration capability" was developed at a time when certain technologies, such as blue tooth, SD storage devices, flash drives, etc., didn't exist. The Committee recognized that it may be difficult to modify the existing definition and associated requirements to be flexible enough to address emerging and future technologies without having a significant (and possibly detrimental impact) on existing devices. Consequently, rather than modifying the current definition, the Committee concluded that a better approach might be to develop an entirely separate set of security requirements that would apply to emerging technologies. The Committee believes that additional work is needed to develop proposed definition(s) and associated requirements and decided to designate the item as Developmental. The Committee requests other Sectors review the Grain Sector's proposed modification to the definition as well as OWM's suggestions and provide input.

During the 2013 NTEP Laboratory Meeting, the NTEP evaluators were asked if they were aware of or had observed during any of their evaluations of a weighing or measuring device, one which required some form of memory card or data storage device be installed in order for the device to be operational in the measuring or weighing mode. A weighing representative from Measurement Canada reported that he had observed scales having flash drives (some of which were micro in size) that are sealed via physical seal that contain calibration information and possibly even the operating system stored on a card, which must remain in the device in order for the device to be operational. The US NTEP evaluators (i.e., on both the weighing and measuring side) reported they had no knowledge of such technology being used in devices they had evaluated, but they also acknowledged that it could have been present without them noticing it during the evaluation process.

At the 2013 NCWM Annual meeting, OWM reiterated comments it made at the 2013 Interim meeting suggesting that it may be appropriate to develop separate requirements to address new and future technologies which can be remotely configured with removable media. OWM indicated it plans to develop draft language and request input from the various sectors at their upcoming meetings. Two additional comments were made in support of possibly including requirements in the General Code of NIST Handbook 44 to address newer and emerging technologies.

Additional background information relative to this item can be found in *2013 NCWM Publication 16* at:
http://www.ncwm.net/resources/dyn/files/1025938z8fff0401/_fn/2013_ST_Pub16.pdf

Recommendation:
The Sector is asked to identify the various types of removable storage media (e.g., USB flash drives, SD memory cards, etc.) currently in use with measuring equipment and explain the functionality of that media. OWM anticipates possibly using the information provided by the Sector to develop some draft proposals to amend NIST Handbook 44 to adequately address the security of the metrological significant parameters of devices using such media. Members of the Sector may wish to review *NCWM Publication 14 LMD Technical Policy, Checklists, and Technical Procedures, Appendix B Requirements for Metrological Audit Trails* prior to the Sector meeting to refresh their understanding of the various acceptable means of providing security.

7.   Identification of Certified Software

Source: NTEP Software Sector

Background: This item originated as an attempt to answer the question "How does the field inspector know that the software running in the device is the same software evaluated and approved by the lab?" In previous meetings it was shown that the international community has addressed this issue (both WELMEC and OIML).

At the 2012 NTETC Software Sector Meeting, there was some discussion as to where the terminology regarding inextricably linking the software version or revision to the software itself belonged.   The Sector recommended adding the following to *NCWM Publication 14* and forward to NTETC Weighing, Measuring, Grain Analyzer Sectors for feedback:

Identification of Certified Software:
Note: Manufacturers may choose to separate metrologically significant software from non-metrologically significant software. Separation would allow the revision of the non-metrological portion without the need for further evaluation. In addition, non-metrologically significant software may be updated on devices without breaking a seal, if so designed. Separation of software requires that all software modules (programs, subroutines, objects etc.) that perform metrologically significant functions or that contain metrologically significant data domains form the metrologically significant software part of a measuring instrument (device or sub-assembly). If the separation of the software is not possible or needed, then the software is metrologically significant as a whole. The conformity requirement applies to all parts and parts shall be marked according to Section G-S-X.X.

The manufacturer must describe and possibly demonstrate how the version or revision identifier is directly and inseparably linked to the metrologically significant software. Where the version revision identifier is comprised of more than one part, the manufacturer shall describe which portion represents the metrological significant software and which does not.

