National Type Evaluation Program (NTEP)
Measuring Sector

Annual Meeting
October 3-4, 2017 Houston, Texas

Meeting Agenda

Appendixes:

Appendix A: Proposed Changes to Field Evaluation and Permanence Tests for Mass Flow Meters – Agenda Item 4

Glossary of Acronyms			
CC	Certificate of Conformance	NTETC	National Type Evaluation Technical Committee
DMS	Division of Measurement Standards	OIML	International Organization of Legal Metrology
ECR	Electronic Cash Register	OWM	Office of Weights and Measures (NIST)
EVFS	Electric Vehicle Fueling Systems	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
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. Transfer Standards Testing - NIST HB 44 Section 3.32. LPG & NH_3 Liquid-Measuring Devices Code and Section 3.37. Mass Flow Meters Code.

Source: Michael Keilty, Endress + Hauser Flowtec AG; *[2014 NCWM S&T Item 332-2 (D)] and [2014 NCWM S&T Item 337-3 (D)] and 2015 and 2016 Measuring Sector Meetings*

Recommendation: At its 2015 and 2016 annual meetings, the Sector was asked to provide input on two proposals being developed by Mr. Michael Keilty (Endress + Hauser Flowtec AG). These items appeared on the 2014 through 2017 NCWM S&T Agendas, most recently appearing as Items 3302-1 N.3. Test Drafts (LPG & NH_3 Code) and Item 3307-1 N.3. Test Drafts (Mass Flow Meters Code).

These proposals recommend the addition of a paragraph to the "Notes" section of the LPG and Anhydrous Ammonia Liquid-Measuring Devices Code and the Mass Flow Meters Code specifying the size of the test draft when using a "transfer standard." The current proposal is outlined below:

Amend NIST Handbook 44 LPG and Anhydrous Ammonia Liquid-Measuring Devices as follows:

N.3. Test Drafts. –

N.3.1 Minimum Test - Test drafts should be equal to at least the amount delivered by the device in one minute at its normal discharge rate.
(Amended 1982 **and 2017**)

N.3.2. Transfer Standard Test. – The minimum quantity for any test draft shall be equal to or greater than the amount delivered in one minute at the flow rate being tested.

Amend NIST Handbook 44 Mass Flow Meters Code as follows:

N.3. Test Drafts. –

N.3.1 Minimum Test - The minimum test shall be one test draft at the maximum flow rate of the installation and one test draft at the minimum flow rate. More tests may be performed at these or other flow rates. (See T.3. Repeatability.)
(Amended 1982)

N.3.2. Transfer Standard Test. – The minimum quantity for any test draft shall be equal to or greater than the amount delivered in one minute at the flow rate being tested.

Background: At its 2014 meeting, the Measuring Sector was asked to discuss and comment on two proposals that were submitted to the four regional weights and measures associations in Fall 2014. These proposals would amend NIST Handbook 44, LPG and Anhydrous Ammonia Liquid-Measuring Devices and Mass Flow Meters codes, Notes Section, Test Drafts, to allow transfer standards (master meters) to test and place into service. The Sector thoroughly discussed and vetted this item. There was extensive discussion about the transfer standard (also referred to as a "master meter") itself, such as:

- The need for the master meter to be a superior standard to the meter being examined;
- Verification procedures including the proper reference weighing device's capacity and division size;
- The need to maintain control charts on the master meter;
- Frequency of re-verification for the master meter;
- The need to develop NIST Handbook 105 series specifications, test procedures, and tolerances for "master meters;"
- Development of criteria and the ability of the master meter to assure legal traceability; and
- Training staff in the correct use of master meters in field applications; etc.

The Sector agreed that transfer standards are valuable in verifying measuring systems that are not readily tested with conventional test methods. Examples include measuring systems used to measure products such as CNG, LNG, viscous products, corrosive products, and other products whose physical properties create challenges in testing. The Sector supported moving these proposals forward as "Voting" items.

At the Sector's 2015 Meeting, this issue was again discussed and the Sector reached the following decision.

After lengthy discussion on this issue, the Sector did not reach any conclusions on this proposal to share with the submitter or with the S&T Committee. The Sector reiterated points made during its 2014 meeting (see "Background" section earlier in this item). Additionally, while the Sector does not have specific recommendations regarding the proposal, the following "observations" might be useful for further work on this issue.

- The use of master meters has particular appeal for use in testing devices such as CNG metering systems where factors such as product type, safety, environmental factors, and the availability of equipment pose special challenges.

- Use of gravimetric testing for CNG has been reported to pose challenges such as returning/disposing of product; procuring a suitable scale and test tank; and controlling environmental influences that may affect testing results.

- Field standards must comply with the general criteria in NIST Handbook 44, Appendix A, Fundamental Considerations includes general criteria for field standards.

- Recognition of transfer standards in NIST Handbook 44 does not, by itself, ensure recognition or acceptance of these devices as an acceptable test method.

- Specific types of field standards do not have to be specifically identified in NIST Handbook 44 in order for a weights and measures jurisdiction to recognize their use in testing measuring devices.

- Additional provisions must be in place to ensure traceability of measurements using a transfer standard as an official test method. Examples include documentary standards for the field standard (e.g., NIST Handbook 105 applicable to the standard); training for laboratory metrologists in the testing of the field standard; control procedures to ensure continued performance of the transfer standard; training of field staff in the use of the transfer standard; and control procedures for maintaining the master meter.

- A master meter must perform better than the meter under test.

The Sector noted that the selection of appropriate test methods for type evaluation is an issue that is often faced by NTEP evaluating laboratories. The Sector agreed that guidelines on determining an appropriate test method(s) for an evaluation would be helpful to both the laboratories and manufacturers. Several Sector members including the following expressed an interest in working together to develop such guidelines for inclusion in Publication 14:

Marc Buttler, Emerson Process Management/Micro Motion
John Roach, CA Division of Measurement Standards
Michael Keilty, Endress + Hauser Flowtec AG, USA
Tina Butcher, NIST OWM

This subgroup agreed to bring any recommendations it develops back to the Sector at its 2016 meeting as a carryover item, either as part of the H44 item or as a separate item for type evaluation criteria.

At the 2015 and 2016 NCWM Interim and Annual Meetings, the S&T Committee discussed both of the proposals in the "Recommendation" as a single item. The Committee heard comments from the submitter along with a list of benefits to using a master meter as the standard in testing meters used in applications to measure CNG, LNG, and LPG in comparison to using volumetric or gravimetric standards. The Committee also heard a number of comments, which were reiterated and summarized at its 2015 Annual Meeting regarding additional issues that must be carefully considered. See the Committee's 2016 Interim Report for details on discussions leading up to the 2016 NCWM

Annual Meeting. At the NCWM Annual Meeting, the S&T Committee agreed to maintain these two items as developing items to allow the submitter time to address the comments received.

At the 2016 Sector Meeting, the Sector heard an update on progress on these two S&T items. Sector Chairman, Michael Keilty (Endress + Hauser) noted that those items were previously "Voting" items on the NCWM S&T Committee's agenda, but are now "Developing" items to allow additional discussion and input to be gathered. A number of comments were made at the NCWM Annual meeting regarding the proposals before the S&T Committee. Several Sector members concurred that additional development is needed, including how to establish and demonstrate a sufficient degree of accuracy in the test method. Tina Butcher noted that there was an issue regarding the presentation of proposed language in NCWM Publication 15 and 16 versus the language that was originally submitted by the submitter and noted that the S&T Committee is working with the submitter for clarification on this point. Other more technical issues with the proposal were the need to clarify the type of transfer standard being referenced and the associated error and uncertainty with the test method. Mrs. Butcher, Randy Moses (Wayne), and others noted that there did not appear to be any opposition to the concept of recognizing transfer standards, only that additional work is needed on the technical concerns that have been raised and the language before the item is ready for adoption. Marc Buttler (Micro Motion) also noted that there is still a need to address the flow rates and times referenced and commented that he had made a proposal from the floor of the NCWM to specify a time of 2 minutes at the maximum operating flow rate. Mrs. Butcher noted that an additional concern about the proposed language for the Mass Flow Meters Code is that, as currently presented, it would not allow testing of compressed natural gas metering systems at the lower flow rates in accordance with the NTEP Examination Procedure Outline for those systems.

Recommendation: The Sector is asked for any additional input that might be of assistance to the S&T Committee and the submitter in its deliberations on Items 3302-1 N.3. Test Drafts (LPG & NH_3 Code) and Item 3307-1 N.3. Test Drafts (Mass Flow Meters Code).

2. Master Meters as an Option for NTEP Testing

Source: Emerson Processing

Background Information: "Master Meters" are often considered as an option for reference standards to facilitate testing of devices during NTEP evaluation and/or field inspection. NCWM Pub 14 could provide valuable information in the form of guidance on how to ensure that master meters are properly calibrated and qualified as reference standards. Additional information about the proper use, including minimum draft size would also be valuable to add to Pub 14.

In considering other alternatives to address the problem, the submitter made note that Section I currently provides this type of information for gravimetric test methods. However, for reasons that include a need for increased safety, environmental stewardship, and immunity to ambient and weather conditions, Master Meters are a desirable alternative to weigh scales in certain applications, especially CNG dispenser testing.

The Sector initially discussed this issue in conjunction with a carryover item from the Sector's 2015 agenda regarding the development of guidance for the NTEP Laboratories to use in assessing the appropriateness of transfer standards and other alternative test methods during type evaluation testing. Mr. Buttler noted that he developed proposed criteria drawing on "essential elements of traceability" identified by NIST OWM's Laboratory Metrology Program and circulated a draft guidelines document to the Sector the night before this Sector meeting. Several members noted that they did not feel that they had adequate time to review the document before commenting on it, and Mr. Keilty suggested that the document be re-distributed to other Sector members for review and comment. Mrs. Butcher suggested that the small group established at the last Sector meeting continue to work on this issue, noting that the group hadn't had the opportunity to devote much time to the issue since the last Sector meeting.

