

National Type Evaluation Program (NTEP) Measuring Sector

Annual Meeting
September 24-25, 2019 Denver, CO

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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
MFM	Mass Flow Meters	S&T	Specifications and Tolerances
NCWM	National Conference on Weights and Measures	TG	Task Group
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.			

First Day, September 24, 2019 – General Comments:

Measuring Sector Chairman, Michael Keilty (Endress + Hauser), opened the meeting on the first day by asking participants to introduce themselves. The final participant list is included in Appendix F. Mr. Keilty noted the Sector strives to reach consensus rather than to vote on its decisions and recommendations. This is particularly important given the imbalance of the number of evaluating laboratory members as compared to industry representatives. Mr. Keilty noted the Measuring Sector will meet jointly with the Software Sector on September 25, 2019 to discuss issues of mutual interest. Teri Gulke (Liquid Controls Corporation) reiterated the Software Sector hopes the opportunity for the two Sectors to jointly meet will help both Sectors be better apprised of their respective work and identify areas of overlap.

NTEP Director, Darrell Flocken noted the Software Sector made the request for a joint meeting was prompted by the need for feedback and information regarding the Software Sector's direction on certain issues. Several years ago, the Software Sector discussed the idea of creating a separate section in NCWM Publication 14 to address software rather than having the criteria embedded in each individual device checklist. He understood there may have been opposition to this approach by the Measuring Sector, though he doesn't have much information regarding this stance or the related discussion. The purpose of the September 25th joint meeting is to revisit this issue; discuss possible approaches from this point onward; and get the Measuring Sector's feedback. If a separate Pub 14 checklist for software is to be established, it is critical to ensure smooth communication amongst all Sectors. Mr. Keilty encouraged members to bring up any details of past discussions when both Sectors meeting so that both groups can start discussions with the same information in that regard.

Second Day, September 25, 2019 – General Comments:

On the second day of the meeting, Mr. Keilty welcomed the addition of members of the NTEP Software Sector. He again asked participants to introduce themselves and provided an introduction of the purpose of the Measuring Sector's agenda. He reiterated the process used by the Measuring Sector and reviewed the remaining items to be covered on the Measuring Sector's the agenda.

NTEP Software Sector Chairman Jim Pettinato (FMC) echoed Mr. Keilty's comments regarding the usefulness of having both Sectors present for some portions of both Sectors' agendas. Discussing some items on the Software Sector's Agenda while both groups are present will be mutually advantageous.

Carry-over Items:

1. 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. At its 2018 meeting, the Sector reviewed proposed changes from the NTEP laboratories to clarify the information in this section. The Sector agreed there are multiple points in this section that are confusing. The Sector discussed this issue at length and develop alternate suggestions without being able to reach agreement on revised language. Consequently, the Sector appointed a small group to work on revisions to be presented at

the next Sector meeting. The following individuals met via web conference and prepared recommendations for the Sector to review:

- Tina Butcher (NIST OWM)
- Craig Cavanaugh (Tuthill)
- Dmitri Karimov (IDEX LC)
- Rich Miller (FMC)
- Randy Ramsey (NC NTEP Lab, NC Department of Agriculture)
- John Roach (CA NTEP Lab, CA Division of Measurement Standards)

Recommendation: The Sector was asked to consider the following recommendations from the above referenced group that worked on this item.

- Modify the section of the LMD checklist titled “Laboratory or Field Evaluation” section at the beginning of the NTEP LMD – Laboratory/Field Evaluation and Permanence Tests for Metering Systems (see page LMD-113 in the 2019 edition of Pub 14) as shown in Appendix E to the Sector’s agenda. Appendix E included a marked copy of the proposed changes to this section of the LMD Checklist followed by a version without editorial markings.
- It would be helpful to have more specific standards for simulating conditions such as vibration and temperature. However, it may be difficult to develop standards that would be meaningful and all- encompassing and would be fair to all devices. International standards have some specific criteria, but some question the duration and broad application. This might be a future project that the Sector could consider taking on. Likewise, the reference to a 20-day, 300-use permanence test would bear more discussion.
- Change NTEP Technical Policy U as follows to reference “indicating element” rather than “indicator” to align with terminology used in NIST Handbook 44 Definitions Appendix D and LMD Code Section 3.30.

U. Evaluating Electronic ~~Indicators~~ Indicating Elements Submitted Separate from a Measuring Element

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

1. For the initial testing of the ~~indicator~~ indicating element.
2. For software changes to a device with an existing CC.

Discussion: Measuring Sector Technical Advisor Tina Butcher (NIST OWM) provided an overview of the small group’s charge. She pointed out the three recommendations made by the small group and asked that the Sector begin its discussions by reviewing the proposed changes to the front section of the Laboratory and Field Evaluation section of the Pub 14 LMD Checklist. Mr. Keilty asked for clarification on some points of the recommendations and various members of the small group provided input.

Key discussion points were as follows:

- Darrell Flocken noted discussions within other NTEP Sectors which indicated that some may be confused about what is meant by references to “subsequent” tests. Some did not understand that the “subsequent” test is the testing that takes place after the permanence criteria has been satisfied.
- Michael Keilty noted many terms are unique to type evaluation rather than in NIST HB44 and questioned if portions of Pub 14 other than the measuring device checklists use these terms. This comes closer to defining “permanence” though we still haven’t defined the term anywhere.
- Darrell Flocken confirmed that other sections use similar references and would like for them to be consistent. Mr. Flocken liked the wording in the proposal and would like to take that wording back to the other Sectors since it spells out what is meant by the “subsequent” testing.
- There was some discussion of whether terms such as “permanence” and “subsequent” might be added to NIST HB 44. There are some references in HB 44 with regard to permanence of a device’s performance and permanence to markings and these references are the basis for many of the “permanence” criteria in Pub 14. Marc Buttler pointed out paragraph G-S.3. Permanence is one of those. Tina Butcher noted that a statement or item might be better placed in the Technical Policy Section to specify what the “permanence test” consists of and perhaps adding the “Code Reference G-S.3.” to any permanence test criteria.
- There was discussion about the elimination of “compatibility testing;” however, there was general agreement this section is still needed and that the “Compatibility Test” paragraph should be moved back to the front part of the section. Another statement should be added to give an example of other types of meters such as loading-rack or large meters.
- Randy Moses (Wayne Fueling) pointed out “compatibility” criteria covers two separate areas. One can relate to the compatibility of software components in systems. The other addresses the question of whether or not meters that have been approved with some indicator will work with other indicators. And in some cases, “systems” such as a retail motor-fuel dispenser are approved as a complete entity.
- Tina Butcher noted that, in Pub 14, compatibility can include:
 - Mixing and matching of separable components like meters and indicators.
 - The compatibility of complete devices/systems such as RMFDs with other equipment like consoles.
- Darrell Flocken commented that, in the evaluation of scales, a complete scale goes through permanence testing. If electronics are changed a reevaluation of the functionality is required, but not a repeat of the permanence test. If hardware is changed, a repeat of the permanence test is typically needed.
- Michael Keilty questioned how NTEP becomes aware of changes made by a manufacturer to a device that has been evaluated. Darrell Flocken noted, when the manufacturer signs an

NTEP application, they are agreeing to notify NTEP of metrologically-significant changes. NTEP assesses whether the change warrants additional evaluation. Sometimes there is some subjectivity to this assessment since changes can sometimes be unique from instance to instance, but we try to be consistent. John Roach pointed out this process frequently includes collaborations among NTEP evaluators to ensure consistency. There was additional discussion about when re-testing is required when a device is changed.

Decisions:

- ***The Sector reviewed and revised the initial proposal from small work group. The revised version, with changes made by the Sector during the September 24, 2019 Sector meeting is included as Appendix E to this summary. The Sector recommends these changes be incorporated into the next edition of Pub 14.***

- ***The Sector agreed that a future discussion needs to be held to explore the different aspects of “compatibility,” including compatibility of separately evaluated and certified measuring and indicating elements as well as compatibility of changes to metrologically significant components of complete devices.***
 - ***The following individuals agreed to work on this issue:***
 - ***Marc Buttler (Emerson Processing)***
 - ***Tina Butcher (NIST Office of Weights and Measures)***
 - ***Craig Cavanaugh (Tuthill Transfer Systems)***
 - ***Allen Katalinic (NCWM NTEP)***
 - ***Dmitri Karimov (Teri G agreed to explore the possibility of LC involvement)***
 - ***Rich Miller (FMC)***
 - ***John Hathaway (Murray Equipment)***

 - ***The group is asked to consider at least the following two key areas relating to “compatibility” and prepare a recommendation for the Sector to consider at its next meeting for addressing these in type evaluation:***
 - ***The case in which individual certified equipment is used to create a metrologically complete, certified system.***
 - ***The case in which an existing, certified system is extended through the addition compatible devices through the addition of certified equipment.***

 - ***The group is also asked to consider how third-party software is to be addressed with regard to compatibility.***