Recommendation:
The Software Sector is requesting feedback on the following language developed by the Software Sector in 2012 for possible future inclusion into NCWM Publication 14 Weighing Devices, DES pages 22-23, Section 3. Additional Marking Requirements – Not Built-for-Purpose Software-Based Devices:

Identification of Certified Software:

Note: Manufacturers may choose to separate metrologically significant software from non-metrologically significant software. Separation would allow the revision of the non-metrological portion without the need for further evaluation. In addition, non-metrologically significant software may be updated on devices without breaking a seal, if so designed. Separation of software requires that all software modules (programs, subroutines, objects etc.) that perform metrologically significant functions or that contain metrologically significant data domains form the metrologically significant software part of a measuring instrument (device or sub-assembly). If the separation of the software is not possible or needed, then the software is metrologically significant as a whole. The conformity requirement applies to all parts and parts shall be marked according to Section G-S-X.X.

The manufacturer must describe and possibly demonstrate how the version or revision identifier is directly and inseparably linked to the metrologically significant software. Where the version revision identifier is comprised of more than one part, the manufacturer shall describe which portion represents the metrological significant software and which does not.

8. Software Protection/Security

Source:
NTEP Software Sector

Background
The Sector agreed that *NIST Handbook 44* already has audit trail and physical seal, but these may need to be enhanced.

From the WELMEC Document:

Protection against accidental or unintentional changes
Metrologically significant software and measurement data shall be protected against accidental or unintentional changes.

Specifying Notes:
Possible reasons for accidental changes and faults are: unpredictable physical influences, effects caused by user functions and residual defects of the software even though state of the art of development techniques have been applied.

This requirement includes consideration of:

a) Physical influences: Stored measurement data shall be protected against corruption or deletion when a fault occurs or, alternatively, the fault shall be detectable.

b) User functions: Confirmation shall be demanded before deleting or changing data.

c) Software defects: Appropriate measures shall be taken to protect data from unintentional changes that could occur through incorrect program design or programming errors, e.g. plausibility checks.

Required Documentation:
The documentation should show the measures that have been taken to protect the software and data against unintentional changes.

Example of an Acceptable Solution:
- The accidental modification of software and measurement data may be checked by calculating a checksum over the relevant parts, comparing it with the nominal value and stopping if anything has been modified.
- Measurement data are not deleted without prior authorization, e.g. a dialogue statement or window asking for confirmation of deletion.
- For fault detection see also Extension I.

The Sector continued to develop a proposed checklist for *NCWM Publication 14*. The numbering will still need to be added. This is based roughly on R 76 – 2 checklist and discussions beginning as early as the October 2007 NTETC Software Sector Meeting. The information requested by this checklist is currently voluntary, however, it is recommended that applicants comply with these requests or provide specific information as to why they may not be

able to comply. Based on this information, the checklist may be amended to better fit with NTEP's need for information and the applicant's ability to comply.

The California, Maryland and Ohio laboratories agreed to use this check list on one of the next devices they have in the lab and report back to the Sector on what the problems may be. In February 2011, the North Carolina laboratory was also given a copy of the check list to try.

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1. Devices with ~~Embedded~~ Software ~~TYPE P (aka built-for-purpose)~~

1.1. Declaration of the manufacturer that the software is used in a fixed hardware and software environment. **AND**   ☐ Yes ☐ No ☐ N/A

1.2. Cannot be modified or uploaded by any means after securing/verification.   ☐ Yes ☐ No ☐ N/A
Note: It is acceptable to break the "seal" and load new software, audit trail is also a sufficient seal.

1.3 The software documentation contains:

    1.3.1. Description of all functions, designating those that are considered metrologically significant.   ☐ Yes ☐ No ☐ N/A

    1.3.2. Description of the securing means (evidence of an intervention).   ☐ Yes ☐ No ☐ N/A

    1.3.3. Software Identification, ==including version / revision==   ☐ Yes ☐ No ☐ N/A

    1.3.4. Description how to check the actual software identification.   ☐ Yes ☐ No ☐ N/A

1.4. The software identification is:

    1.4.1. Clearly assigned to the metrologically significant software and functions.   ☐ Yes ☐ No ☐ N/A

    1.4.2. Description how to check the actual software identification.   ☐ Yes ☐ No ☐ N/A

    1.4.3. Provided by the device as documented.   ☐ Yes ☐ No ☐ N/A

    1.4.4. ==Directly linked to the software itself.==   ☐ Yes ☐ No ☐ N/A

2. ~~Personal Computers, Instruments with PC Components, and Other Instruments, Devices, Modules, and Elements with Programmable or~~ Loadable Metrologically Significant Software ~~TYPE U (aka not built-for-purpose)~~