Mrs. Butcher also suggested that the Sector consider breaking out the criteria in the draft guidelines to address specific metering technologies, starting with the use of mass flow meters used as transfer standards and, once that language and associated guidelines have been adequately developed, then move on to the use of other technologies. Mr. Buttler noted that the draft guidelines he has been working on for type evaluation could also be used in routine field inspections.

At the end of the 2016 Sector meeting, Sector members were generally in support of the concept of using transfer standards for both type evaluation testing and routine field tests, but acknowledged that additional development and details are needed for both the guidelines for NTEP evaluations and the items before the NCWM S&T Committee. The Sector agreed that the draft document developed by Mr. Buttler should be reviewed by Sector members and all Sector members should provide input on the draft to the small working group established in 2015. The Sector also agreed that the small group and the NTEP laboratories should continue to work on the guidelines and present an updated draft to the Sector for review by the next Sector meeting. A draft was distributed to the Sector via the NCWM Measuring Sector List Serve following the meeting.

Immediately after the 2016 Sector meeting, Mr. Buttler formally submitted this information on a Form 15 for consideration at the next Sector Meeting.

Recommendation: The Sector is asked to consider recommending that Section I. Field Evaluation and Permanence Tests for Mass Flow Meters be modified as shown in Appendix A to this agenda.

3. LMD & VTM Codes - Verification of Linearization Factors (S&T 330-3 and S&T 331-4)

Source: Carryover Item from 2016 Measuring Sector Meeting

Background: At its 2016 Annual Meeting, the NCWM adopted the following changes to the LMD Code and the VTM Code to add a test note pertaining to the testing of metering systems using linearization factors. A corresponding user requirement was added to each code to describe the user's responsibilities when making adjustments to systems with these capabilities.

LMD Code:

N.4.5. Verification of Linearization Factors. - All enabled linearization factors shall be verified. The verification of enabled linearization factors shall be done through physical testing, or a combination of physical testing and empirical analysis at the discretion of the official with statutory authority.

VTM Code:

N.4.6. Verification of Linearization Factors. - All enabled linearization factors shall be verified. The verification of enabled linearization factors shall be done through physical testing, or a combination of physical testing and empirical analysis, at the discretion of the official with statutory authority.

The submitter of these items also worked with a group of experts in the community to develop a document providing guidance on conducting an empirical analysis and presented the document to the S&T Committee for consideration. A copy of this document was included in Appendix C to the Sector's 2016 meeting summary and is titled "Guidance on Empirical Analysis." Comments received suggested getting additional input from the community on the guidance document, including input from the Measuring Sector, and providing the final document to NIST for incorporation in metering Examination Procedure Outlines as appropriate.

At its 2016 meeting, the Sector was asked to discuss whether additional criteria are needed for addition to Pub 14 with regard to the evaluation of systems including linearization factors, possibly in the Field Evaluation and Permanence Testing for Metering Sections of the LMD Checklist as outlined below.

Presently the only references in the checklist regarding linearization are a reference to the inclusion of multi-point calibration capability as a feature on a CC where applicable (See Technical Policy Section A. Type Evaluation Test Location, Installations Criteria, and Certificate of Conformance) and Technical Policy Section G. Range of Data Points (see below).

F. Range of Data Points

The number and types of tests to be run on devices covered under this checklist are specified in the Checklist and Test Procedures section and the Field Evaluation and Permanence Tests for Metering Systems section of this checklist. However, if the NTEP laboratory feels that there is a performance or other *NIST Handbook 44* related problem and provides reasons to support this belief, the laboratory is given the latitude to require additional testing.

A measuring element may use factory-established linearization curves to establish the minimum flow range (5:1, 10:1, or as required), providing the linearization programming is installed during manufacturing and the programming cannot be altered after leaving the factory.

Auxiliary equipment (e.g., indicator or register) with programmable multi-point calibration that alters the output signal from the measuring element to extend the flow range of the system beyond the measuring element's required minimum flow range may be used and the auxiliary device's multi-point calibration will be noted on the Certificate of Conformance and must be marked on the meter.

The Sector was also asked to review the guidance document "Guidance on Empirical Analysis" and provide input on its contents.

The Sector acknowledged that the guidelines were developed for use in routine field testing rather than for type evaluation and that the criteria might be useful to include in relevant NIST EPOs. Some members suggested that a clear explanation of how to translate a meter factor into a meter error so that officials are able to appropriately assess the result of different meter factors through the flow range of a system would be useful, and the Sector suggested that additional explanation be provided in the guidance document regarding how to compare meter factors. Individual Sector members were also encouraged to provide comments on the guidance document to the Technical Advisor and to the Chairman of the Work Group that developed the document.

Several NTEP Laboratory representatives commented that it would be beneficial to have something in Publication 14 to describe how to handle multi-point calibration capability during type evaluation. Several Sector members noted that there are differences in how various systems and technologies handle linearization. Rich Miller (FMC) shared a copy of Measurement Canada's Approval Procedure for Linearization Functions Incorporated in Measuring Instruments and suggested that the Sector consider this in its assessment. He expressed concern about how poor performance of a particular meter could reflect negatively on the performance of an indicator. Mrs. Butcher noted that there are two issues for the Sector to consider: (1) The group that developed the guidance document *for use in routine field testing* submitted to the NCWM in July 2016 would appreciate feedback from people with expertise in metering systems, particularly the Measuring Sector members; and (2) There appears to be a need to further define/document how linearization capability is addressed in type evaluation with regard to how the feature will be evaluated so that there is consistency among type evaluations.

At the conclusion of the Sector's 2016 discussions on this item, Sector members were asked to review the guidelines presented by the small working group that presented the draft guidelines to the NCWM and provide input as it applies to field testing.

The Sector agreed that more definitive criteria is needed in Publication 14 to define how linearization factors are to be addressed during type evaluation. The labs currently address this feature in the same way, but agree it needs to be documented.

The Sector acknowledged that there is a document from Measurement Canada that could form the basis for these criteria. The Sector also noted that there is a draft checklist for indicators that is close to completion and that this type of criteria might be included in that document. Several members volunteered to work on finalizing this checklist and including criteria for evaluating indicators with linearization features.

The following members agreed to work on this project:

- Rich Miller (FMC)
- Allen Katalinic (NC)
- Joe Eccleston (MD)

Allen and Rich agreed to co-chair the group. Others who are interested in working on this are encouraged to contact Allen.

The Sector agreed that this item should be included as a carryover item and that this group will work on finalizing the electronic indicators checklist, including additional guidance on linearization features.

Recommendation: The Sector will hear an update on the status of this work. Individual Sector members are asked to share any observations or suggestions that would be of help to this work.

New Items:

4. Recommendations to Update NCWM Pub 14 to Reflect Changes to NIST HB 44 and Other Proposed Changes.

Source: NCWM S&T Committee

Background:
At its 102nd Annual Meeting, the National Conference on Weights and Measures (NCWM) adopted the following items that will be reflected in the 2018 Edition of NIST Handbook 44. These items were included on the Sector's agenda to inform the Measuring Sector of the NCWM actions and to recommend corresponding changes to NCWM Publication 14. For additional details on these items, refer to the NCWM S&T Committee's 2017 Interim Report and its accompanying appendix, which can be found on the NCWM's web site at:

http://www.ncwm.net/meetings/interim/archive#2017

In the process of preparing these updates, Technical Advisor, Tina Butcher, also identified several other discrepancies and inconsistencies, including editorial changes needed to the checklist. Recommendations on these changes are also included under this item.

A. Vapor Elimination – Multiple Measuring Codes

Background: At the 2017 NCWM Annual Meeting, the NCWM adopted the following changes to the LMD Code; VTM Code; Milk Meters Code; Water Meters Code; and Mass Flow Meters Code:

LMD Code:

(S&T Item 3300-1)

S.2. Measuring Elements.

S.2.1. Air/Vapor Elimination. -

~~(a)~~ A **~~liquid measuring device~~** **measuring system** shall be equipped with a**n effective** **~~vapor or~~** air**/vapor** eliminator or other automatic means to prevent the passage of **~~vapor and~~** air**/vapor** through the meter. **~~(b)~~** Vent lines from the air**~~ or~~ /**vapor eliminator shall be made of **~~metal tubing or other rigid~~** **appropriate non-collapsible** material.

(Amended 1975 **and 2017**)

S.2.1.1. Air/Vapor Elimination on Loading Rack ~~Metering~~ Measuring Systems.

(a) A loading rack **~~metering~~** **measuring** system shall be equipped with **~~a vapor or air~~** **an effective air/vapor** eliminator or other automatic means to prevent the passage of **air/**vapor and air through the meter unless the system is designed or operationally controlled by a **means ~~method, approved by the weights and measures jurisdiction having control over the device,~~** such that air**/~~and/or~~** vapor cannot enter the system.

(b) Vent lines from the air**~~ or~~ /**vapor eliminator **~~(if present)~~** shall be made of **~~metal tubing or other rigid~~** **appropriate non-collapsible** material.

(Added 1994) **(Amended 2017)**

VTM Code:

(S&T Item 3301-1)

S.2. Design of Measuring Elements.