- ***Sector agreed that the 20-day use permanence test for mobile electronic devices needs to be addressed, including the possibility of establishing more specific standards to ensure consistency. Issues such as duration, road conditions, standards for degree of use, mileage, etc. need to be encompassed in the discussion.***
 - ***The following individuals agreed to work on this issue:***
 - ***Tina Butcher (NIST OWM)***
 - ***Craig Cavanaugh (Tuthill Transfer Systems)***
 - ***Dmitri Karimov (IDEX LC) (suggested by Teri Gulke, pending Dmitri’s agreement)***
 - ***Rich Miller (FMC)***
 - ***Randy Ramsey (NC NTEP Lab)***

- *John Roach (CA NTEP Lab)*
- *Allen Katalinic (NCWM NTEP)*
- *John Hathaway (Murray Equipment)*
- *The Sector requests participation from Measurement Canada*
- *Add the term “Code reference G-S.3. Permanence” to the front of this entire LMD – Laboratory/Field Evaluation and Permanence Tests section.*
- *Consider adding a statement in the Technical Policy section of this (and other Pub 14) checklists regarding the key components of a “Permanence Test.”*

2. Development of Proposal to Modify Sealing Requirements to Clarify Application

Source: 2018 Measuring Sector (Ref Item 3 D on 2018 Agenda)

Background Information: During its 2018 annual meeting, the Sector reviewed the changes made by the NCWM to include specific requirements for “categories of devices” and “methods of sealing” for water meters agreed upon recommended changes for NCWM Publication 14 to correspond to these requirements. See Agenda Item 3D on the Sector’s 2018 Agenda.

As part of its discussions in 2018, the Sector had considered a modification to the provisions for sealing in the Publication 14 Water Meters Checklist as shown below; however, recognized that such a change would not be appropriate without supporting language in NIST Handbook 44.

An approved means of security (e.g., data change audit trail) so that no changes may be made to its adjustable components **without evidence of the change.**

At that meeting, the Sector agreed include a future agenda and item and consider developing a proposal to recommend modifications to paragraph S.2.1. Provision for Sealing and corresponding paragraphs in other HB44 measuring device codes to clarify that audit trails are intended to track and provide evidence of metrologically significant changes as a way of *detering* unauthorized changes, not *prevent* such changes from being made.

Recommendation: No specific recommended language was been submitted by any Sector member. To assist the Sector in addressing this item, Technical Advisor, Tina Butcher prepared the draft recommendation shown below for the Sector to use as a starting point in its discussions. The following represents suggested changes to paragraph S.2.2. Provision for Sealing in Section 3.30 Liquid-Measuring Devices Code. Once the Sector reaches agreement on the basic language changes, corresponding recommendations can be developed for the remaining measuring codes, which presently include similar or identical requirements for sealing.

S.2.2. Provision for Sealing. – Adequate provision shall be made for an approved means of security **such that no changes may be made to metrologically significant parameters without evidence of the change to or evidence of access to the adjustable components.**

Means include electronic provisions for security such as a (~~e.g.,~~ data change audit trail) or provisions 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 as of January 1, 1995]*

(Amended 1991, 1993, 1995, and 2006)

Discussion: Key discussion points included the following.

- Tina Butcher provided overview of history of item, noting it is a carryover item from the 2018 Sector meeting and that no specific proposal was submitted other than that suggested by Mrs. Butcher as a starting point for discussion.
- John Roach noted, as an example, he needed more specific criteria regarding methods of sealing for water meters and this prompted the eventual addition of specific sealing requirements and “audit trail” criteria to the Water Meters Code.
- Multiple Measuring Sector members questioned whether or not a change is needed since most who are using the codes understand the intent.
- Michael Keilty and others indicated they believe Pub 14 is not being interpreted incorrectly. The labs have not had any issues with this.
- Darrell Flocken and Tina Butcher noted that, if we find a problem, we should fix it. The question is whether or not it is a significant enough issue to take on proposed changes to multiple codes.
- An alternate approach is to well document the intent of the language. This can be used by NTEP and the evaluating labs to clarify the intended application in the event of any challenges.

Decision: *The Sector concluded it did not want to pursue a proposal to modify NIST HB 44 to clarify the intent of the sealing requirements. Should NTEP receive challenges to the interpretation of the provisions for sealing included in NCWM Pub 14, the Sector can pursue changes to the NIST Handbook 44 language at that time.*

New Items:

3. 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 104th Annual Meeting, the National Conference on Weights and Measures (NCWM) adopted the following items that will be reflected in the 2020 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 2019 Interim Report and its accompanying appendix along with the addendum sheets issued by the S&T Committee during the 2019 NCWM Annual Meeting, all of which can be found on the NCWM’s web site at:

<https://www.ncwm.net/meetings/annual/publication-16>

A. Provisions for Sealing for Devices and Systems Adjusted Using Removable Digital Device Storage – 2019 S&T Committee Agenda Block 3 Items

Background: At its 2019 Annual Meeting, the NCWM adopted a series of changes to address sealing provisions for devices adjusted using a removable digital storage device. These were considered on the S&T Committee’s Agenda as a single “block” of items referenced as “Block 3.” Included in this block were changes to the following Codes; paragraphs affected are shown following the Code reference. These changes included the addition of a new paragraph to the General Code and modifications to existing paragraphs in the other codes listed to refer back to that new General Code paragraph.

Code	Paragraph and Action	Location in 2019 Edition of Pub 14 Checklist
General	Paragraph G-S.8.2. Devices and Systems Adjusted Using Removable Digital Device Storage – Add a new Code Reference.	LMD-29 See Appendix A to Agenda
Liquid-Measuring Devices	Paragraph S.2.2. Provision for Sealing – Modify existing Code Reference. (for RMFDs)	Section 9; LMD-41 See Appendix A to Agenda
	Paragraph S.2.2. Provision for Sealing – Modify existing Code Reference. (for Wholesale & Loading Rack Meters)	Section 17.; LMD-54 See Appendix A to Agenda
Vehicle-Tank Meters	Paragraph S.2.2. Provision for Sealing - Modify existing Code Reference.	Section 24; LMD-60 See Appendix A to Agenda
Liquefied Petroleum Gas & Anhydrous Ammonia Liquid-Measuring Devices	Paragraph S.2.2. Provision for Sealing - Modify existing Code Reference.	Section 29; LMD-71 See Appendix A to Agenda
Hydrocarbon Gas Vapor-	Paragraph S.2.2. Provision for	Section 3; HGVM-7

Measuring Devices	Sealing - Modify existing Code Reference.	See Appendix B to Agenda
Cryogenic Liquid Measuring Devices	Paragraph S.2.5. Provision for Sealing - Modify existing Code Reference.	Section 8; CLMD-15 See Appendix C to Agenda
Milk Meters	Paragraph S.2.3. Provision for Sealing - Modify existing Code Reference.	Section 40; LMD-89 See Appendix A to Agenda
Water Meters	Paragraph S.2.1. Provision for Sealing - Modify existing Code Reference.	Section 43; LMD-94 See Appendix A to Agenda
Mass Flow Meters	Paragraph S.3.5. Provision for Sealing - Modify existing Code Reference.	Section 34; LMD-81 See Appendix A to Agenda
Carbon Dioxide Liquid-Measuring Devices	Paragraph S.2.5. Provision for Sealing - Modify existing Code Reference.	Presently no specific checklist criteria for carbon dioxide liquid-measuring devices.
Hydrogen Gas Measuring Devices	Paragraph S.3.3. Provision for Sealing - Modify existing Code Reference.	Section 49; LMD-105 See Appendix A to Agenda

Recommendation: The Sector was asked to consider changes to NCWM Publication 14 to reflect the changes made to the above codes. See the S&T Committee’s 2019 Interim Report for background on these changes.

Proposed changes were outlined in Appendixes A, B, and C to the agenda as noted in the table above.

Discussion: The Sector reviewed the proposed changes to the checklist on screen. Beyond noting a few editorial corrections, there was no substantial discussion of this item.

Decision: *The Sector agreed to the proposed changes to reflect the modifications to sealing requirements as shown in Appendixes A, B, and C to the agenda, noting editorial changes are needed as follows:*

- *Page LMD-93 of Appendix A, in the Milk Meters Checklist section, delete the last proposed paragraph which references retail motor-fuel dispensers.*
- *Page LMD-30 (revised version): Add an asterisk to the statement “Note that this provision...” and correct the misspelling of the word “provision.”*

These documents are included as Appendixes A, B, and C to this summary. Appendix A has been revised to include the above editorial changes.

B. Provisions for Timeout on Retail Motor-Fuel Dispensers – 2019 S&T Committee Agenda Block 4 Items

Background: At its 2019 Annual Meeting, the NCWM adopted changes to the Mass Flow Meters Code and the Hydrogen Gas Measuring Devices Code to add provisions for an automatic timeout for vehicle fuel dispensers. These requirements were to correspond to the

existing requirement for timeout on retail motor-fuel dispensers already specified in the LMD Code. These were considered on the S&T Committee’s Agenda as a single “block” of items referenced as “Block 4.” Included in this block were changes to the following Codes; paragraphs affected are shown following the Code reference. Except for the General Code which included the addition of a new paragraph, paragraphs were modified to address these devices and refer back to the new General Code paragraph.