2.1. The metrologically significant software is:

    2.1.1. Documented with all relevant (see below for list of documents) information.   ☐ Yes ☐ No ☐ N/A

    2.1.2. Protected against accidental or intentional changes.   ☐ Yes ☐ No ☐ N/A

2.2. Evidence of intervention (such as, changes, uploads, circumvention) is available until the next verification / inspection (e.g., physical seal, Checksum, ==Cyclical Redundancy Check (==CRC==)==, audit trail, etc. means of security).   ☐ Yes ☐ No ☐ N/A

3. Software with ~~Closed Shell (~~no access to the operating system and/or programs possible for the user~~)~~

3.1. Check whether there is a complete set of commands (e.g., function keys or commands via external interfaces) supplied and accompanied by short descriptions.   ☐ Yes ☐ No ☐ N/A

3.2. Check whether the manufacturer has submitted a written declaration of the completeness of the set of commands.   ☐ Yes ☐ No ☐ N/A

4. Operating System and / or Program(s) Accessible for the User

4.1 Check whether a checksum or equivalent signature is generated over the machine code of the metrologically significant software (program module(s)   ☐ Yes ☐ No ☐ N/A

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subject to legal control Weights and Measures jurisdiction and type-specific parameters).

4.2 Check whether the metrologically significant software will detect and act upon any unauthorized alteration of the metrologically significant software using simple software tools (e.g., text editor). ☐ Yes ☐ No ☐ N/A

5. Software Interface(s)

5.1 Verify the manufacturer has documented:

5.1.1. The program modules of the metrologically significant software are defined and separated. ☐ Yes ☐ No ☐ N/A

5.1.2. The protective software interface itself is part of the metrologically significant software. ☐ Yes ☐ No ☐ N/A

5.1.3. The functions of the metrologically significant software that can be accessed via the protective software interface. ☐ Yes ☐ No ☐ N/A

5.1.4. The parameters that may be exchanged via the protective software interface are defined. ☐ Yes ☐ No ☐ N/A

5.1.5. The description of the functions and parameters are conclusive and complete. ☐ Yes ☐ No ☐ N/A

5.1.6. There are software interface instructions for the third party (external) application programmer. ☐ Yes ☐ No ☐ N/A

The Maryland laboratory had particular questions regarding 3.1 and 5.1. The information for 3.1 could be acquired from an operator's manual, a training video, or in-person training. The items in 5.1 were confusing to the evaluators. The terminology is familiar to software developers, but not necessarily others. It was indicated that manufacturers were typically quick to return the filled out questionnaire, but he didn't know how his laboratory was supposed to verify that it was true. Generally, the laboratories wouldn't be expected to verify things to that level. For example, if the manufacturer states that a checksum is used to ensure integrity, the laboratories wouldn't be expected to evaluate the algorithm used.

The intent was to see whether the manufacturer had at least considered these issues, not for evaluators to become software engineers. Perhaps a glossary or descriptive paragraphs might be added to assist the evaluators for if the manufacturer has questions for the evaluators.

OIML makes use of supplementary documents to explain the checklist they use. Below are links:
http://www.oiml.org/publications/D/D031-e08.pdf
http://www.welmec.org/latest/guides/72.html
http://www.welmec.org/fileadmin/user_files/publications/2-3.pdf

WELMEC document 2.3 is the original source for our checklist, but it's been significantly revised and simplified. Mr. Payne, Maryland Department of Agriculture, is going to review the other documents and come up with some suggestions for the checklist. Mr. Roach, California Division of Measurement Standards, is going to begin using the checklist. The international viewpoint is that any device running an operating system is considered to be Type U. Mr. Roach mentioned that they're having lots of problems with "skimmers" stealing PIN's. Is there some way they can detect this?

Mr. Lewis, Rice Lake Weighing Systems, Inc., mentioned that he liked Measurement Canada's website. When answering similar questions, different pages would appear, based on answers to those questions:
http://www.ic.gc.ca/eic/site/mc-mc.nsf/eng/lm00573.html

At the 2011 NTETC Software Sector Meeting, the laboratories were polled to obtain any feedback on the use of the checklist. Maryland attempted to use this checklist a few times. They had some difficulty obtaining answers from

the manufacturers because the individual(s) interacting with the Maryland evaluator didn't always have the required information on hand. More experience in using the checklist will help determine what needs to be revised.
It was suggested that the checklist could be sent to manufacturers for their feedback as well, with the stipulation that it a completely voluntary exercise and purely informational at this point. The laboratories will coordinate with willing manufacturers to obtain feedback.
Work is ongoing on this item with the intent that it eventually will be incorporated as a checklist in *NCWM Publication 14*; again the laboratories are requested to try utilizing this checklist for any evaluations on software-based electronic devices.