S.2.1. Air/Vapor Elimination. – A **~~metering~~** **measuring** system shall be equipped with an effective **~~vapor or~~** air/**vapor** eliminator or other automatic means to prevent the passage of **~~vapor and~~** air**/vapor** through the meter. Vent lines from the air **~~or~~/**vapor eliminator shall be made of **~~metal tubing or some other suitable rigid~~** appropriate non-collapsible material.

(Amended 1993) (Amended 2017)

Milk Meters Code:

(S&T Item 3305-1)

S.2.1. Air/Vapor Elimination. – A **~~metering~~** **measuring** system shall be equipped with an effective **air/**vapor eliminator or other **~~effective means~~** automatic **means** **~~in operation~~** to prevent the passage of **air/**vapor **~~and air~~** through the meter. Vent lines from the air **~~or~~/**vapor eliminator shall be made of **~~metal tubing or some other suitably rigid material~~** **appropriate non-collapsible material**.

(Amended 2017)

Water Meters Code:

(S&T Item 3306-1)

S.2.2. Batching ~~Meters~~Measuring Systems Only.

S.2.2.1. Air/Vapor Elimination, Batching Measuring Systems. – Batching ~~meters~~**measuring systems** shall be equipped with an effective air/**vapor** eliminator **or other automatic means to prevent the passage of air/vapor through the meter. Vent lines from the air/vapor eliminator shall be made of appropriate non-collapsible material. (Amended 2017)**

Mass Flow Meters Code:

(S&T Item 3307-1)

S.3.3. Air/Vapor Elimination. – A ~~**liquid-measuring instrument or**~~ measuring system shall be equipped with an effective **air/**vapor ~~**or air**~~ eliminator or other ~~**effective**~~ **automatic** means~~**, automatic in operation,**~~ to prevent the measurement of **air/**vapor. Vent lines from the air/~~or~~ vapor eliminator shall be made of ~~**metal tubing or some other suitable rigid**~~ **appropriate non-collapsible** material.
(Amended 1999 **and 2017**)

S.3.3.1. **Air/**Vapor Elimination on Loading Rack Liquid ~~**Metering**~~ **Measuring** Systems.

(a) A loading rack ~~**liquid metering**~~ **measuring** system shall be equipped with a**n effective air/**vapor ~~**or air**~~ eliminator or other automatic means to prevent the passage of **air/**vapor ~~**and air**~~ through the meter, unless the system is designed or operationally controlled by a **means** ~~**method, approved by the weights and measures jurisdiction having statutory authority over the device,**~~ such that neither air nor vapor can enter the system.

(b) Vent lines from the air/ **or** vapor eliminator ~~**(if present)**~~ shall be made of ~~**metal tubing or other rigid**~~ **appropriate non-collapsible** material.

(Added 1995) **(Amended 2017)**

Recommendation: The Sector is asked to consider the following proposed changes to NCWM Publication 14 to correspond with the changes to Handbook 44 relative to "vapor elimination" that were adopted by the NCWM in July 2017.

Proposed Changes to NCWM Publication 14 to Reflect Changes Adopted by the NCWM in July 2017 Vapor Elimination

Liquid-Measuring Devices Checklist, Checklist and Test Procedures for Common Specific Code Requirements

Page LMD-32:

1. Measuring Elements

Code Reference: S.2.1. Vapor Elimination (LPG S.2.1.)

If air**/vapor** enters ~~**through**~~ a ~~**metering**~~ **measuring** system or the product changes into **the** vapor **state** as it passes through the system, then ~~**it**~~ **the system** must be equipped with a**n effective air/**vapor eliminator **or other automatic means** to ~~**remove**~~ **prevent** the air ~~**or**~~ **/**vapor ~~**before it passes**~~ **from passing** through the meter. To prevent the vapor eliminator vent lines from being pinched closed and re-opened without being detected, the vent lines shall be made of metal tubing or other appropriate non-collapsible material. If the system is designed such that air ~~**or**~~ **/**vapor will not enter the system, then a**n air/**vapor eliminator is not required. One example is when a product is being pumped from the bottom of a tank and a low-level detector in the tank shuts off the pump before the liquid level gets to the point where air could enter the system. ~~**Code Reference: S.1.5.1. Symmetry**~~

6.1 The metering system is equipped with an effective **air/**vapor eliminator. ☐ Yes ☐ No ☐ N/A

6.2 **Other effective, automatic means are provided to prevent air/vapor from passing through the system. Describe the means provided and list this information on the Certificate of Conformance:** ☐ Yes ☐ No ☐ N/A

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6.3 The vent lines are made of metal tubing or some other appropriate non-collapsible material **to prevent the lines from being pinched closed and re-opened without being detected**. ☐ Yes ☐ No ☐ N/A

Checklist and Test Procedures for Wholesale and Loading-Rack Meters

Page LMD-54

17. Measuring Elements

Code Reference: S.2.1.1. Vapor Elimination on Loading Rack Metering Systems

A loading rack ~~**metering**~~ **measuring** system shall be equipped with a**n effective** ~~**vapor or air**~~ **air/vapor** eliminator or other automatic means to prevent the passage of ~~**vapor and air**~~ **air/vapor** through the meter. This is unless the system is designed or operationally controlled by a ~~**method that is approved by the weights and measures jurisdiction, which the device controls**~~ **means** such that air ~~**and**~~/or vapor cannot enter the system. (Several guidelines, not intended to be all-inclusive for evaluation of a loading rack metering system in which an air eliminator is not needed were adopted by NCWM in July of 1995. ~~**The guidelines are intended to be incorporated in the next edition of *NIST Publication 12*, EPO Number 25**~~). ☐ Yes ☐ No ☐ N/A

17.1. The metering system is equipped with an effective air/vapor eliminator.

☐ Yes ☐ No ☐ N/A

17.2 Other effective, automatic means are provided to prevent air/vapor from passing through the system. Describe the means provided and list this information on the Certificate of Conformance: ☐ Yes ☐ No ☐ N/A

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17.~~2.~~3. Vent lines from the **~~air or vapor~~ air/vapor** eliminator **~~(if present)~~** shall be made of metal tubing or **some** other **~~rigid~~ appropriate non-collapsible** material **to prevent the lines from being pinched closed and re-opened without being detected**. ☐ Yes ☐ No ☐ N/A

Renumber subsequent checklist items.

Checklist and Test Procedures for Mass Flow Meters

Page LMD-78 to LMD-79

Modify Section 34 to reflect changes to paragraph S.3.3. Vapor Elimination and to move references to S.3.5. Provision for sealing into a separate code reference for clarity, renumbering subsequent checklist paragraphs/sections.

34. Measuring Elements

Code Reference: ~~S.3.5. Provision for Sealing and~~ S.3.3. Vapor Elimination

~~Measuring elements shall be designed with adequate provisions to prevent changes from being made to the measuring element or the flow rate control (if the flow rate control affects the accuracy of deliveries) without evidence of the change being made. These provisions can be an approved means of security (e.g., data change audit trail) or physically applying a security seal which must be broken before adjustments can be made. When applicable, the adjusting mechanism shall be readily accessible for the purposes of affixing a security seal.~~ If air/vapor enters a measuring system or the product changes into the vapor state as it passes through the system, then the system must be equipped with an effective air/vapor eliminator or other automatic means to prevent the air/vapor from being measured by the meter. To prevent vapor eliminator vent lines from being pinched closed and re-opened without being detected, the vent lines shall be made of metal tubing or other appropriate non-collapsible material. If the system is designed such that air/vapor will not enter the system, then an air/vapor eliminator is not required. One example is when a product is being pumped from the bottom of a tank and a low-level detector in the tank shuts off the pump before the liquid level gets to the point where air could enter the system.

34.1. A mass flow metering system shall be equipped with a vapor or air eliminator or other automatic means to prevent the **~~passage of~~ measurement of** vapor or air **~~through~~ by** the meter. ☐ Yes ☐ No ☐ N/A

34.2. Other effective, automatic means are provided to prevent air/vapor from passing through or being measured by the system. Describe the means provided and list this information on the Certificate of Conformance: ☐ Yes ☐ No ☐ N/A

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34.3. Vent lines from the **~~air or vapor~~ air/vapor** eliminator **~~(if present)~~** shall be made of metal tubing or **some** other **~~rigid~~ appropriate non-collapsible** material to prevent the lines from being pinched closed and re-opened without being detected. ☐ Yes ☐ No ☐ N/A

Code Reference: S.3.5. Provision for Sealing

Measuring elements shall be designed with adequate provisions to prevent changes from being made to the measuring element or the flow rate control (if the flow rate control affects the accuracy of deliveries) without evidence of the change being made. These provisions can be an approved means of security (e.g., data change audit trail) or physically applying a security seal which must be broken before adjustments can be made. When applicable, the adjusting mechanism shall be readily accessible for the purposes of affixing a security seal.

34.4. A measuring element shall have provision for either…..

Renumber subsequent checklist paragraphs/sections.

Additional Checklist and Test Procedures for Water Meters

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44. Batching Meters Only

Code Reference: S.2.2.1. Air/Vapor Elimination, Batching Measuring Systems.

If air/vapor enters a measuring system or the product changes into the vapor state as it passes through the system, then the system must be equipped with an effective air/vapor eliminator or other automatic means to prevent the air/vapor from being measured by the meter. To prevent vapor eliminator vent lines from being pinched closed and re-opened without being detected, the vent lines shall be made of metal tubing or other appropriate non-collapsible material. If the system is designed such that air/vapor will not enter the system, then an air/vapor eliminator is not required. One example is when a product is being pumped from the bottom of a tank and a low-level detector in the tank shuts off the pump before the liquid level gets to the point where air could enter the system.