Code	Paragraph	Location in 2019 Edition of Pub 14 Checklist
Mass Flow Meters	Paragraph S.2.9. Automatic Timeout – Pay at Retail Motor Fuel Devices. Move current reference to “Credit-Card and Debit-Card Activated RMFD” on page LMD-77 to a new section 38 and expand to include reference to new paragraph S.2.8. and G-S.2. Facilitation of Fraud (this mirrors references in the LMD Code and Hydrogen Code sections of Pub 14)	LMD-77 and LMD-84 See Appendix A to Agenda
Hydrogen Gas Measuring Devices	Paragraph S.2.8. Automatic Timeout – Pay-At-Vehicle Fuel Dispensers	Section 55; LMD-111 See Appendix A to Agenda

Recommendations: The Sector was asked to consider the following changes to NCWM Publication 14 to reflect the changes made to the above codes. See the S&T Committee’s 2019 Interim Report for background on these changes

Proposed changes were outlined in Appendix A to the agenda as noted in the table above.

In reviewing these proposed changes, the Technical Advisor noted an additional “housekeeping” item related to these changes. When changes were made by the Measuring Sector in 2016 to reflect the adoption of LMD Code paragraph S.6.1.10. Automatic Timeout – Pay-At-Pump Retail Motor-Fuel Devices the proposed changes should have included the addition of a reference to the corresponding LMD Code paragraph in the “Code Reference” title. A proposed change is included in Appendix A to address this under Code Reference G-S.2. in the Additional Checklists and Test Procedures for Card-Activated Retail Motor-Fuel Dispensers, page LMD-85 in the 2019 LMD Pub 14 checklist. The Sector is asked to also consider this change in its review. Consideration might be given to consolidating references to pay-at dispenser requirements for all metering types into a single section and including a reference to this section in individual checklist sections.

Discussion: Tina Butcher reviewed the proposed changes and rationale for those changes. She suggested the Sector may want to consider collecting requirements for pay-at-pump criteria and grouping them together. It is also necessary to ensure that the references to “time out” values are consistent with the two-minute requirement for RMFDs. This may warrant a specific search of the checklist to ensure no references have been overlooked. Darrell Flocken

suggested having a newly-hired NTEP evaluator go through the checklist to identify any remaining references that need to be corrected.

John Hathaway pointed out that there are some instances where the language is not consistent, referring in some places as “pay-at-pump” and in other places “pay-at-vehicle.” These need to be cleaned up and made consistent with the NIST HB 44 references.

Decisions: The Sector agreed with the changes as proposed in the Appendix A to the Agenda. This document, including any updates made during the Sector’s meeting, is included as Appendix A to this summary.

The Sector agreed it would be helpful to have a global review for the discrepancies in time limits; documenting these areas for review; and making changes as appropriate.

Darrell Flocken will ask Mike Manheim (NCWM NTEP) to mark all references to “3 minutes” (and variations, including hyphens and spelled out times) using track changes. Michael Keilty and Tina Butcher will review the marked areas and confirm which sections are to be changed; these changes will be incorporated into the recommendations of changes for the 2020 edition of NCWM Publication 14.

C. Repeatability Requirements and Tolerances – 2019 S&T Committee Agenda Block 5 Items

Background: At its 2019 Annual Meeting, the NCWM adopted a series of changes to clarify and align repeatability tests and tolerances across multiple measuring codes in NIST Handbook 44. These were considered on the S&T Committee’s Agenda as a single “block” of items referenced as “Block 5.” Included in this block were changes to the following Codes; paragraphs affected are shown following the Code reference.

Code	Paragraph	Location in 2019 Edition of Pub 14 Checklist
Liquid-Measuring Devices	Paragraphs N.4.1.2. Repeatability Tests; N.4.6. Repeatability Tests; and T.3. Repeatability RMFDs and Wholesale PD Meters and Magnetic Flow Meters and Ultrasonic Meters	Section A, Field Evaluation; LMD-114 AND Section D, Field Evaluation; LMD-117 AND Section M, Field Evaluation; LMD-129
Vehicle-Tank Meters	Paragraphs N.4.1.2. Repeatability Tests; N.4.7. Repeatability Tests; and T.3. Repeatability	Section C, Field Evaluation; LMD-115
Liquefied Petroleum Gas & Anhydrous Ammonia Liquid-Measuring Devices	Paragraphs N.4.1.2. Repeatability Tests; N.4.4. Repeatability Tests; and T.3. Repeatability	Section E, Field Evaluation; LMD-117 and LMD-118
Hydrocarbon Gas Vapor-Measuring Devices	Paragraphs N.4.1.2. Repeatability Tests; N.4.3. Repeatability Tests; and T.2. Repeatability.	Section H, Field Evaluation; HGVMD-14
Cryogenic Liquid Measuring Devices	Paragraphs N.5.1.1. Repeatability Tests; N.5.3. Repeatability Tests; and T.4. Repeatability	Section E, Field Evaluation; CLMD-20
Milk Meters	Paragraphs N.4.1.1. Repeatability	Section G, Field Evaluation;

	Tests; N.4.4. Repeatability Tests; and T.3. Repeatability	LMD-118
Water Meters	Paragraphs N.4.1.1. Repeatability Tests and N.4.4. Repeatability Tests	Section L, Field Evaluation; LMD-128
Mass Flow Meters	Paragraphs N.6.1.1. Repeatability Tests; N.6.3. Repeatability Tests; and T.3. Repeatability	Section I, Field Evaluation; LMD-122
Carbon Dioxide Liquid-Measuring Devices	Paragraphs N.4.1.1. Repeatability Tests; N.4.5. Repeatability Tests; and T.2.1. Repeatability	Presently no specific checklist criteria for carbon dioxide liquid-measuring devices.
Hydrogen Gas Measuring Devices	Paragraphs N.6.1.1. Repeatability Tests; N.6.2. Repeatability Tests; and T.3. Repeatability	Presently no separate checklist criteria for testing of hydrogen devices in the “Field Test” portion of the LMD checklist. Add a new section N. to the Field Evaluation and Permanence Tests for Metering Systems to address Hydrogen Gas-Measuring Devices. See also Item 3G later in this agenda.

Recommendation: The Sector was asked to consider the following changes to NCWM Publication 14 to reflect the changes made to the above codes. See the S&T Committee’s 2019 Interim Report for details.

Proposed changes were outlined in Appendixes A, B, and C to the agenda as noted in the table above.

Discussion: The Sector reviewed the proposed changes. There was little discussion beyond noting several editorial changes and corrections.

Decisions: *The Sector agreed with the changes as proposed in Appendixes A, B, and C to the agenda, with the following additional changes/corrections.*

- *Page LMD-117 and LMD-118 in Appendix A. The numbering jumps from 2. to 12. The line numbered “12” should be “3” and the line numbered “13” should be “4.”*
- *Page LMD-118 of Appendix A the following statement is redundant with the same statement earlier in the paragraph. One of the two sentences (probably the last sentence) needs to be deleted.*
 - *“For devices equipped with an automatic temperature compensator, the results shall be based on uncompensated (gross) volume (i.e., with the temperature compensator deactivated).”*
- *Check all existing and new sections where repeatability criteria have been modified or added to ensure the above error is corrected.*

Appendixes A, B, and C to the Sector's agenda have been revised to include the above corrections and other updates (if any) made during the Sector's meeting. The revised versions are included as Appendixes A, B, and C to this summary.

D. Provisions to Address Systems Dispensing Diesel Exhaust Fluid (DEF) in the LMD Code – 2019 S&T Committee Agenda Item LMD-3

Background: At its 2019 Annual Meeting, the NCWM adopted changes to the following paragraphs in the LMD Code (along with changes to the “Application” Section and “User Requirements” which do not impact the Pub 14 checklist) in NIST Handbook 44 to better address metering systems used to dispense Diesel Exhaust Fluids and other products. These were considered on the S&T Committee’s Agenda under Item LMD-3 and are shown in the table below for reference.

