Appendix D

National Type Evaluation Program (NTEP)
Measuring Sector Annual Meeting Summary

2014 FINAL SUMMARY

October 3 - 4, 2014
Raleigh, North Carolina

INTRODUCTION

The charge of the NTETC Measuring Sector (herein after referred to as "Sector") is to provide appropriate type evaluation criteria based on specifications, tolerances and technical requirements of NIST Handbook 44, *Specifications, Tolerances, and Other Technical Requirements for Weighing and Measuring Devices,* Sections 1.10. General Code and all portions of Section 3 including codes for Liquid Measuring Devices, Vehicle Tanks Meters, Liquid Petroleum Gas and Anhydrous Ammonia Measuring Devices, Cryogenic Liquid Measuring Devices, Milk Meters, Water Meters, Mass Flow Meters, and Carbon Dioxide Liquid Measuring Devices. The Sector's recommendations are presented to the National Type Evaluation Program (NTEP) Committee each January for approval and inclusion in NCWM Publication 14, *Technical Policy, Checklists, and Test Procedures* for national type evaluation.

The Sector is also called upon occasionally for technical expertise in addressing difficult NIST Handbook 44 issues on the agenda of National Conference on Weights and Measures (NCWM) Specifications and Tolerances (S&T) Committee. Sector membership includes industry, NTEP laboratory representatives, technical advisors, and the NTEP Administrator. Meetings are held annually, or as needed and are open to all NCWM members and other registered parties.

Proposed revisions to the handbook(s) are shown as follows: 1) deleted language is indicated with a **bold face font using ~~strikeouts~~** (e.g., **~~this report~~**), 2) proposed new language is indicated with an **underscored bold faced font** (e.g., **new items**), and 3) nonretroactive items are identified in *italics*. There are instances where the Sector will use **red** text and/or highlighted text to bring emphasis to text that requires additional attention. When used in this report, the term "weight" means "mass."

Note: It is policy to use metric units of measurement in publications; however, recommendations received by NCWM technical committees and regional weights and measures associations have been printed in this publication as submitted. Therefore, the report may contain references to inch-pound units.

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

Detail of All Items
(In order of Reference Key)

Carry-over Items:

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

Source:
California NTEP Lab

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

From 2007 to 2010, the California NTEP laboratory worked to develop a checklist but received limited input on the drafts. At its 2011 meeting, the Sector agreed that additional work is needed to finalize the checklist and established a work group (WG) to complete this task. Mr. Rich Miller (FMC) volunteered to serve as Chair of the WG and the NIST OWM Sector Technical Advisor. From 2001 to 2012 attempts were made to find an opportunity to test the draft checklist during a type evaluation. In August 2013, Mr. Miller, informed the Technical Advisor that the North Carolina laboratory used the checklist when conducting an evaluation on an FMC's indicator. During the evaluation,

Mr. Miller and the North Carolina laboratory evaluators reviewed the checklist and identified some suggested areas for revision. At its 2013 meeting, the Measuring Sector concluded that additional work is needed on the draft checklist and agreed to carry this item over to allow the WG to finalize it.

See the 2007 to 2013 NTEP Measuring Sector Meeting Summaries for additional details.

In July 2014, Mr. Clark Cooney (NIST, OWM), Measuring Sector Technical Advisor, spoke with Mr. Rich Miller (FMC) and Mr. Allen Katalinic (North Carolina Weights and Measures) about the progress on this item. Mr. Miller stated he received no additional feedback from any Sector members. He stated that he and Mr. Katalinic used the checklist on an evaluation, and it appeared to work. Mr. Katalinic stated there may still be some portions that need refinement; however, he also believes that it is ready to move forward. Consequently, the Sector was asked to recommend that the draft be added to the next edition of NCWM Publication 14.

Discussion:
At its 2014 meeting, the Measuring Sector discussed both this agenda Item 1 and agenda Item 7, titled, *Eliminate Permanence Testing for Point of Sale (POS) Systems*, simultaneously due to the overlap of the two items. Consequently, discussion of both of these items appears under this agenda Item 1.

The Sector was asked to review a draft checklist entitled, *Checklist for testing electronic digital indicators with simulated inputs* and consider recommending it be added to NCWM Publication 14. A "clean" copy (although, it contains notes) of the proposed amendments to the checklist is included in Appendix A, *Draft Checklist for Testing Electronic Digital Indicators*.

Mr. Miller and Mr. Katalinic, both of whom who had used the draft checklist (see Appendix A, *Draft Checklist for Testing Electronic Digital Indicators*), provided an overview and background discussion. They pointed out that this proposed checklist is for NTEP Laboratory evaluations only. In addition, they identified a few items on which they would still like input on from the Measuring Sector members. Some of these items include the following:

- Is permanence testing necessary? They believe if the device is being evaluated for the first time, then permanence testing is necessary. If the device was previously evaluated and is being examined for updates, then it does not need permanence testing.