The checklist has been reviewed with an eye to making its terminology clearer to laboratories. Some examples and clarifications have been added as shown in the discussion section of this item. The revised checklist will be distributed to the laboratories for additional review. Maryland and California laboratories agreed to use the checklist on a trial basis.

Discussion:
Over the past year, attempts to use the current checklist did not meet with many difficulties. The checklists were given to the manufacturers to fill out, and that seemed to work rather well. Minor modifications (in red above) were made to clarify certain confusing areas or eliminate redundancy.

*Recommendation***:**
The Software Sector is recommending that each NTETC Sector consider adding the proposed software checklist (shown in the table above) to their respective and appropriate NCWM Publication 14 device checklists. Thus, the WS is to consider whether or not it is appropriate to add the proposed software checklist to Publication 14, and if so, to which of the checklists within Pub 14 Liquid Measuring Devices it is be included (for example, LMD General, RMFD, ECR-LMD, etc.).

9.   Software Maintenance and Reconfiguration

Source:
NTEP Software Sector

Background:
After the software is completed, what do the manufacturers use to secure their software? The following items were reviewed by the Sector. *Note that agenda Item 3 also contains information on Verified and Traced updates and Software Log.*

1.   Verify that the update process is documented (OK)
2.   For traced updates, installed Software is authenticated and checked for integrity
    Technical means shall be employed to guarantee the authenticity of the loaded software (i.e. that it originates from the owner of the type approval certificate). This can be accomplished (e.g. by cryptographic means like signing). The signature is checked during loading. If the loaded software fails this test, the instrument shall discard it and either use the previous version of the software **or become inoperative**.
    Technical means shall be employed to guarantee the integrity of the loaded software i.e. that it has not been inadmissibly changed before loading. This can be accomplished e.g. by adding a checksum or hash code of the loaded software and verifying it during the loading procedure. If the loaded software fails this test, the instrument shall discard it and either use the previous version of the software **or become inoperative**.
    Examples are not limiting or exclusive.
3.   Verify that the sealing requirements are met
    The Sector asked, What sealing requirements are we talking about?
    This item is **only** addressing the **software update**, it can be either verified or traced. It is possible that there are two different security means, one for protecting software updates (software log) and one for protecting the other metrological parameters (Category I II or III method of sealing). Some examples provided by the Sector members include but are not limited to:
    Physical Seal, software log
    Category III method of sealing can contain both means of security

4.   Verify that if the upgrade process fails, the device is inoperable or the original software is restored

The question before the group is, Can this be made mandatory?
The manufacturer shall ensure by appropriate technical means (e.g. an audit trail) that traced updates of metrologically significant software are adequately traceable within the instrument for subsequent verification and surveillance or inspection. This requirement enables inspection authorities, which are responsible for the metrological surveillance of legally controlled instruments, to back-trace traced updates of metrologically significant software over an adequate period of time (that depends on national legislation). The statement in italics will need to be reworded to comply with US weights and measures requirements.

The Sector **agreed** that the two definitions below for Verified update and Traced update were acceptable.

Verified Update
A verified update is the process of installing new software where the security is broken and the device must be re-verified. Checking for authenticity and integrity is the responsibility of the owner/user.

Traced Update
A traced update is the process of installing new software where the software is automatically checked for authenticity and integrity, and the update is recorded in a software update log or audit trail.

Note: It's possible that the Philosophy of Sealing section of NCWM Publication 14 may already address the above IF the definitions of Verified and Traced Updates (and the statement below) were to be added. The contrary argument was that it may be better to be explicit).

<u>Use of a Category 3 audit trail is required for a Traced Update. A log entry representing a traced software update shall include the software identification of the newly installed version.</u>

The Sector recommended consolidating the definitions with the above statement thus:

Verified Update
A verified update is the process of installing new software where the security is broken and the device must be re-verified. Checking for authenticity and integrity is the responsibility of the owner/user.