- S.1.6.10. Pay-at-Pump Retail Motor Fuel Dispensers (LMD Checklist 2019 Edition, Page LMD-85)
- S.2.5. Zero-Set-Back Interlock, for Retail Motor-Fuel Devices. (No change needed to LMD Checklist 2019 Edition, Page LMD-42)
- S.4. Marking Requirements.
- S.5. Zero-Set-Back Interlock, for Retail Motor-Fuel Devices

A.1. General. – This code applies to:

- (a) devices used for the measurement of liquids, ~~including liquid fuels and lubricants~~, and
 - (b) wholesale devices used for the measurement and delivery of agri-chemical liquids such as fertilizers, feeds, herbicides, pesticides, insecticides, fungicides, and defoliant.
- (Added 1985)

***S.1.6.10. Automatic Timeout – Pay-At-Pump for Retail ~~Motor-Fuel~~ Devices.** – Once a device has been authorized, it must de-authorize within two minutes if not activated. Re-authorization of the device must be performed before any product can be dispensed. If the time limit to de-authorize the device is programmable, it shall not accept an entry greater than two minutes
[Nonretroactive as of January 1, 2017]
(Added 2016) (**Amended 20XX**)*

S.2.5. Zero-Set-Back Interlock, for Retail ~~Motor-Fuel~~ Devices. – A device shall be constructed so that:

- (a) after a delivery cycle has been completed by moving the starting lever to any position that shuts off the device, an automatic interlock prevents a subsequent delivery until the indicating elements, and recording elements if the device is equipped and activated to record, have been returned to their zero positions;
- (b) the discharge nozzle cannot be returned to its designed hanging position (that is, any position where the tip of the nozzle is placed in its designed receptacle and the lock can be inserted) until the starting lever is in its designed shut-off position and the zero-set-back interlock has been engaged; and
- (c) in a system with more than one dispenser supplied by a single pump, an effective automatic control valve in each dispenser prevents product from being delivered until the indicating

elements on that dispenser are in a correct zero position.
(Amended 1981, ~~and~~ 1985, and 20XX)

S.4.4.1. Discharge Rates. – *On a retail device with a designed maximum discharge rate of 115 L (30 gal) per minute or greater, the maximum and minimum discharge rates shall be marked in accordance with S.4.4.2. Location of Marking Information; Retail ~~Motor-Fuel~~ Dispensers. The marked minimum discharge rate shall not exceed 20 % of the marked maximum discharge rate.*
[Nonretroactive as of January 1, 1985]
(Added 1984) (Amended 2003 and 20XX)

S.4.4.2. Location of Marking Information; ~~for~~ Retail ~~Motor-Fuel~~ Dispensers. – *The marking information required in the General Code, paragraph G-S.1. Identification shall appear as follows:*

- (a) *within 60 cm (24 in) to 150 cm (60 in) from the base of the dispenser for system in a dispenser;*
- (b) *either internally and/or externally provided the information is permanent and easily read; and*
- (c) *on a portion of the device that cannot be readily removed or interchanged (i.e., not on a service access panel).*

Note: *The use of a dispenser key or tool to access internal marking information is permitted for retail liquid-measuring devices.*
[Nonretroactive as of January 1, 2003]
(Added 2002) (Amended 2004 and 20XX)

...

S.5. Totalizers for Retail ~~Motor-Fuel~~ Dispensers. – *Retail ~~motor-fuel~~ dispensers shall be equipped with a non-resettable totalizer for the quantity delivered through the metering device.*

[Nonretroactive as of January 1, 1995]

(Added 1993) (Amended 1994 and 20XX)

...

N.4.2.2. Retail Motor-Fuel and DEF Devices.

(a) **Devices without a marked minimum flow-rate shall have a “special” test performed at the slower of the following rates:**

- (1) 19 L (5 gal) per minute; or
- (2) the minimum discharge rate at which the device will deliver when equipped with an automatic discharge nozzle set at its slowest setting.

(b) **Devices with a marked minimum flow-rate shall have a “special” test performed at or near the marked minimum flow rate.**

(Added 1984) (Amended 2005 and 20XX)

UR.2.4. Diversion of Liquid Flow. – *A ~~motor-fuel~~ device equipped with two delivery outlets used exclusively in the fueling of trucks shall be so installed that any diversion of flow to other than the receiving*

vehicle cannot be readily accomplished and is readily apparent. Allowable deterrents include, but are not limited to, physical barriers to adjacent driveways, visible valves, or lighting systems that indicate which outlets are in operation, and explanatory signs.
(Amended 1991 **and 20XX**)

UR.2.5. Product Storage Identification.

- (a) The fill connection for any petroleum product **or other product** storage tank or vessel supplying **petroleum product or other products** ~~motor-fuel devices~~ shall be permanently, plainly, and visibly marked as to product contained.

Recommendation: While the specification sections noted above are currently referenced in the LMD Checklist, these sections are specifically covered under the “Retail Motor-Fuel Dispensers” portion of the checklist. The changes to NIST Handbook 44 were intended to make the references more generic so as to provide the ability to apply criteria to systems dispensing DEF. However, the current Pub14 checklist does not facilitate this.

The Sector was asked to discuss how to best address this issue so that NTEP evaluators have clear checklist criteria to apply to DEF-dispensing systems. Among possible options for the Sector to consider are:

- 1) Broaden the “RMFD” Checklist to Refer to “Stationary Retail Dispensing Systems”
- 2) Create as separate section for DEF dispensing systems, which would mirror many of the RMFD Checklist requirements and, perhaps, include additional guidance relative to DEF dispensing systems.

Discussion: Technical Advisor, Tina Butcher presented the item and reviewed the two possible options noted above and asked if Sector members preferred one or the other of these options. She pointed out there is presently no section in the checklist to address DEF dispensers.

Randy Moses (Wayne Fueling) commented he doesn’t want to see separate checklists, and Allen Katalinic (NCWM NTEP) agreed, noting he doesn’t want to add to the overall size of the checklist.

There was general agreement among Sector members present to lean toward the first option of broadening the RMFD checklist. Mrs. Butcher recommended that, if the Sector decides to pursue the option of broadening the RMFD checklist, the Sector should go back and review the RMFD checklist and develop a proposal to modify the checklist to encompass stationary retail dispensing systems. She also noted there are likely sections of that checklist which may not be appropriate for use with DEF.

Mr. Moses suggested the Sector’s objective should be for Pub 14 to align with NIST Handbook 44. For any gaps identified, the Sector should develop proposed changes to HB 44 and once those are adopted make corresponding recommendations to modify the Pub 14 checklist.

Measuring Sector Chairman, Michael Keilty noted the MFM Code doesn't include these references to allow recognition for DEF.

The NTEP Laboratories are already applying these requirements, so there shouldn't be a significant impact on devices already evaluated.

Mrs. Butcher questioned how best to go about broadening current references to "retail motor-fuel dispensers" to include other stationary retail devices. A "search and replace" might be useful in identifying these references, but it would not be appropriate to replace all of them; some references might correctly apply to only RMFDs. The Sector discussed having one or a group of people do such as search to identify the references. Mr. Keilty suggested we include this as a carryover item with regard to these checklist changes.

Decisions:

The Sector agreed to the following corrections to the LMD Checklist:

- ***Correct the reference to "S.1.6.10. Automatic Timeout-Pay-At-Pump for Retail Devices" on pg. LMD-89. It reads S.6.1.10. and it should read S.1.6.10.***
- ***Correct the existing reference to S.5. Totalizers on page LMD-45 of Appendix A to the Sector's Agenda. It reads "S.5.1." and should read "S.5."***

Appendix A to the Sector's agenda has been revised to include the above corrections and other updates made during the Sector's meeting. The revised version is included as Appendix A to this summary.

The Sector also acknowledged the changes made by the NCWM to broaden the application of the LMD Code to encompass DEF and other devices. This is consistent with what the laboratories have already been doing and will continue to do.

The Sector agreed the RMFD section of the checklist needs to be broadened and not limited to "retail motor-fuel." However, the Sector is reluctant to do a "search and replace" without specifically reviewing the proposed changes to ensure there isn't an inadvertent problem created by a given change. Consequently, the Sector agreed that NTEP will through the RMFD checklist and do a "search and replace" marking the replacements as proposed changes for Sector review at its next meeting. This effort will include the following tasks and parameters.

- ***The search will include a search for the terms such as the following as well as any terms that are limiting:***
 - ***"retail motor-fuel" (with the hyphen)***
 - ***"retail motor fuel" (without the hyphen)***
 - ***"retail fuel devices"***
 - ***"motor-fuel"***

- “motor fuel”
- “retail” and “fuel” and motor”
- *Darrell Flocken will assign Mike Manheim the task of doing a search for and highlighting these terms in the electronic version of Pub 14*
- *The following people agreed to serve on a small task group who will assist by reviewing the marked document:*
 - *Tina Butcher (NIST OWM)*
 - *Michael Keilty (Endress + Hauser)*
 - *Allen Katalinic (NCWM NTEP)*
 - *Brent Price (Gilbarco)*

These individuals will provide comments back to Darrell Flocken. Darrell will ask Mike to incorporate changes proposed by the task group.

- *The final proposed changes as identified and agreed to by the task group will be included as a “carryover item” on the Sector’s 2020 Meeting Agenda and presented to the Sector for review and agreement at that meeting.*

E. Liquefied Petroleum Gas Liquid-Measuring & Anhydrous Ammonia Liquid-Measuring Devices Code Paragraph S.2.5. Zero-Set-Back Interlock, Stationary and Vehicle Mounted Meters, Electronic – 2019 S&T Committee Agenda Item LPG-2

Background: At its 2019 Annual Meeting, the NCWM adopted a new paragraph S.2.5. Zero-Set-Back Interlock, Stationary and Vehicle Mounted Meters, Electronic in the Liquefied Petroleum Gas (LPG) Liquid-Measuring Devices & Anhydrous Ammonia Liquid-Measuring Devices Code of NIST Handbook 44. Subsequent paragraphs were renumbered accordingly. This was considered on the S&T Committee’s Agenda under Item LPG-2; see the Committee’s Interim Report for additional details.