44.1 ~~**Batching meters shall be**~~ **The metering system is** equipped with an effective air**/vapor** eliminator. ☐ Yes ☐ No ☐ N/A

44.2 Other effective, automatic means are provided to prevent air/vapor from passing through the system. Describe the means provided and list this information on the Certificate of Conformance: ☐ Yes ☐ No ☐ N/A

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44.3 **Vent lines from the air or vapor air/vapor eliminator (if present) shall be made of metal tubing or some other rigid appropriate non-collapsible material to prevent the lines from being pinched closed and re-opened without being detected.** ☐ Yes ☐ No ☐ N/A

Field Evaluation and Permanence Tests for Metering Systems

Page LMD-122

J. Testing of Lubricating Oil Meters

Lubricating oil meters are to be tested as follows using a specially designed small volume prover for small meters or using gravimetric test methods for all sizes of meters.

Avoid recirculating product during the testing process; recirculation can cause aeration of the product and create changes in product temperature. The Certificate of Conformance is to specify that effective **automatic** means must be provided in the installation to prevent the introduction of air**/vapor** into the meter **or, in the case of a mass flow meter, prevent the air/vapor from being measured**.

B. VTM Code: S.5.7. Meter Size

Background: At the 2017 NCWM Annual Meeting, the NCWM modified the VTM Code to delete the required marking for meter size as follows:

> *S.5.7. Meter Size. – 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.*
> *[Nonretroactive as of January 1, 2009]*
> (Added 2008)

Recommendation: The Sector is asked to consider the following proposed changes to NCWM Publication 14 to correspond with the deletion of paragraph S.5.7. as adopted by the NCWM in July 2017.

LMD Checklist, Checklist and Test Procedures for RMFDs:

Page LMD-62

Delete Code Reference S.5.7. Meter Size as follows:

~~**Code Reference: S.5.7. Meter Size**~~

32.20. ~~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~~	

C. MFM Code Paragraph S.4.1. Diversion of Measured Product

Background: In reviewing the changes outlined under Item 2A, Technical Advisor, Tina Butcher, noted that under Section 35. Discharge Lines and Discharge Line Valves in the Checklist and Test Procedures for Mass Flow Meters, the term "vapor" rather than "product" (as it appears in NIST Handbook 44 MFM Code Paragraph S.4.1.) is used in the code reference. The Technical Advisor researched past editions of NCWM Publication 14 and found that this terminology has been in place at least since the 1990s. A search of Measuring Sector summaries as early as 1994 revealed no Sector action that would have intentionally made this change. Note that Mass Flow Meters may be used in applications measuring liquid or vapor; thus, the term "product" would be universally applicable to either application.

Recommendation: The Sector is asked to consider recommending the word "vapor" be replaced with "product" in Section 35 as outlined below to correct the erroneous reference to NIST HB 44 MFM Paragraph S.4.1. Diversion of Measured Product

Page LMD-80

35. Discharge Lines and Discharge Line Valves

Code Reference: S.4.1. Diversion of Measured ~~Vapor~~Product

To prevent fraudulent practices, it shall not be possible to divert measured ~~**vapor**~~ **product** from the measuring chamber or the discharge line of a device.

A device may have two or more delivery outlets if there are automatic means to insure that:

a. ~~**Vapor**~~ **Product** can flow from only one outlet at a time. **AND**

b. The direction of ~~**vapor**~~ **product** flow is definitely and conspicuously indicated.

35.1. Except as identified above, it shall not be possible to divert measured ~~**vapor**~~ **product** from the measuring chamber or the discharge line of the device. ☐ Yes ☐ No ☐ N/A

D. Section J. Testing of Lubricating Oil Meters, Field Evaluation and Permanence Tests for Metering Systems

Background: In reviewing the changes outlined under Item 2A, Technical Advisor, Tina Butcher, noted that in the Field Evaluation and Permanence Tests Metering Systems, Section J. Testing of Lubricating Oil Meters, the following note regarding air elimination appears to erroneously use the term "viscous liquids" rather than "less viscous liquids" in the last sentence. This note is found at the end of Section J, on page LMD-125 of the LMD Checklist.

> *Note: When a single meter is used to deliver various products with a range of viscosities or densities, performance tests should be made at least with the products of the extreme densities or viscosities. It should also be noted that air elimination becomes much more critical than with viscous liquids.*

Recommendation: The Sector is asked to consider whether the note should read as follows and, if so, recommend changes to this note in the 2018 edition of NCWM Publication 14 as follows:

> *Note: When a single meter is used to deliver various products with a range of viscosities or densities, performance tests should be made at least with the products of the extreme densities or viscosities. It should also be noted that air elimination becomes much more critical than with* ***less*** *viscous liquids.*

5. Flow Rates Used in NTEP Testing

Source: Allen Katalinic (NCDA & CS, NC NTEP Laboratory)

Purpose: This would eliminate the manufacturers of liquid measuring devices expanding the minimum flow rates beyond the capability of the measuring element with the aid of the special tolerance formula. Mass meter technology is not afforded this option.

Recommendation: Modify NTEP Technical Policy Paragraph B. Tolerance Applications, Normal Test Tolerances as follows:

Normal Test Tolerances
For the purposes of calculating tolerances, normal tests conducted in an NTEP evaluation ~~may~~ shall be performed at any flow rate down to **the minimum flow rated on the meter:**
~~**[50% of the rated maximum flow rate + the rated minimum flow rate]/2**~~

~~**For example: For a meter with a rated maximum flow rate of 60 gallons/minute (gpm) and a minimum flow rate of 12 gpm, the maximum discharge rate developed in an actual installation may be as low as 30 gpm.**~~

~~**Therefore, for NTEP tests, calculate the "breakpoint" between normal and special tests as:**~~

~~**[(50% x 60) + 12]/2 = 21**~~

~~**Thus, in the example, NTEP test runs at flow rates between 60 and 21 gpm are considered normal tests.**~~

Background Information: NIST Handbook 44 addresses the need for special test when evaluating a device **and** any special elements **and** accessories associated with the device. NIST Handbook 44, General Code Paragraph G-T.1. (e) (shown below for reference) should always be applied for all devices and technologies under evaluation.

G-T.1. Acceptance Tolerances. – Acceptance tolerances shall apply to equipment:

(a) to be put into commercial use for the first time;

(b) that has been placed in commercial service within the preceding 30 days and is being officially tested for the first time;

(c) that has been returned to commercial service following official rejection for failure to conform to performance requirements and is being officially tested for the first time within 30 days after corrective service;

(d) that is being officially tested for the first time within 30 days after major reconditioning or overhaul; and

(e) undergoing type evaluation.

(Amended 1989)

In considering possible reasons against the proposal, the submitter notes that there may be strong opposition from some manufacturers to the proposed change. As an NTEP evaluator he has witnessed performance from meters that would not have passed the evaluation without applying the special tolerance values.

6. Laboratory and Field Evaluation – Clarification of Language

Source: NTEP Laboratories

Background Information: The NTEP evaluators have experienced confusion when interpreting the "laboratory or Field Evaluation: section of the LMD checklist (see Page LMD-111). It appears to some as it applies to a field inspector, not an NTEP evaluator. The labs offer the following clarification changes.

Recommendation: Amend the **Laboratory or Field Evaluation** section of Pub 14 Measuring Devices (Page LMD-111) as follows:

Laboratory or Field Evaluation

When evaluating electronic indicators submitted separate from a measuring element, simulated inputs (e.g. meter pulse, temperature, pressure, density, communications, etc.) may be used as follows:

· For the initial testing of the indicator.

· For software changes to a device with an existing CC.

Measuring systems, devices, and elements whose performance may change with use over time are generally subject to field evaluation and permanence tests.

The following types of devices and elements are subject to ~~a subsequent field evaluation after the~~ initial field or laboratory evaluation:

· Electronic Indicating Elements

· Consoles

· Recording Elements

· Electronic Cash Registers

· Data Processing Units

Field examination is conducted between 20 and before 30 days of use in a normal installation. During this interval, the device must perform and function correctly and not be serviced. Permanence tests are conducted on equipment such as a complete measuring system or only a measuring element (meter.)

The permanence test is not required in either new evaluations or updating a CC for the electronic devices listed above in stationary installations. The permanence test for mobile electronic devices may be waived by NTEP for updating a CC.

~~**Vapor Recovery Options**~~

~~**If a retail motor fuel dispenser includes a vapor recovery option, the following statement will be included on the Certificate of Conformance: "No NTEP National Type Evaluation Program (NTEP) testing has been performed on the device equipped with vapor recovery option or equipment to determine compliance with air resources board requirements."**~~ **Note: Not needed already stated in Technical Policy J.]**

Compatibility Test

Similar devices that were individually tested for a similar application can be "mixed and matched" without additional testing, if the system functions properly during the initial ~~**routine field**~~ test. For example~~**, inspectors**~~ **NTEP** can determine the compatibility of an approved console interfaced with an approved retail motor fuel dispenser during a ~~**field**~~ **type** evaluation when both components are previously approved in like applications. If devices are to be used in dissimilar applications, then additional NTEP testing is required.

7. Diesel Exhaust Fluid (DEF) - Testing Criteria to Include DEF on an NTEP CC

Source: NTEP Laboratories

Background Information: NTEP evaluators routinely are asked what testing is necessary to cover DEF on NTEP certificates. Another common question is what testing is necessary to get a family of meters certified for DEF and what other products will be included.

The current policy has been questioned at times by applicants. For example, a recent client stated that DEF is 67% water and 32% Urea. Mag Flow conductance for Urea is 5000 micro siemens/centimeter and water is 725 (see page LMD-7 in Pub 14 for both products). Plus, they are in different families.