Traced Update
A traced update is the process of installing new software where the software is automatically checked for authenticity and integrity, and the update is recorded in a ~~software update log or~~ Category 3 audit trail. The audit trail entry shall include the software identification of the newly installed version.

In 2012, the Sector recommended that as a first step, the following be added to *NCWM Publication 14*:

<u>The updating of metrologically significant software, including software that checks the authenticity and integrity of the updates, shall be considered a sealable event.</u>

Mr. Truex, NTEP Administrator, indicated his opinion that the above sentence is unnecessary since it's self-evident. It was agreed by the group however to ask the other sectors for feedback on the value of this addition.
Though the Sector is currently considering only the single sentence be incorporated into *NCWM Publication 14* for the time being, ultimately, the Sector may wish to advance the remaining language of the original item submission.

Discussion:
The Sector had no information indicating that the other Sectors had yet been approached for feedback on the value of the addition of the proposed sentence.

Recommendation:
The Software Sector is requesting each of the NTETC Sectors review and provide feedback on the following draft language it developed for consideration of adding it to NCWM Publication 14:

<u>The updating of metrologically significant software, including software that checks the authenticity and integrity of the updates, shall be considered a sealable event.</u>

Should the MS agree this language is appropriate, it might then consider where within Publication 14 Liquid-Measuring Devices this sentence should be inserted. The Sector might consider including it in the appropriate sealing sections of Publication 14 relating to audit trails. For example:

- LMD Checklist:
  - General, Section 2. Graduations, Indications and Recorded Representations, Code Reference G-S.8.
  - RMFDs, Section 9. Measuring Elements, Code Reference S.2.2. Provision for Sealing and Code Reference: S.2.2.1. Multiple Measuring Devices with a Single Provision for Sealing
  - Wholesale & Loading Rack Meters, Section 19. Measuring Elements, Code Reference S.2.2. Provision for Sealing and Code Reference: S.2.7.3. Provision for Sealing - Automatic Temperature Compensation
  - Vehicle-Tank Meters, Section 26. Measuring Elements, Code Reference S.2.2. Provision for Sealing and Code Reference: S.2.6.2. Provision for Sealing
  - LPG & NH3 Meters, Section 31. Measuring Elements, Code Reference S.2.2. Provision for Sealing
  - Mass Flow Meters, Section 36. Measuring Elements, Code Reference: S.3.5. Provision for Sealing
  - Water Meters Checklist, Section 45 Measuring Elements, Code Reference: S.2.1. Provision for Sealing
  - Hydrogen Gas Measuring Devices, Section 51. Design of Measuring Elements and Measuring Systems, Code Reference: S.3.3. Provision for Sealing
  - LMD Checklist Appendix B Requirements for Metrological Audit Trails

- ECR-LMD Checklist
  - Section 4. Provisions for Sealing, Code Reference: G-S.8. Provision for Sealing Electronic Adjustable Components

The Software Sector is also requesting feedback from the other NTETC Sectors regarding whether or not additional language such as the following is needed in Publication 14 to make clear that an existing audit trail should be protected during a software update. In the background information provided for this item, it was noted that the Software Sector noted that this does already seem to be addressed in the Requirements for Metrological Audit Trails in Publication 14.

1. The audit trail data shall be:

3.5.1.1.1. Stored in non-volatile memory and shall be retained for at least 30 days if power is removed from the device. **AND**

3.5.1.1.2. Protected from unauthorized erasure, substitution, or modification.

10. LNG Metering Applications

Source: Michael Keilty, Chairman, NTEP Measuring Sector

Background: The number of LNG dispensing applications is growing in the U.S. NIST Handbook 44 does not specifically address this application and many questions have come up regarding the requirements for metering devices at both retail level and also for large capacity and wholesale applications. Likewise, there are many questions about the appropriate testing procedures and criteria for these applications. Questions about this application have arisen within OIML R-117 discussions and Canada has a draft regulation for dispensing LNG already developed. NIST has begun reviewing proposed approaches for addressing LNG within NIST Handbook 44; however, does not have any specific proposals for consideration at this point.

Recommendation: While there is no specific recommendation for the Sector to consider, the Sector is asked to provide input on how to best address this product in NIST Handbook 44 and NCWM Publication 14 as well as for suggestions on proposed testing criteria. Additional information may be provided by Mr. Keilty at the Sector Meeting.