S.2.5. Zero-Set-Back Interlock, Stationary and Vehicle Mounted Meters, Electronic. - A device shall be so constructed that after an individual or multiple deliveries at one location have been completed, an automatic interlock system shall engage to prevent a subsequent delivery until the indicating and, if equipped, recording elements have been returned to their zero position. For individual deliveries, if there is no product flow for two minutes the transaction must be completed before additional product flow is allowed. The 2-minute timeout shall be a sealable feature on an indicator.

(Added 2019) (Nonretroactive as of 2021)

Recommendation: This paragraph does not become effective until 2021. Given that NTEP Evaluators will be evaluating equipment as 2021 approaches, the Sector was asked to consider adding a note to the checklist under Code Reference S.2.5. Zero-Set-Back Interlock in the LPG LMD Checklist to alert evaluators and manufacturers to the approaching change as shown below. This proposed change is also shown in Appendix A to this summary.

Code Reference: S.2.5. Zero-Set-Back Interlock

The zero-set-back interlock on a dispenser is critical to prevent fraudulent practices. A retail motor fuel device shall have an effective automatic interlock such that once the dispenser shuts off, it cannot be restarted without resetting the indicating element to zero. This requirement also applies to the recording element if one is present. The dispenser shall be designed so that the starting lever must be in the shut-off position and the interlock engaged before the discharge nozzle can be returned to its designed hanging position. If a single pump supplies more than one dispenser, then each dispenser shall have an automatic control valve that prevents product from being delivered by a dispenser until its indications have been set to zero.

Note that the following NIST Handbook 44 requirement becomes nonretroactively effective as of 2021. NTEP evaluators and manufacturers must be cognizant of the approaching requirement, especially for evaluations conducted as 2021 approaches.

S.2.5. Zero-Set-Back Interlock, Stationary and Vehicle Mounted Meters, Electronic. - A device shall be so constructed that after an individual or multiple deliveries at one location have been completed, an automatic interlock system shall engage to prevent a subsequent delivery until the indicating and, if equipped, recording elements have been returned to their zero position. For individual deliveries, if there is no product flow for two minutes the transaction must be completed before additional product flow is allowed. The 2-minute timeout shall be a sealable feature on an indicator.

(Added 2019) (Nonretroactive as of 2021)

Discussion: Sector Technical Advisor, Tina Butcher, noted the new paragraph does not become effective until 2021; however, devices are often submitted to NTEP leading up to the effective date of a requirement and companies are expected to be able to demonstrate the ability to comply with the requirement. Particularly for devices submitted in the fall of 2020, it is important for evaluators and manufacturers alike to be aware of the requirement.

Since the 2021 edition of NCWM Pub 14 isn't scheduled for publication until at least January 2021, including a note in the checklist about the impending effective date would provide manufacturers submitting equipment with advance information about what will be required as of January 1, 2021. With the addition of the note, evaluators will be able to remind manufacturers of the requirement. At this point, the "checklist boxes" are not needed, but will be needed in the 2021 edition.

The Sector discussed whether or not to put such a notice into Pub 14 now or wait until the requirement actually becomes effective. Rich Miller (FMC) questioned how this type of requirement is handled in field inspections. Mrs. Butcher noted how this is handled may differ among jurisdictions with regard to notifying device owners/users and inspectors and in how they ensure devices comply as of the effective date. While this is a specification, device owners/users must maintain and program devices correctly to ensure compliance.

Decision: Sector agreed to add the note as shown in the Recommendation to the Pub 14 LMD checklist. The Sector also to include this item as a “carryover item” on the Sector’s 2020 agenda so that proposed changes to reformat this reference as a checklist item; remove the note; and add check boxes can be considered by the Sector.

F. Mass Flow Meters Code Paragraph S.1.3.3. Maximum Value of Quantity-Value Divisions

Background: At its 2019 Annual Meeting, the NCWM adopted the following changes to paragraph S.1.3.3. Maximum Value of Quantity-Value Divisions in the Mass Flow Meters Code of NIST Handbook 44. This was considered on the S&T Committee’s Agenda under Item MFM-2; see the Committee’s Interim Report for additional details.

Amend NIST Handbook 44 Mass Flow Meters Code as follows:

S.1.3.3. Maximum Value of Quantity-Value Divisions.

- ~~(a) The maximum value of the quantity-value division for liquids shall not be greater than 0.2 % of the minimum measured quantity.~~
- ~~(b) For dispensers of compressed natural gas used to refuel vehicles, the value of the division for the gasoline liter equivalent shall not exceed 0.01 GLE; the division for gasoline gallon equivalent (GGE) shall not exceed 0.001 GGE. The maximum value of the mass division shall not exceed 0.001 kg or 0.001 lb.~~

~~(Amended 1994)~~

The maximum value of the quantity-value division shall not exceed the following.

- (a) For compressed natural gas dispensed as an engine fuel:**
 - (1) 0.001 for gasoline gallon equivalent (GGE) units; or**
 - (2) 0.001 diesel gallon equivalent (DGE) units; or**
 - (3) 0.001 kg or 0.001 lb for mass units.**
- (b) For liquefied natural gas dispensed as an engine fuel:**
 - (1) 0.001 for diesel gallon equivalent (DGE) units; or**
 - (2) 0.001 kg or 0.001 lb for mass units.**
- (c) For all liquids other than liquefied natural gas dispensed as an engine fuel a maximum value not greater than 0.2 % of the minimum measured quantity.**

(Amended 1994 **and 2019**)

Recommendations: The Sector was asked to consider changes to the “Checklists and Test Procedures for Mass Flow Meters” portion of the LMD Checklist to reflect the changes adopted to S.1.3.3. References to this paragraph in Pub 14 are found under “Code Reference S.1.3.3. Money-Value Divisions, Digital” and Code Reference S.1.3.3. Value of Smallest Unit,” both of which are found on page LMD-78 in the 2019 checklist.

See Appendix A to the Sector’s Agenda and Summary for proposed changes.

Decision: *The Sector agreed to accept the proposed changes to NCWM Pub 14 shown in Appendix A to this summary relative to the changes to MFM Code paragraph S.1.3.3. shown above.*

G. MFM-4 V S.5.1. Location of Marking Information; Retail Motor-Fuel Dispensers.

Background: At its 2019 Annual Meeting, the NCWM adopted the following changes to paragraph S.5.1. Location of Marking Information; Retail Motor-Fuel Dispensers in the Mass Flow Meters Code of NIST Handbook 44. This was considered on the S&T Committee’s Agenda under Item MFM-4; see the Committee’s Interim Report for additional details.

Amend NIST Handbook 44 Mass Flow Meters Code as follows:

S.5.1. Location of Marking Information; Retail Motor-Fuel Dispensers. – *The marking information required in General Code, paragraph G-S.1. Identification shall appear as follows:*

- (a) *within 60 cm (24 in) to 150 cm (60 in) from the base of the dispenser;*
- (b) *either internally and/or externally provided the information is permanent and easily read;
and*
- (c) *on a portion of the device that cannot be readily removed or interchanged (i.e., not on a service access panel).*

*Note: The use of a dispenser key or tool to access internal marking information is permitted for retail liquid and compressed gas-measuring devices.
[Nonretroactive as of January 1, 2003]
(Added 2006) (Amended 2019)*

Recommendations: The Sector was asked to consider changes to the “Checklists and Test Procedures for Mass Flow Meters” portion of the LMD Checklist to reflect the changes adopted to S.5.1. Location of Marking Information; Retail Motor-Fuel Dispensers. References to this paragraph in Pub 14 are found under “Code Reference: S.5.1. Location of Marking Information; Retail Motor Fuel Dispensers” found on page LMD-84 in the 2019 checklist.

See Appendix A for proposed changes related to this new MFM paragraph.

Discussion: Technical Advisor, Tina Butcher noted this requirement adopted into the MFM extends the exemption that allows markings on RMFDs covered by the LMD Code to be accessible via a key to include devices covered by the MFM Code.

Decision: *The Sector agreed to accept the proposed changes to NCWM Pub 14 related to the new MFM Code paragraph S.5.1. Location of Marking Information on Retail Motor-Fuel Dispensers as proposed in Appendix A.*

H. HGM-6 Hydrogen-Gas Measuring Devices Code. N.2 Test Medium., N.3. Test Drafts., N.4.1. Master Meter (Transfer) Standard Test., N.4.2. Gravimetric Tests., N.4.3 PVT Pressure Volume Temperature Test., N.6.1.1. Repeatability Tests., T.3. Repeatability., T.6. Tolerance –Minimum Measured Quantity (MMQ). and Appendix D. Definitions where applicable.