NTEP tested the product with DEF. NTEP concluded that each family (water and fertilizer) should be tested to establish conductivity. Our thoughts were that we would simply give the product DEF (the product actually tested) on the CC since we are not really establishing conductivity for the family table for either water or fertilizer. In this case, after discussion, NTEP let the client know that they had a couple of choices.

1. Test only DEF and only get DEF with no conductance range

2. Test water and Urea which would establish conductivity for both water and fertilizer families.

Recommendation: Currently DEF is and has been considered fertilizer due to the Urea content. DEF is prevalent enough now to justify its own category listing. Establish a separate product category for diesel exhaust fluid (DEF).

8. Display of Unit Prices to Greater than Two Decimal Places for Bulk Fuel Metering Systems

Source: Ben Fitchett, Southern States Cooperative, Inc.

Purpose: Removal of Section 1.22., Pub 14, Liquid Measuring Device Checklist. There is a legitimate need for retailers who deliver bulk fuel (other than motor fuels) to display and record unit prices greater than two decimal places to the right of the decimal point.

Recommendation: Remove Section 1.22. from LMD Checklist Page LMD-24 as shown below.

LMD Checklist, Page LMD-24:

Code Reference: G-S.5.1. and G-S.5.2.2. Indicating and Recording Elements

Several requirements of a general nature facilitate the reading and interpretation of displayed values. Each display for quantity or total price must be appropriate in design and have sufficient capacity for particular applications to be suitable for the application. For example, retail fuel dispensers capable of indicating to 99.999 liters or gallons or $99.99 are appropriate for automobiles at today's prices, but that are unsuitable for fueling trucks where deliveries may regularly exceed 100 liters or gallons and $100. Metering devices must be capable of indicating the maximum quantity and money values that can normally be expected in a particular application.

1.16. The maximum money value and quantity indications and unit prices are appropriate for the intended use.	☐ Yes ☐ No ☐ N/A
1.17. The indications must be clear, definite, and accurate.	☐ Yes ☐ No ☐ N/A
1.18. The indications must be easily read under normal operating conditions.	☐ Yes ☐ No ☐ N/A
1.19. Totalizer values must be accurate to the nearest minimum interval with decimal points displayed or subordinate digits adequately differentiated from others, if applicable.	☐ Yes ☐ No ☐ N/A
1.20. Symbols for decimal points shall clearly identify the decimal position. (Generally acceptable symbols are dots, small commas, or x.)	☐ Yes ☐ No ☐ N/A
1.21. The zero indication must consist of at least the following minimum indications as appropriate:	☐ Yes ☐ No ☐ N/A
1.21.1. One digit to the left and all digits to the right of a decimal point.	☐ Yes ☐ No ☐ N/A
1.21.2. If a decimal point is not used, at least one active decade plus any constant zeros.	☐ Yes ☐ No ☐ N/A

1.21.3. A fixed or constant zero cannot appear after a decimal point, (e.g., all decades to the right of a decimal point must be active).*	☐ Yes ☐ No ☐ N/A
~~**1.22. Unit price values shall be displayed and recorded to the nearest 1 cent ($ 0.01), except motor fuel dispensers which are permitted to display and record up to three decimal places to the right of the decimal point ($0.001).**~~	☐ Yes ☐ No ☐ N/A

*A fixed zero may appear after a decimal point on a receipt and/or console if the system is unable to distinguish if the digit is fixed or active.

Background: The submitter provided the following background information for this item.

Southern States Cooperative delivers bulk fuel (LP Gas (propane), gasoline, and diesel products) from 33 of our Company Owned Retail locations (as well as a similar number of our Member Coops). These locations use fuel trucks that are equipped with metering devices that must comply with HB 44 requirements.

The submitter is in the process of creating and implementing a mobile solution (software and hardware) to be installed in all of our fuel trucks. These systems will interact directly with the fuel meters to read in quantity delivered, calculate extended price, and print a combined delivery ticket/invoice to leave with customers. The software component, MAgExpress, will later sync with our point-of-sale system, MerchantAg, to finalize fuel delivery orders. MAgExpress and MerchantAg are both products of our software provider, EFC.

During the development of the MerchantAg software, EFC reached out to the Maryland Department of Agriculture in order to obtain a Certificate of Conformance. They were put in touch with NTEP evaluator, Joe Eccleston. After his evaluation of MAgExpress, he provided EFC with a few software requirements that needed to be resolved in order to gain compliance. Unfortunately, one of the requirements will fundamentally change the way SSC goes to market with all bulk fuels except motor fuels. The requirement stems from a new checklist item, Section 1.22., in NCWM Publication 14, added at the NTEP Measuring Sector Meeting in September of 2016. The new section requires liquid measuring devices to display and record unit prices to the nearest 1 cent ($0.01).

Justification for removing new Section 1.22. from Pub 14, Liquid Measuring Device Checklist:

1. Pricing bulk fuel to three decimal places to the right of the decimal point ($0.001) is standard business practice for fuel suppliers (not just SSC). In these markets, customers are used to seeing unit prices that include fractions of cents.

2. Customers who purchase large amounts of fuel will often enter into contract arrangements with their fuel suppliers in order to manage the risk of price increases.

    a. Sometimes, the contract price is a number that floats based upon an index that goes out to three or even four decimal places. In those cases, the customer expects to see a three or four-digit price on their invoices.

    b. Larger customers (including many government entities) will determine which supplier wins a contract bid based on prices that extend out to fractions of pennies. If SSC is forced to move to two-digit pricing because of our new software, it will cause irreparable harm to our ability to compete for those contracts.

The submitter also referenced the following item from the Sector's 2016 meeting when the Sector agreed to add Section 1.22 to the LMD Checklist:

Excerpts from Item 4 of the 2016 Measuring Sector Summary:

4. Display of Unit Price in Tenths of a Cent.

Source: NTEP Measuring Labs via NTEP Director Jim Truex

Recommendation: The Sector is asked to consider the addition of a specific Handbook 44 code reference to the lead in paragraph to Pub 14, Liquid Measuring Device Checklist, Section 1.16. to read as follows:

"Code Reference**s**: G-S.5.1**. and G-S.5.2.2.** Indicating and Recording Elements"

The Sector is also asked to consider recommending the addition of a new section **1.22.** to read as follows:

Page LMD-23, 2016 Edition:

Code References**: G-S.5.1. and G-S.5.2.2. Indicating and Recording Elements**

Several requirements of a general nature facilitate the reading and interpretation of displayed values. Each display for quantity or total price must be appropriate in design and have sufficient capacity for particular applications to be suitable for the application. For example, retail fuel dispensers capable of indicating to 99.999 liters or gallons or $99.99 are appropriate for automobiles at today's prices, but that are unsuitable for fueling trucks where deliveries may regularly exceed 100 liters or gallons and $100. Metering devices must be capable of indicating the maximum quantity and money values that can normally be expected in a particular application.

…

1.22. Unit price values shall be displayed and recorded to the nearest 1 cent ($ 0.01), except motor fuel dispensers which are permitted to display and record up to three decimal places to the right of the decimal point ($0.001).

…

Background: During an NTEP evaluation the evaluator was asked to accept a recording element and receipt where the unit price was indicated and printed out to four decimal places (example: $3.6990). The NTEP Labs acknowledge that it is customary for dispensers to indicate unit price values to three decimal places but do not think it is appropriate for other devices, such as POS systems, registers for meters). Total price values need to be rounded to the nearest cent. The NTEP labs propose the following amendments to Pub 14.

Discussion: Sector Chairman, Michael Keilty, reviewed the item and its source, noting that the goal is to add clarity and consistency to the requirements for displaying unit prices on RMFDs. NTEP Director, Jim Truex, and a number of others questioned the need for multiple places past the decimal point; since transactions are conducted based on whole cents, the need for even tenths of a cent seems inappropriate. However, the practice for expressing unit prices to a tenth of a cent is already ingrained in the system.

Sector Technical Advisor, Tina Butcher, commented that there are two different issues being discussed: (1) The value of the unit price is not sealable; and (2) The appropriate number of places past the decimal point for a unit price display. Mrs. Butcher also commented that it seems like the ability to make adjustments to the number of places past the decimal point should be a sealable feature; however, there was no additional discussion on this point. Mr. Truex and others agreed that the gap and lack of clarity around the appropriate number of places needs to be corrected and the Sector agreed that the proposed language will accomplish this.

Gordon Johnson (Gilbarco) expressed concerns that the change regarding the number of places past the decimal is not supported by a specific Handbook 44 reference. Others felt that the General Code adequately supported the change. The Sector discussed the idea of adding a reference to General Code Paragraph G-S.5.5. Money Values, Mathematical Agreement as well; however, there wasn't strong support to do this. Some

manufacturers expressed concern about possible instances where they find that the additional places are legitimately needed, but couldn't provide examples at that point. The Sector agreed that there is always the option to bring the issue back at a future point should a specific need be identified.

Decision: The Sector agreed to recommend the proposed changes to the checklist. The Sector acknowledged that there are not specific references in Handbook 44 to reflect the proposed changes; however, there is a reference in the General Code under which the proposed changes clearly fall. Consequently, the Sector concurred that the proposed changes are supported by Handbook 44.

Additional Items as Time Allows:

If time permits, the NCWM S&T Committee and/or other groups 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. For each item in this section, the Sector is asked to review the item and consider providing input that might assist the S&T Committee in their deliberations.

9. S&T 2017 Carryover Items 3100-1 and 3600-2 – (Summing of Multiple Electronic Elements) - G-S.5.2.2. Digital Indications and Recorded Representations and Appendix A – Fundamental Considerations – Section 4.4. General Considerations

Source: Ross Andersen, Retired (2017)

Purpose: Address the application of the code requirements across multiple devices.

Items Under Consideration: The submitter is proposing the following modifications to General Code Paragraph G-S.5.2.2. Digital Indications and Recorded Representations and Appendix A – Fundamental Considerations – Section 4.4. General Considerations.

G-S.5.2.2. Digital Indication and Representation. – Digital elements shall be so designed that:

(a) All digital values of like value in a system agree with one another.

(b) A digital value coincides with its associated analog value to the nearest minimum graduation.

(c) A digital value "rounds off" to the nearest minimum unit that can be indicated or recorded.

(d)A digital zero indication includes the display of a zero for all places that are displayed to the right of the decimal point and at least one place to the left. When no decimal values are displayed, a zero shall be displayed for each place of the displayed scale division.
[Nonretroactive as of January 1, 1986]

(e) A digital value that is electronically summed from the digital indications of multiple independent devices shall be mathematically correct.
[Nonretroactive as of January 1, 20XX]

(Amended 1973**,** and 1985**, and 20XX**)

4.4. **General Considerations.** –

The simpler the commercial device, the fewer are the specification requirements affecting it, and the more easily and quickly can adequate inspection be made. As mechanical complexity increases, however, inspection becomes increasingly important and more time consuming, because the opportunities for the existence of faulty conditions are multiplied. It is on the relatively complex device, too, that the official must be on the alert to discover any modification that may have been made by an operator that might adversely affect the proper functioning of the device. **Code requirements in the Handbook are applied only to a single device or system, unless specifically stated in the code. An electronic sum of measured values from multiple devices is not subject to code requirements, except that it be mathematically correct, i.e. add up to the proper sum - See General Code G-S.5.2.2.(e).**

It is essential for the officials to familiarize themselves with the design and operating characteristics of the devices that he inspects and tests. Such knowledge can be obtained from the catalogs and advertising literature of device manufacturers, from trained service persons and plant engineers, from observation of the operations performed by service persons when reconditioning equipment in the field, and from a study of the devices themselves.

Inspection should include any auxiliary equipment and general conditions external to the device that may affect its performance characteristics. In order to prolong the life of the equipment and forestall rejection, inspection should also include observation of the general maintenance of the device and of the proper functioning of all required elements. The official should look for worn or weakened mechanical parts, leaks in volumetric equipment, or elements in need of cleaning.

Background: The submitter believes that the NCWM made a mistake in 1990 in interpreting how code requirements are applied to multiple-platform scales with multiple indicators. The submitter is proposing changes to the General Code and the Fundamental Considerations that would require that a summed indication derived by summing indications of individual elements be mathematically correct, but exempt the summed indication from other code requirements. While these proposals were designed to address concerns raised in conjunction with the application of requirements to weighing systems. The inclusion of the proposed changes in the General Code and Fundamental Considerations would extend their application to all weighing and measuring devices covered by Handbook 44. The Sector may wish to review the proposed changes and consider any potential impact on measuring systems that may provide summed indications derived from individual measuring elements (if such systems exist).

For full details on this issue, including the submitter's justification and recommendations and other background information, please see Appendix A, Pages S&T – A6 and A96 in the S&T Committee's 2017 Interim Report found at: https://www.ncwm.net/_resources/e30d:omyqm5-od/files/75729907zaec3e14d/_fn/4-ST-Web.pdf

10. S&T 2017 Carryover Item (3300-2) – LMD Code – UR.3.4. Printed Ticket

Source: Morrow County, OH (2017)

Purpose: Require that printed receipts declares an alpha or numeric pump designation that coincides with the dispensing device used for a specific transaction.

Item Under Consideration: Modify LMD Code Paragraph UR.3.4. Printed Ticket as follows.

UR.3.4. Printed Ticket. – **This requirement applies only to devices that are capable of issuing a printed ticket.** The total price, the total volume of the delivery, **a corresponding alpha or numeric dispenser designation** and the price per liter or gallon shall be shown, either printed by the device or in clear hand script, on any printed ticket issued by a device and containing any one of these values.

(Amended 2001 **and 2017)**

Background: The submitter stated that, with these proposed changes, the consumer as well as the weights and measures official would be able to verify that all transaction information corresponds accurately at locations with multiple dispensers on site. If no pump designation is on the receipt it hinders the consumer's ability to know that they were given the correct receipt for the transaction. Similarly, a pump designation on the receipt will asset weights and measures in verifying correct communication between devices as well as follow up as needed in case of a consumer complaint. The submitter recognizes that software updates would be required for those establishments that do not already meet this proposed requirement.

The S&T Committee heard suggestions at the July 2017 NCWM Annual Meeting that corresponding modifications should be considered to specifications in the LMD Code related to recorded representations, including Paragraphs S.1.6.7. Recorded Representations (POS Systems) and S.1.6.8. Recorded Representations for Transactions Where a Post-Delivery Discount(s) is Provided. Without corresponding changes to such paragraphs, the proposed modifications to UR.3.4. would result in a device owner needing to hand write the pump number on any system that does not already provide that information. The Committee and others believe the proposal has merit and would benefit consumers, inspectors, and device owners; however, the Committee believes additional work is needed and changed the status of the item from "Voting" to "Developing" in order to allow the submitter to further develop the item.

For full details on this issue, including the submitter's justification and recommendations and other background information, please see Appendix A, Page S&T – A56 in the S&T Committee's 2017 Interim Report found at: https://www.ncwm.net/ resources/e30d:omyqm5-od/files/75729907zaec3e14d/ fn/4-ST-Web.pdf

11. S&T 2017 Carryover Item (3302-2) LPG & NH_3 Code, N.4.2.4. Repeatability Tests - Type Evaluation

Source: Ross Andersen, Retired (2017)

Purpose: Address differences between Handbook44 and Publication 14 practices for LPG Liquid Meter testing.

Item under Consideration: Amend NIST Handbook 44 Liquid Measuring Devices Code as follows:

> **N.4.1.2. Repeatability Tests. –** Tests for repeatability should include a minimum of three consecutive test drafts of approximately the same size and be conducted under controlled conditions where variations in factors such as temperature, pressure, and flow rate are reduced to the extent that they will not affect the results obtained. **Repeatability tests shall be based on the uncompensated volume, e.g. with the temperature compensator deactivated. Both field tests and type evaluation tests shall be run at flow rates consistent with normal tests as specified in N.4.1.**
> **(amended 20XX)**
>
> Add a new Paragraph N.4.2.4. as follows:
>
> **N.4.2.4. Repeatability Tests for Type Evaluation. – Tests for repeatability should include a minimum of three consecutive test drafts of approximately the same size and be conducted under controlled conditions where variations in factors such as temperature, pressure, and flow rate are reduced to the extent that they will not affect the results obtained. Repeatability tests shall be based on the uncompensated volume, e.g. with the temperature compensator deactivated. Type evaluation tests shall be run at flow rates consistent with special tests as specified in N.4.2., N.4.2.1., N.4.2.2,, or N.4.2.3. as appropriate.**
> **(Added 20XX)**

Background: The proposal is aimed to correct a number of areas of confusion. The inclusion of repeatability in the N.4.1. series indicates that repeatability is to be run at normal flow rates. There was some confusion if this was the

actual intent? Running the tests only at Normal flow rates is consistently how the test was performed in the field. The amendment to N.4.1.2. clarifies this explicitly for field tests and type evaluation tests.

The new paragraph was added because NTEP has for a long time required repeatability on tests over the entire range of flow rates conducted under controlled conditions during type evaluation testing. This means anywhere between rated maximum and minimum flow rates. The code addition now formalizes and legitimizes what has been done for a long time.

Another question arose whether gross or net results could be used in repeatability tests? Obviously, you can't compare net to gross but you can compare three consecutive gross or three consecutive net results. As the practice in HB44 is to test one variable at a time to the extent possible, the revision clarifies that repeatability is addressed to gross meter performance only. This can be through deactivating the ATC or just using gross values where both gross and net are available from the same test.

At the its 2017 NCWM Interim Meeting open hearings, the S&T Committee heard support for the item from Mr. Dmitri Karimov (Liquid Controls) on behalf of the MMA.

Mrs. Tina Butcher (OWM) clarified that although it is common for repeatability to be conducted at the normal flow rate, there is nothing precluding an inspector from running these tests at any valid flow rate. The meter should be expected to meet repeatability requirements at any flow rate throughout the approved range. There was also some discussion as to whether repeatability should only be applicable to gross or uncompensated meter readings. Some felt that the same requirements should also be applicable when testing a meter in net or compensated mode. OWM suggested that this may have unintended consequences. These may include errors or stability issues in the temperature compensation being interpreted as apparent repeatability issues.

Mr. Constantine Cotsoradis (Flint Hills Resources) also questioned whether or not repeatability requirements may be applied to the compensated, net registrations.

Mr. Michael Keilty (Endress & Hauser Flowtec AG) commented that the proposal should be further evaluated by the NTEP laboratories.

Mr. Karimov reminded the group that any changes to the requirements must consider all meter technologies and not just positive displacement (PD) meters.

Ultimately, the Committee agreed that more work was needed to develop the item and assigned it a "Developing" status.

For full details on this issue, including the submitter's justification and recommendations and other background information, please see Appendix A, Page S&T – A75 in the S&T Committee's 2017 Interim Report found at: https://www.ncwm.net/_resources/e30d:omyqm5-od/files/75729907zaec3e14d/_fn/4-ST-Web.pdf

12. S&T 2017 Carryover Item (3600-5) –Appendix D – Remote Configuration Capability

Source: NIST Office of Weights and Measures

Purpose: Expand the scope of definition to cover instances where the "other device," as noted in the current definition, may be necessary to the operation of the weighing or measuring device or which may be considered a permanent part of that device.