Recommendations: The Sector was asked to consider adding a new section to the “Field Evaluation and Permanence Tests for Metering Systems” portion of the LMD Checklist to include references to tests of hydrogen gas-measuring devices. Criteria proposed for this section are to reflect the following paragraphs and associated changes adopted to Hydrogen Gas-Measuring Devices Code at the 2019 NCWM Annual Meeting. See the NCWM S&T Committee’s 2019 Interim Report and Annual Meeting Addendum Sheets for details and additional background information.

N.2. Test Medium. – The device shall be tested with the product commercially measured except that, in a type evaluation examination, hydrogen gas as specified in NIST Handbook 130 shall be used.

Note: ~~Corresponding requirements are under development and this paragraph will be revisited.~~

N.3. Test Drafts. –The minimum test shall be one test draft at **twice** the declared minimum measured quantity and one test draft at approximately ~~ten-five~~ times the minimum measured quantity or ~~1~~ **4** kg, whichever is greater. More tests may be performed over the range of normal quantities dispensed. (See T.3. Repeatability)

The test draft shall be made at flows representative of that during normal delivery. The pressure drop between the dispenser and the proving system shall not be greater than that for normal deliveries. The control of the flow (e.g., pipework or valve(s) size, etc.) shall be such that the flow of the measuring system is maintained within the range specified by the manufacturer.

N.4. Tests.

N.4.1. Master Meter (Transfer) Standard Test. –When comparing a measuring system with a calibrated transfer standard, the minimum test shall be one test draft at the declared minimum measured quantity and one test draft at approximately ten times the minimum measured quantity or 1 kg, whichever is greater. More tests may be performed over the range of normal quantities dispensed.

N.4.1.1. Verification of Master Metering Systems. – A master metering system used to verify a hydrogen gas-measuring device shall be verified before and after the verification process. A master metering system used to calibrate a hydrogen gas-measuring device shall be verified before starting the calibration and after the calibration process.

N.4.2. Gravimetric Tests. – The weight of the test drafts shall be equal to at least **twice** the amount delivered by the device at the declared minimum measured quantity and one test draft at

approximately ~~ten~~ **five** times the minimum measured quantity or ~~1~~ **4** kg, whichever is greater. More tests may be performed over the range of normal quantities dispensed

N.4.3. PVT Pressure Volume Temperature Test. – The minimum test with a calibrated volumetric standard shall be one test draft at **twice** the declared minimum measured quantity and one test draft at approximately ~~ten~~ **five** times the minimum measured quantity or ~~1~~ **4** kg, whichever is greater. More tests may be performed over the range of normal quantities dispensed.

This new section is proposed to be added following existing Section M of the Field Evaluation and Permanence Tests for Metering Systems section of the LMD Checklist found on page LMD-130 in the 2019 checklist.

Proposed changes offered for consideration by the sector are shown in Appendix A to this summary.

Discussion: John Roach (CA DMS, NTEP Lab) questioned if NTEP will begin issuing NTEP CCs for these devices as full CCs rather than as “provisional.” NTEP Director Darrell Flocken agreed that, unless he hears any opposition, NTEP will begin accepting applications and issuing non-provisional CCs for hydrogen gas measuring devices from this point onward. He noted that NTEP will not issue NTEP CCs based on California Type Evaluation Program Certificates without additional NTEP evaluation and testing. Records from the California type evaluation can certainly be examined; however, a review of requirements that were in effect at the time of the evaluation relative to the requirements now in effect in NIST Handbook 44 would need to be considered. There may be differences between the criteria used in the CTEP evaluation and NTEP evaluations and some things such as tolerances may have changed.

Decision: *The Sector reviewed the changes proposed to NCWM Pub 14 (in Appendix A) to reflect the changes to the NIST HB 44 Hydrogen Measuring Devices Code shown above. The Sector agreed to recommend these changes as shown in Appendix A to this summary.*

4. Table S.2.2. Sealing, Provision for Electronic Copy of Event Log for Category 3 Devices

Source: Randy Moses, Wayne Fueling Systems, LLC

Background: In most cases, the printer inside of a retail motor-fuel dispenser is not directly connected to the dispenser electronics and, thus, printing on the internal printer is at best difficult, and in most cases, not possible. The ability to provide an electronic file in lieu of a printed copy can also enhance the ability to organize the information contained in the log to make it easier to present to the official. The exact format and electronic transportation method is open to discussion.

Recommendation: The existing code regarding a category 3 seal reads as follows in HB44 LMD Code Section 3.30, Table S.2.2. The Sector was asked to consider the following proposed change and provide input to the submitter. (*Note: During the Sector meeting, participants observed there was an error in the version of the proposal included in the agenda. The correct version appears below.*)

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.~~ **either in printed or electronic format.** ~~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.)*

The amount of information required for a category 3 log is extensive (5 items x 1000 events). That is a lot of printing, especially using a standard receipt printer. With today's technology leaning towards the ability to perform remote downloads and configurations, we need a practical approach that allows this technology to move forward while still providing the means to document changes to sealable parameters that have taken place in the device.

Discussion: Sector Chairman, Michael Keilty (Endress + Hauser) introduced the item, noting Mr. Moses has asked the Sector to review and provide comments on the proposal. Mr. Moses also submitted the item to the four regional weights and measures associations for consideration at their fall 2019 meetings.

Mr. Moses acknowledged that the progress toward permitting electronic versions of the event log in lieu of a hard copy was started by Gordon Johnson (Gilbarco, retired) a few years ago when he also proposed changes to the General Code G-S.5.6. Recorded Representations. At that time, the General Code was expanded to acknowledge an electronic copy of the information could be provided in addition to the required hard copy. Mr. Moses reviewed the justification for his current proposal. He is recommending modifications to Table S.2.2. Categories of Device and Method of Sealing in Section 3.30 Liquid-Measuring Devices Code to permit an electronic copy be permitted as an option in lieu of the hard copy. Presently Category 3 devices covered by the LMD Code are required to provide for a printed record of the event logger through a printer on site. Typically, the only printers on site for many of these devices are receipt printers which are integrated into the RMFD (card readers in dispenser). Printed records generated by these printers would result in a lot of paper on a small surface area and may not be usable.

Mr. Moses noted he is trying to work incrementally toward a goal of allowing only electronic information. He also observed he was prompted to move this proposal forward based on comments from a regulatory official in the northeast who questioned why electronic versions of this information aren't already accepted in lieu of a hard copy. Mr. Moses has kept the proposal broad initially and is looking to see how it develops and what level of acceptance he can achieve. Examples of how it might be further tweaked include approaches such as considering the options of downloading the required information to a web site or sent via email or downloaded to a memory stick. He noted there may be barriers with each of those options such as lack of access to internet by the inspector. His goal is to move the requirement to a point where there is an option for something other than a printed copy.

Technical Advisor, Tina Butcher (NIST OWM) shared some of the rationale and discussion surrounding the previous changes to G-S.5.6. referenced by Mr. Moses. She noted concerns raised within the regulatory community included the inspector's lack of access to the internet (e.g., when no internet service available in a given area or the inspector has no means to access the internet or is not permitted to insert digital media from an external source into his or her computer). Some Sector members noted that inspectors sometimes don't have email or have access to it on site.

Tina notes, while the ultimate goal is to move in the direction of the electronic form, there is, perhaps, a spectrum of readiness. She believes most people are supportive of the electronic versions of the information and want to move in that direction; however, it is essential that they be able to gain the information needed for an inspection in a form they are able to access and that it be accessible at the time of the inspection. An inspector needs to have access to this information on site.

Perhaps an alternate option which provides a compromise that would address some of these concerns would be to allow electronic version provided a device had a reasonably large display where the inspector could easily access and view the information. There are already requirements that the audit trail has to be decipherable and readable and readily understandable so the information is usable by the inspector.

Craig Cavanaugh (Tuthill) said perhaps the device owner could hand over a laptop to allow the inspector to be able to access the information. The device owner could have this available for the inspector to review and could email it somewhere for later access. Mr. Moses observed these suggestions and ideas are why he kept the proposal rather open-ended. He would like to allow for the possibility of various options that could satisfy the need. He doesn't want to see equipment or manufacturers pigeon-holed into a narrowly defined set of options.

Allen Katalinic (NCWM NTEP) observed that, as long as you provide a printed copy, other options are okay. Others clarified that the option Mr. Moses has proposed would allow for *only* an electronic version of the information.

Mr. Keilty noted the challenges raised during this discussion are what need to be addressed. An inspector needs an alternative that allows him to see the record at the time of inspection. Mr. Moses noted the option in his proposal would allow the use of a display on site to show the information and it would be on demand. If there is a desire to have a permanent record, the requirement could be elaborated on to say the information has to be available in some other way. John Roach (CA DMS) said he would like to see the option of allowing inspectors to be able to get a permanent record in some manner. Randy Ramsey (NC Division of Standards, NTEP Lab) noted he doesn't carry a printer nor does he have a laptop in the field so he has no way to access an electronic record on site. Teri Gulke (Liquid Controls) observed that vehicle-tank metering systems also don't have printers beyond the ticket printers used for printing delivery tickets.