Item under Consideration: Add a new paragraph to the General Code and modify the LMD Code; VTM Code; LPG & NH3 Code; Hydrocarbon Gas Vapor-Measuring Devices Code; Cryogenic Liquid-Measuring Devices Code; Milk Meters Code; Water Meters Code; Mass Flow Meters Code; Carbon Dioxide Liquid-Measuring Devices Code; and Hydrogen Measuring Devices Code as shown below. Note that the full proposal to the S&T Committee includes

proposed changes to other Handbook 44 Codes; in the interest of brevity, only the proposed changes relevant to measuring systems are included in table below.

1.10 General Code:

G-S.8.2. Devices and Systems Adjusted Using Removable Digital Storage Device. - For devices and systems in which the configuration or calibration parameters can be changed by use of a removable digital storage device, such as a secure digital (SD) card, USB flash drive, etc., security shall be provided for those parameters using an event logger in the device. The event logger shall include an event counter (000 to 999), the parameter ID, the date and time of the change, and the new value of the parameter. A printed copy of the information must be available on demand through the device or through another on-site device. In addition to providing a printed copy of the information, the information may be made available electronically. The event logger shall have a capacity to retain records equal to 10 times the number of sealable parameters in the device, but not more than 1000 records are required. (Note: Does not require 1000 changes to be stored for each parameter.) (Added 20XX)

3.30 Liquid Measuring Devices:

S.2.2. Provision for Sealing. – For devices and systems in which the configuration or calibration parameters can be changed by use of a removable digital storage device, security shall be provided for those parameters as specified in G-S.8.2. For parameters adjusted using other means, the following applies:

Adequate provision shall be made for an approved means of security (e.g., data change audit trail) or for physically applying a security seal in such a manner that requires the security seal to be broken before an adjustment or interchange can be made of:

(a) any measuring or indicating element;

(b) any adjustable element for controlling delivery rate when such rate tends to affect the accuracy of deliveries; and

(c) any metrological parameter that will affect the metrological integrity of the device or system.

When applicable, the adjusting mechanism shall be readily accessible for purposes of affixing a security seal.

*[Audit trails shall use the format set forth in Table S.2.2.]**
*[*Nonretroactive and Enforceable as of January 1, 1995]*

(Amended 1991, 1993, 1995, 2006**,** and **20XX**)

3.31. Vehicle-Tank Meters

S.2.2. Provision for Sealing. – For devices and systems in which the configuration or calibration parameters can be changed by use of a removable digital storage device, security shall be provided for those parameters as specified in G-S.8.2. For parameters adjusted using other means, the following applies:

Adequate provision shall be made for an approved means of security (e.g., data change audit trail) or for physically applying a security seal in such a manner that requires the security seal to be broken before a change

or an adjustment or interchange may be made of:

(a) any measuring or indicating element;

(b) any adjustable element for controlling delivery rate when such rate tends to affect the accuracy of deliveries; and

(c) any metrological parameter that will affect the metrological integrity of the device or system.

When applicable, the adjusting mechanism shall be readily accessible for purposes of affixing a security seal. *[Audit trails shall use the format set forth in Table S.2.2. Categories of Device and Methods Sealing.]* *[*Nonretroactive as of January 1, 1995]*

(Amended 2006 **and 20XX**)

3.32. LPG and Anhydrous Ammonia Liquid-Measuring Devices

S.2.2. Provision for Sealing. For devices and systems in which the configuration or calibration parameters can be changed by use of a removable digital storage device, security shall be provided for those parameters as specified in G-S.8.2. For parameters adjusted using other means, the following applies:

Adequate provision shall be made for an approved means of security (e.g., data change audit trail) or for physically applying a security seal in such a manner that requires the security seal to be broken before an adjustment or interchange may be made of:

(a) any measuring or indicating element;

(b) any adjustable element for controlling delivery rate, when such rate tends to affect the accuracy of deliveries; and

(c) any metrological parameter that will affect the metrological integrity of the device or system.

When applicable, the adjusting mechanism shall be readily accessible for purposes of affixing a security seal.

*[Audit trails shall use the format set forth in Table S.2.2. Categories of Device and Methods of Sealing.]**

[*Nonretroactive as of January 1, 1995]

(Amended 2006 and 20XX**)**

3.33. Hydrocarbon Gas Vapor-Measuring Devices

S.2.2. Provision for Sealing. For devices or systems in which the configuration or calibration parameters can be changed by use of a removable digital storage device, security shall be provided for those parameters as specified in G-S.8.2. For parameters adjusted using other means, the following applies:

Adequate provision shall be made for applying security seals in such a manner that no adjustment or interchange may be made of any measurement element.

(Amended 20XX)

3.34. Cryogenic Liquid-Measuring Devices

S.2.5. Provision for Sealing. – <u>For devices or systems in which the configuration or calibration parameters can be changed by use of a removable digital storage device, security shall be provided for those parameters as specified in G-S.8.2. For parameters adjusted using other means, the following applies:</u>

Adequate provision shall be made for an approved means of security (e.g., data change audit trail) or for physically applying a security seal in such a manner that requires the security seal to be broken before an adjustment or interchange may be made of:

(a) any measuring or indicating element;

(b) any adjustable element for controlling delivery rate when such rate tends to affect the accuracy of deliveries;

(c) any automatic temperature or density compensating system; and

(d) any metrological parameter that will affect the metrological integrity of the device or system.

When applicable, any adjusting mechanism shall be readily accessible for purposes of affixing a security seal.

[Audit trails shall use the format set forth in Table S.2.5. Categories of Device and Methods of Sealing]*[*Nonretroactive as of January 1, 1995]

(Amended 2006 **<u>and 20XX</u>**)

3.35. Milk Meters

S.2.3. Provision for Sealing. – <u>For devices and systems in which the configuration or calibration parameters can be changed by use of a removable digital storage device, security shall be provided for those parameters as specified in G-S.8.2. For parameters adjusted using other means, the following applies:</u>

Adequate provision shall be made for an approved means of security (e.g., data change audit trail) or for physically applying a security seal in such a manner that requires the security seal to be broken before an adjustment or interchange may be made of any:

(a) measuring element or indicating element;

(b) adjustable element for controlling delivery rate, when such rate tends to affect the accuracy of deliveries; and

(c) metrological parameter that will affect the metrological integrity of the device or system.

When applicable, the adjusting mechanism shall be readily accessible for purposes of affixing a security seal.

[Audit trails shall use the format set forth in Table S.2.3. Categories of Device and Methods of Sealing] [*Nonretroactive as of January 1, 1995]*

(Amended 2006 **<u>and 20XX</u>**)

3.36. Water Meters

S.2.1. Provision for Sealing. – <u>For devices or systems in which the configuration or calibration parameters can be changed by use of a removable digital storage device, security shall be provided for those parameters as specified in G-S.8.2. For parameters adjusted using other means, the following applies:</u>

Adequate provision shall be made for applying security seals in such a manner that no adjustment or interchange may be made of:

(a) any measurement elements; and

(b) any adjustable element for controlling delivery rate when such rate tends to affect the accuracy of deliveries.

The adjusting mechanism shall be readily accessible for purposes of affixing a security seal.

<u>(Amended 20XX)</u>

3.37. Mass Flow Meters

S.3.5. Provision for Sealing. – <u>For devices or systems in which the configuration or calibration parameters can be changed by use of a removable digital storage device, security shall be provided for those parameters as specified in G-S.8.2. For parameters adjusted using other means, the following applies:</u>

Adequate provision shall be made for an approved means of security (e.g., data change audit trail) or physically applying security seals in such a manner that no adjustment or interchange may be made of:

(a) any measuring or indicating element;

(b) any adjustable element for controlling delivery rate when such rate tends to affect the accuracy of deliveries;

(c) the zero adjustment mechanism; and

(d) any metrological parameter that will affect the metrological integrity of the device or system.

When applicable, the adjusting mechanism shall be readily accessible for purposes of affixing a security seal.

[Audit trails shall use the format set forth in Table S.3.5. Categories of Device and Methods of Sealing] [*Nonretroactive as of January 1, 1995]*

(Amended 1992, 1995, 2006**,** and **<u>20XX</u>**)

3.38. Carbon Dioxide Liquid-Measuring Devices

S.2.5. Provision for Sealing. – <u>For devices and systems in which the configuration or calibration parameters can be changed by use of a removable digital storage device, security shall be provided for those parameters as specified in G-S.8.2. For parameters adjusted using other means, the following applies:</u>

Adequate provision shall be made for an approved means of security (e.g., data change audit trail) or for physically applying a security seal in such a manner that requires the security seal to be broken before an adjustment or interchange may be made of:

(a) any measuring or indicating element;

(b) any adjustable element for controlling delivery rate when such rate tends to affect the accuracy of deliveries;

(c) any automatic temperature or density compensating system; and

(d) any metrological parameter that will affect the metrological integrity of the device or system.

When applicable any adjusting mechanism shall be readily accessible for purposes of affixing a security seal.

*[Audit trails shall use the format set forth in Table S.2.5. Provision for Sealing]**
*[*Nonretroactive as of January 1, 1995]*

(Amended 2006 **and 20XX**)

3.39. Hydrogen Gas-Measuring Devices – Tentative Code

S.3.3. Provision for Sealing. – **For devices and systems in which the configuration or calibration parameters can be changed by use of a removable digital storage device, security shall be provided for those parameters as specified in G-S.8.2. For parameters adjusted using other means, the following applies:**

Adequate provision shall be made for an approved means of security (e.g., data change audit trail) or physically applying security seals in such a manner that no adjustment may be made of:

(a) each individual measurement element;

(b) any adjustable element for controlling delivery rate when such rate tends to affect the accuracy of deliveries;

(c) the zero adjustment mechanism; and

(d) any metrological parameter that detrimentally affects the metrological integrity of the device or system.

When applicable, the adjusting mechanism shall be readily accessible for purposes of affixing a security seal. Audit trails shall use the format set forth in Table S.3.3. Categories of Device and Methods of Sealing.

(Amended 20XX)

Background: The S&T Committee initially considered a proposal from the NTEP Grain Analyzer Sector to modify the definition for "remote configuration capability." The proposal was intended to address the use of removable digital storage devices (such as a flash drive, memory card, etc.) in transferring calibration and other metrologically significant information to weighing and measuring devices. The Committee heard a lot of opposition to the proposed changes to the definition; however, acknowledged that changes are needed to adequately address security requirements for systems capable of adjustments using these types of devices. The Grain Analyzer Sector decided to address its concerns by requiring event loggers (which provide detailed information about metrologically significant changes made to a device) on grain analyzers with this capability. NIST OWM recognized that current NIST Handbook 44 requirements for device security do not adequately address other device types with these capabilities and asked the Committee to reassign the item to OWM. OWM presented the proposals outlined in the Item Under Consideration to the Committee in July 2017 and is asking that the regional weights and measures associations support forwarding the proposal to the S&T Committee as a voting item for the 2018 NCWM cycle. The proposal would essentially require an event logger on any device with the capability for accessing metrologically

significant adjustments through removable digital media; existing requirements for device security would continue to apply to device types without this capability. OWM would appreciate input from the Sector on the proposed changes.

For full details on this issue, including the submitter's justification and recommendations and other background information, please see Appendix A, Page S&T – A107 in the S&T Committee's 2017 Interim Report found at: https://www.ncwm.net/_resources/e30d:omyqm5-od/files/75729907zaec3e14d/_fn/4-ST-Web.pdf

13. S&T 2018 New Item – Vapor Elimination, Measuring Codes

Source: NCWM S&T Committee/Tina Butcher (NIST OWM)

Purpose: To align language in Sections 3.32 LPG and Anhydrous Ammonia Liquid-Measuring Devices Code; 3.34 Cryogenic Liquid Measuring Devices Code; and 3.38. Carbon Dioxide Liquid-Measuring Devices Code with changes adopted in 2017 to the Liquid-Measuring Devices Code; the Vehicle-Tank Meters Code; the Milk Meters Code; the Water Meters Code; and the Mass Flow Meters Code.

Item under Consideration: Amend the requirements for vapor elimination in the following NIST Handbook 44 Sections and Paragraphs as outlined below:

Section 3.32. LPG Code:

S.2. Design of Measuring Elements.

S.2.1. Air/Vapor Elimination. A ~~**device**~~ **measuring system** shall be equipped with an effective **air/vapor eliminator or other** automatic means to prevent the passage of **air/**vapor through the meter. Vent lines from the **air/**vapor eliminator shall be made of appropriate non-collapsible material.

(Amended 2016)

Section 3.34. Cryogenic Liquid-Measuring Devices Code:

S.2. Design of Measuring Elements.

S.2.1. Air/Vapor Elimination. – A measuring system shall be equipped with an effective **air/**vapor eliminator or other ~~**effective**~~ **automatic** means to prevent the ~~**measurement of vapor that will cause errors in excess of the applicable tolerances**~~ **passage of air/vapor through the meter. Vent lines from the air/vapor eliminator shall be made of appropriate non-collapsible material.** (Also see Section T. Tolerances.)

Section 3.38. Carbon Dioxide Liquid-Measuring Devices Code:

S.2. Design of Measuring Elements.

S.2.1. Vapor Elimination.

~~**(a)**~~ A ~~**device**~~ **measuring system** shall be equipped with an effective **air/vapor eliminator or other** automatic means to prevent the passage of **air/**vapor through the meter.

~~**(b)**~~ Vent lines from the **air/**vapor eliminator shall be made of appropriate non-collapsible material.

(Amended 2016)

Background: In 2016, changes were made to the requirements for vapor elimination in the LPG & NH_3 code to make the requirement less design specific; clarify that the means provided for vapor elimination must be "effective;" and recognize that the vent line need not be rigid, provided the material chosen is effective at preventing the vent line from being obstructed. In 2017, corresponding changes were made to:

- Section 3.30 Liquid-Measuring Devices Code (S.2.1);
- Section 3.31 Vehicle-Tank Meters Code (S.2.1);
- Section 3.35 Milk Meters Code (S.2.1);
- Section 3.36 Water Meters Code (S.2.2.1); and
- Section 3.37 Mass Flow Meters Code (S.3.3)

The changes made e to the Mass Flow Meters Code, include slight variations in the language to reflect that the introduction of air into the meter does not create accuracy problems for some mass flow metering systems.

In the process of reviewing the proposals submitted in 2017, the NCWM S&T Committee heard comments that similar changes should be made to align the language in the vapor/air elimination paragraphs in all the measuring codes. At the Committee's suggestion, the submitters of the 2017 item, Tina Butcher (NIST OWM) and Mr. Dmitri Karimov (Liquid Controls), prepared corresponding proposed changes to align the vapor/air elimination paragraph(s) in Sections 3.32, 3.34, and 3.38, including vetting these proposals with members of the Meter Manufacturers Association. The Committee felt that these changes could be incorporated into the existing proposal; however, the BOD concluded that these additional changes needed to be introduced as a separate item in the next NCWM cycle. Rather than delay the items presented in 2017, the Committee decided to recommend those items for a vote and propose the remaining items for a vote in 2018. Consequently, this current proposal to modify Sections 3.32., 3.34., and 3.38. is being submitted as outlined during the 2017 Interim Meeting. Note that, although the paragraph in Section 3.32. was modified in 2016, the changes proposed to the other measuring codes in 2017 included some additional minor changes to align format and language.

14. S&T 2018 New Item – Water Meters – Paragraph S.2.1. Provision for Sealing

Source: John Roach, CA Division of Measurement Standards, CA NTEP Laboratory

Purpose: To standardize sealing requirements in the Water Meter Code with the LMD code.

Recommendation: Adopt the three categories of sealing into the water meter code 3.36. as is found in H44 LMD Code Paragraph and Table S.2.2. and as shown below.

S.2.2. Provision for Sealing. – Adequate provision shall be made for an approved means of security (e.g., data change audit trail) or for physically applying a security seal in such a manner that requires the security seal to be broken before an adjustment or interchange can be made of:

a) any measuring or indicating element;

b) any adjustable element for controlling delivery rate when such rate tends to affect the accuracy of deliveries; and

c) any metrological parameter that will affect the metrological integrity of the device or system.

d) When applicable, the adjusting mechanism shall be readily accessible for purposes of affixing a security seal.

*[Audit trails shall use the format set forth in Table S.2.2.]**

Table S.2.2. ***Categories of Device and Methods of Sealing***	
Categories of Device	***Methods of Sealing***
Category 1: *No remote configuration capability.*	*Seal by physical seal or two event counters: one for calibration parameters and one for configuration parameters.*
Category 2: *Remote configuration capability, but access is controlled by physical hardware.* *The device shall clearly indicate that it is in the remote configuration mode and record such message if capable of printing in this mode or shall not operate while in this mode.*	*[The hardware enabling access for remote communication must be on-site. The hardware must be sealed using a physical seal or an event counter for calibration parameters and an event counter for configuration parameters. The event counters may be located either at the individual measuring device or at the system controller; however, an adequate number of counters must be provided to monitor the calibration and configuration parameters of the individual devices at a location. If the counters are located in the system controller rather than at the individual device, means must be provided to generate a hard copy of the information through an on-site device.]** *[*Nonretroactive as of January 1, 1996]*
Category 3: *Remote configuration capability access may be unlimited or controlled through a software switch (e.g., password).* *[Nonretroactive as of January 1, 1995]* *The device shall clearly indicate that it is in the remote configuration mode and record such message if capable of printing in this mode or shall not operate while in this mode.* *[Nonretroactive as of January 1, 2001]*	*An event logger is required in the device; it must include an event counter (000 to 999), the parameter ID, the date and time of the change, and the new value of the parameter. A printed copy of the information must be available on demand through the device or through another on-site device. The information may also be available electronically. The event logger shall have a capacity to retain records equal to 10 times the number of sealable parameters in the device, but not more than 1000 records are required. (**Note:** Does not require 1000 changes to be stored for each parameter.)*

Background Information: The submitter notes that water meters submitted to NTEP now have digital registers instead of the old analog odometer type of registers. The current water meter code section 3.36 S.2.1. provision of sealing, seems to only allow for a physical sealing provision. Digital registers use a remote device or even Near Field Communication (NFC). Because of the digital technology changes, MCWM should adopt the three categories for sealing into the water meter code to allow for audit trail event counter (Category 2) or event logger (Category 3) because a physical seal won't protect or even be tamper evident. Remote or NFC has the capability to change the unit of measure from gallons to cubic feet or even the calibration factor. We need the guidelines of Category 2 or 3 to properly seal meters that are digital. Otherwise, water meters using today's technology cannot be certified by NTEP.

15. Discussion of Possible Meeting Location and Date

Background/Discussion/Decision: The Sector is asked to discuss plans for the 2019 Sector Meeting, including proposed location and time frame.