Marc Buttler (Emerson) suggested an option along the lines of what Mrs. Butcher described. He agreed that this should be a progressive evolution. Perhaps providing a user requirement would put the responsibility on the user to provide the equipment needed to print the record. This would mean the manufacturer has to provide the capability in the equipment, but the user must provide the printing mechanism. He also noted that he has personally had instances in which he as requested an electronic receipt be sent to him only to find it never arrives. There needs to be some way an inspector can ensure access to this information prior to leaving the site. Marc Buttler (Micro Motion) suggested an option of logging into a site to print out the log prior to arrival on site. Some concerns were raised with the willingness of the device owners to allow such remote access and associated concerns over security. With on-site access owners have more control and can open access to only a finite period of time.

Mr. Keilty observed if this proposed change is made it will impact other measuring devices covered under the LMD Code and may eventually expand to other codes. He doesn't believe the requirement can be isolated. Mrs. Butcher observed there are also some variations in sealing requirements such as the Belt-Conveyor Scales Code but agreed with Mr. Keilty that this can have impact on other device types. Perhaps starting with RMFDs and expand as you move closer to the goal of electronic is a reasonable approach to further introducing this into the community.

In response to some suggestions to allow for other printed options, Mr. Moses noted this would not provide him with relief; he can already print a hard copy on site and/or put a PC in place on site; he wants to move to eliminate the hard copy entirely. He also noted that they must provide the capability for the printed version whether the company enables and uses the remote option or not. Brent Price (Gilbarco) commented that the current printed requirement is preventing them from moving in the direction of providing remote capability.

Mr. Pettinato suggested that printing out the event log is the least tasteful option since it would be a huge amount of paper. Mrs. Butcher questions whether the narrow receipt would even meet the requirement that the information must be convenient to view.

Decisions: *The Sector did not reach a decision or conclusion on this issue. Mr. Keilty wrapped up the discussion on this item, noting some viable options have been proposed and discussed and these might make progressive steps toward the ultimate goal of an electronic-only option. He didn't feel the discussion yielded a common comment from the Measuring Sector, given the number of differing opinions shared and others concurred. He observed comments will also be provided from discussion at the regional associations. Mr. Moses noted his goal was to open this up for discussion and feedback and this discussion has assisted with that.*

5. Meeting Location and Date of 2020 Measuring Sector Meeting

Background: This Item was included on the Sector's agenda to allow for input from Sector members on future meetings and to allow NTEP Administration to apprise the Sector of dates that have already been set.

Discussion: The Sector discussed preferences for timing and location for the Sector meeting. Comments heard on each are listed below.

Timing.

- Don't too late of a date so as to not run into a crunch relative to the time available to prepare the meeting summary given the November 15th deadline.
- The meeting date for the Southern Weights and Measures Association or other regions is unknown and we don't want to conflict with those.
- This general week in September works well. Two preferred time frames for 2020 are:
 - Sept 22-23
 - Sept 29-30

Location:

- The location for the 2019 Sector meeting is convenient to airport and accommodations were decent. People like the Denver area. Middle of the country.

- There are not a lot of food options within walking distance. Sacrifice transportation for food.
- A downtown hotel might be expensive.
- The Stapleton area where the Sector previously met wasn't bad.
- Chicago would be okay.
- The Weighing Sector had mentioned Milwaukee, Annapolis, and Pittsburgh as possibilities.

Decisions: The Sector was not asked to make a decision on this item. The Sector offered general comments and suggestions as noted above on possible location and time for the 2020 Sector meeting.

Additional Items as Time Allows:

2019-2020 NCWM S&T Committee Items for Sector Review and Input. Current NCWM S&T Chairman, Loren Minnich, requested input (time permitting) from the Sector on the following “carryover” items on the S&T Committee’s agenda.

6. GEN-1 G-A.1. Commercial and Law-Enforcement Equipment. and G-S.2. Facilitation of Fraud. (Skimmers)

See Appendix D for details.

Discussion: The following key points were made during the Sectors discussion of this item.

- Sector Technical Advisor Tina Butcher (NIST OWM) introduced the item providing brief background and perspective on the item as it was introduced and addressed by the S&T Committee. She noted that, while the issue of “skimmers” is certainly one of concern and one where weights and measures officials can play a key role in helping to address the problem, there remains a question (that is being addressed by the NCWM Task Group assigned to the item) of whether taking action on these “skimming” devices is within the regulatory authority of weights and measures agencies. It would be necessary to modify sections of NIST HB 44 and possibly weights and measures laws and/or regulations in specific jurisdictions to address this possible gap.
- Randy Moses (Wayne Fueling) noted he is a member of the Task Group. The Task Group is divided on the question of whether or not this is a weights and measures issue. Finally decided it is a W&M issue. A key problem is that the inspector needs access to the portion of the RMFD where the skimmer resides. The group has moved toward proposing a user requirement and softening the requirement relative to “security.” Some other (non-weights and measures) credit card regulations will come into effect next year and the TG has been considering how this might impact the issue. Safeguards are being put into place by different segments of the industry. The TG heard some great presentations from different organizations and learned about their perspectives and the devices that can be used to capture customer information. He was not certain where the TG was in the process of submitting a proposed “User Requirement” for consideration by the weights and measures community.

- NTEP Director Darrell Flocken (NCWM) noted he was not in favor of a “Specification” in the LMD Code; a “User Requirement” would be a better approach. Mr. Flocken also understands the S&T Committee may see the proposed “User Requirement” during its deliberations at the January 2020 NCWM Interim Meeting. The S&T Committee has already had some preliminary discussions on this and the S&T Committee didn’t have any problems with the proposed approach of addressing it through a User Requirement. He believes it is likely the item will go forward as a “Voting” item since the TG has essentially completed its work and the initial impression of the S&T Committee is supportive thus far of the proposed concept of a User Requirement.

7. New Block 1 Field Standards (Block 1, Block 2, GEN-3, LPG-3, MFM-5, and from the Hydrogen Code N.4.1 and N.4.1.1.)

See Appendix D for details.

Discussion: Points of discussion during the Sector’s review of this item are outlined below.

- Measuring Sector Chairman (and one of the submitters of some items in the block of items), Michael Keilty (Endress + Hauser) introduced this item and identified the scope of the “block” and the individual items included in the block.
- Measuring Sector Technical Advisor (and one of the submitters of some items in the block of items) Tina Butcher (NIST OWM) provided an overview of some activities going on in the community related to these items. The S&T Committee established a Task Group to study this block of items; the TG includes the submitters and other industry and regulators in the community who have an interest in these items. While the TG has not yet met (being formally appointed only this past July), OWM looks forward to the progression of the work.
- Mrs. Butcher provided a brief update on work NIST OWM is doing to assist the community in the general task of exploring the use of “master meters” and to help ensure that “essential elements of traceability” are addressed. NIST has expended considerable resources and funds to purchase multiple mass flow meters of different sizes and for a variety of product applications. (See the July 2019 S&T Committee Report for details.)

This project is beginning by focusing on the use of these devices in compressed natural gas (CNG) fueling applications; this was based on the prevalence of requests by states to NIST OWM and the NCWM for assistance in validating the use of “master meters” in this application. OWM has organized a small group of regulators (who own or are procuring a mass flow master meter for this application) and industry who have agreed to assist in this work. The group has had two initial meetings and will meet in person to at the end of October to begin initial training and preliminary testing using the NIST CNG mass flow meter and those of the regulatory participants. In the months following that session, individual jurisdictions will use the NIST master meter along with their own meters in a round robin to collect data which will be analyzed by the group.

The goal of this effort is to begin documenting and demonstrating that the essential elements of traceability have been satisfied. The process and associated documentation can be used as a model for other product applications and will also help identify whether or not changes are needed in NIST HB 44.

- Mr. Keilty reported he has been very discouraged with lack of progress on the items that he proposed in this block, noting the items have been before the S&T Committee for almost five years. He finds it ironic that one of the companies working on the NIST project, Tulsa Gas Technology, has been using their proving system (which includes a mass flow meter for use in testing compressed natural gas dispensing systems) for more than ten years. They haven't sold a large number of units, perhaps 12 globally. However, they have been tested in New York and in Europe at PTB. There is already information available on these units and it has moved forward in these arenas.

Mr. Keilty commented it will be a long time before the work being done by NIST OWM will be completed and, in the meantime, the items he has proposed will be delayed. He is concerned about the impact this has on the use of this equipment in the field in the meantime.

Mr. Keilty also noted he was only asking to expand references to "master meters" that are already in other codes to the LPG and MFM codes. More recently, he was surprised to see the Hydrogen Gas Measuring Devices Code was changed to a permanent code and the reference to "transfer standards" was not eliminated from the tentative code prior to making it permanent. The use of transfer standards was not prohibited with these devices.

Mrs. Butcher acknowledged Mr. Keilty's point about the Hydrogen Gas Measuring Devices Code but noted there is nothing in NIST HB 44 that would specifically preclude the use of master meters for any devices covered by NIST HB 44, provided the essential elements of traceability have been addressed. Marc Buttler (Micro Motion) and John Roach (CA DMS) noted the reference in the Hydrogen Code have been in place since its inception.

- CA NTEP Evaluator John Roach (CA DMS) noted there was a work group within the Sector at one time to address master meters and proposed work with the laboratories. He asked if the Sector is doing anything to help with this. He noted he is willing to help however he can.
- NTEP Director Darrell Flocken commented this was set up between the previous NTEP Director and Tulsa Gas Technology; however, the session was cancelled because the laboratories were unable to attend the meeting. Mrs. Butcher commented she understood that effort was in response to a request from the NTEP laboratories for training and discussion on testing CNG dispensing systems and the use of master meters.
- Marc Buttler (Micro Motion) commented there has been a great deal of success with master meters in general and that use these for establishing traceable measurements. He

doesn't have any comments beyond those given to the S&T Committee earlier on the duration of the test. He commends NIST OWM for its work.

- Mrs. Butcher noted OWM has also been discussing an alternative, interim approach to addressing this block of items may be to elaborate on section already in the Fundamental Considerations which states that weights and measures directors have the authority to determine whether or not a particular type of test standard is appropriate. This might be a better alternative than including specific references to test methods in the individual codes since those points might be better addressed in NIST Examination Procedure Outlines or other guidance documents.
- Mr. Keilty pointed out that industry has been using master meters for a long time. There are also international standards that have been in use and Rich Miller (FMC) pointed out API has an entire chapter on the use of master meters.

Mr. Keilty noted this is very basic information. In response to customers asking about how to go about validating and using master meters, he said he would test it extensively and make sure it is traceable. There is a difference in the way the word "master meter" is used and the way "transfer standard" is used. He is of the opinion that the way these two terms are described needs to be reviewed and there are significant points that need to be clarified by this work group. If a device is used in the field, does that device have to be tested prior to and after that test comparison? Does every meter have to be tested first and then tested again after each use? This would be difficult. If we can establish a period of use between checks, this is more viable.

- Mr. Roach noted if he were to test with a specific product, he would do preliminary testing and go back and test and extend time as results allowed. Tina Butcher concurred that this is the approach used for other field standards; time between testing is based on the degree of use, maintenance of the standard, and the results of repeated re-tests. Both Mr. Roach and Mrs. Butcher agreed that you would establish a control chart to monitor usage.
- John Hathaway (Murray Equipment) commented a master meter shouldn't be held to any different calibration frequency than a neck-type standard.

8. EVF-3 D S.3.5. Temperature Range for System Components and S.5.2. EVSE Identification and Marking, Temperature Range for System Components

See Appendix D for details.

Discussion/Recommendations: The Sector did not discuss this item, noting participants had no input to provide.

9. OTH-4 D Electric Watthour Meters Code under Development

See Appendix D for details.

Discussion/Recommendations: The Sector did not discuss this item, noting participants had no input to provide.

Walk-On Item – Criteria for Testing Magnetic Flow Meters

10. Magnetic Flow Meters – NCWM Pub 14 Technical Policy and Test Procedures

Background/Discussion: This item was added as a “walk-on” item during the Sector Meeting in response to a request from the NTEP Evaluating Laboratories and Sector Chairman Michael Keilty.

Mr. Keilty introduced the item, noting that more definitive criteria are needed in NCWM Pub 14 to address magnetic flow meters. Pub 14 includes some criteria in a new Section M. which was added to the Field Evaluation and Permanence Test Section of the LMD Checklist last year. However, there isn't a lot more in the overall checklist. Some laboratories have questioned whether there is an adequate amount of information in the checklist for evaluating these devices, particularly since NTEP has not evaluated a large number of them.

Mrs. Butcher suggested the Sector begin by considering how to close the gap created by the “exception” in the title of Section M. “Initial Evaluation and Permanence Tests for Magnetic Flow Meters and Ultrasonic Meters (Other Than Vehicle-Mounted and Retail-Motor-Fuel Applications)” For example, the Sector might consider adding a statement such as “For Vehicle-Mounted Magnetic Flow Meters and Vehicle-Mounted Ultrasonic Meters, use the field and permanence test requirements found in Section C.” A similar statement might be considered to address meters used in RMFD applications; for example, “For magnetic flow meters and ultrasonic meters used in Retail Motor-Fuel Applications, use the field and permanence test requirements found in Section A.” If these criteria aren't appropriate, then the Sector should discuss what criteria are appropriate and specify this in the field and permanence test criteria. Mrs. Butcher suggested a small work group be formed to review these issues and provide suggestions for the Sector to consider and the Sector concurred.

The Sector also acknowledged similar concerns about whether or not Pub 14 includes clear criteria for addressing all applications of ultrasonic meters. The Sector recognized this is an issue that may need to be addressed at some point, including elaborating on the checklist criteria and addressing the technology in the Product Families Table. In the meantime, there is nothing that precludes the submission and evaluation of ultrasonic metering applications.

Mr. Keilty also questioned why a previously-included category of “normal liquids” category no longer appears in the Product Families Table and questioned whether it was inadvertently eliminated. Sector Technical Advisor, Tina Butcher, referenced the 2006 Measuring Sector Summary during which the Sector agreed to add the criteria and column to Pub 14 to address magnetic flow meters. The two separate tests listed in today's (2019) edition under this category were added at that time. Thus, the current separate “tests” were intentional. This doesn't mean the criteria cannot be revisited;

however, the current references were not the result of a mistake in the editing of the table and the Sector would need to review the item and past when considering consider how or if to propose redefining the testing.

Mr. Keilty questioned whether there is a need for something specific that states ultrasonic and magnetic flow meters. Sector Technical Advisor Tina Butcher noted there is no specific language in NIST HB H44 that references magnetic flow meters since HB 44 is not design-specific. Type evaluation criteria are established based on H44. In the case where NTEP begins looking at a different technology than has been evaluated before, it is necessary to establish minimum amounts of testing. In the past, NTEP has typically started with stating a number of tests over what range of conditions. For different technologies, NTEP may look at the need to test under different conditions based on the technology of the device and how the technology is affected by certain characteristics of the product being measured such as viscosity. As NTEP gets applications for technologies that haven't been dealt with before in NTEP evaluations, it is necessary to ensure specifics are established in the checklist for permanence testing and relevant code references are identified and specified in appropriate sections of the Pub 14 checklist.

The Sector discussed questions of: What are the gaps in the checklist right now? Do we add (in addition to the new Section M added to the field and permanence tests section in 2018) a section to include "Magnetic Flow Meters" criteria or do we reference existing sections with instructions such as "for magnetic flow meters, use the procedures and checklist criteria found in section x?"

The Sector also needs to look at the Product Families Table as it pertains to magnetic flow meters to ensure we can minimize the amount of testing needed to demonstrate confidence in the device and its performance. In general, manufacturers describe the maximum conductivity for products measured by a magnetic flow meter. For hydrocarbons a conductivity is not typically specified. For organics, one may find values specified. The Sector set the criteria for "Test F" and "Test D."

For many products, conductivity values aren't available and, therefore, not specified in the table. Mr. Keilty commented he doesn't recall the language in the "Test D" criteria to be what was to be added.

John Roach (CA DMS, NTEP Lab) noted he had raised questions in the past year regarding how milk fits into the existing Product Families table, particularly for a magnetic flow meter. Does this product qualify as a beverage with regard to the table? Is its conductivity different from that of the products covered in the product category of "water?" Does milk fit into an established product category or should another category specifically for "milk" be added? Mr. Keilty also noted a question arose regarding were "sludge" would fall in the table. NTEP Director Darrell Flocken noted sludge would likely have some conductivity, but it is unclear how much conductivity it would have or how the conductivity would vary in the product.

The Sector agreed a small work group might be appropriate to address these issues surrounding the Product Families table and this might be the same group proposed for reviewing the mass flow meter and ultrasonic meter criteria.

Decisions: The Sector established a small work group to take on a set of tasks related to refining type evaluation criteria for magnetic flow meters. The work group consists of the following:

- ***Marc Buttler***
- ***Allen Katalinic***
- ***Michael Keilty***
- ***Randy Ramsey***
- ***John Roach***

The work group is asked to review NCWM Pub 14 and complete the following tasks and bring recommendations for changes to Pub 14 back to the Sector for review at its 2020 annual meeting:

- ***Identify how to close the gaps created by the exceptions in the title of “Section M. Initial Evaluation and Permanence Tests for Magnetic Flow Meters and Ultrasonic Meters (Other Than Vehicle-Mounted and Retail-Motor-Fuel Applications)”***
- ***Review other sections of Pub 14 to ensure there are adequate criteria to address magnetic flow meters and their applications.***
- ***Make recommendations on how to best address the gaps, including referencing other existing sections of the checklist or creating new language to be considered by the Sector.***
- ***Review the criteria and tests specified for magnetic flow meters in Product Families to determine if changes are needed and, if so, make recommendations on what those changes should be.***