- In Section "Code Reference: G-S.2. Facilitation of Fraud," it addresses the process of changing the unit price or unit prices set into a metering system. They believe that other items fall under facilitation of fraud and this needs more input from the Sector. For example, if the device is a Category 3 device, then the evaluator must verify that the passwords and audit trail function correctly. Mr. Katalinic states this is not a laboratory issue but rather a field requirement; due to the fact that the equipment is being lab evaluated, the evaluator will not see the end use installation.

- In Section "Code Reference: G-S.4. Interchange or Reversal of Parts, paragraph 1.15.," they noted that there may be a need to add a NIST Handbook 44 requirement to cover this.

- In Section, "Code Reference: G-S.5.1. Indicating and Recording Elements, paragraph 2.1.5.," they noted that a comment section is needed.

- In Section, "Code Reference: G-S.5.2.5. Permanence, paragraph 2.18.," they need to know what permanence quantities the Sector believes should be verified for electronic devices with graphic displays.

- In Section, "Code Reference: G-UR.1.1. Suitability of Equipment," titled, *The equipment is suitable for its intended application*, should the checklist item title be removed?

- In the table, "*Simulator tests: All tests shall have a minimum of 10,000 pulses applied to the device for each test. Test with a minimum of two API/Density settings*," they note the following items need to be added to the table and checklist:

- information needs to be added to capture different K-Factor values;
- all API tables to be included on the certificate shall be verified; and
- extreme endpoints and a center point of each table must be verified.

The Measuring Sector discussed whether or not the checklist is even necessary and suggested that the concerns might be resolved in other ways.

There was much discussion and debate about the proposed amendments to the draft checklist and whether or not permanence tests were necessary in certain applications.

Mr. John Roach (CDFA DMS) stated that he is amenable to eliminating the permanence test requirements if the unit is in a stationary application. However, if it is in a mobile application, then he strongly believes that a permanence test in the field is required. Mr. Randy Moses (Wayne) stated that if he installs a system in San Diego, for example, his electronic is not going to fail. In response, Mr. Mike Keilty (Endress + Hauser) stated that the equipment could be subjected to the most extreme conditions as well.

Mr. Jim Truex (NTEP Director) pointed out that if there is an update to a Certificate of Conformance (CC), then NTEP makes the decision if a permanence test is required or not.

During the discussion, the NTEP laboratories represented at the meeting expressed frustration with having to duplicate efforts in different sections of NCWM Publication 14 plus running the risk of overlooking requirements in other sections. Mr. Miller thought that the purpose was to have one checklist with all of the requirements that apply to electronic indicators in one place. Mr. Roach stated that he has to print out and cover the General Section for every evaluation and repeating information from the General in this checklist. Mr. Rich Tucker (RL Tucker LLC) stated that he agrees with the laboratories; if requirements are in the checklist already, it does not make sense to duplicate it.

Mrs. Tina Butcher (NIST, OWM) suggested addressing this in the Permanence Testing for POS item on this agenda. This would require matching up Policy U and the Field Evaluation portion of the Checklist (see Item 7). The Sector supported Mrs. Butcher's suggestion of developing an alternative proposal.

In conjunction with this item, the Sector also discussed agenda Item 7, titled, *"Eliminate Permanence Testing for Point of Sale (POS) Systems."*

Mr. Miller stated OIML conducts additional testing beyond what is required in the United States. For example, OIML R 117 requires testing for environmental, RFI, immunity, vibration, and other influences to help ensure the devices will perform appropriately in actual applications. However, it does not require permanence testing. It was noted the United States does not have the same requirements as OIML R 117. If the device is new and undergoing NTEP evaluation for the first time, then a permanence test is required in the field. But, if the changes are for minor updating, then a permanence test is not required. Mr. John Roach (CDFA DMS) stated his opinion that the permanence test may be eliminated if the NTEP CC is simply being amended or if the device is installed in a stationary location; however, if the device is installed in a mobile application, then it needs to be subjected to permanence testing. Mr. Truex stated it is always up to NTEP to decide if permanence testing is necessary or not.

Based on the discussion, the Sector developed an alternate proposal to amend NCWM Publication 14, LMD *Field Evaluation and Permanence Tests for Metering Systems*, to include both laboratory and field tests for evaluating indicators that have been submitted separate from a measuring element (Sector's agenda Item 1) and to address the concerns for permanence testing (Sector's agenda Item 7).

Decision:
The Sector rejected the proposed checklist due to redundancy with other sections of Publication 14 and the belief that the checklist is not necessary. In addition, the Sector rejected the original proposed amendment to NCWM Publication 14, Liquid-Measuring Devices (LMD) checklist, titled, *Field Evaluation and Permanence Tests for Metering Systems – Field Evaluation* (see Sector's agenda Item 7)

However, to resolve the concerns of evaluating electronic indicators and to eliminate permanence testing for point of sale systems, the Sector recommends amending NCWM Publication 14 in three sections:

1. Modify LMD *Technical Policy*, section "U," titled, *Evaluating Electronic Indicators Submitted Separate from a Measuring Element* as follows:

U. Evaluating Electronic Indicators Submitted Separate from a Measuring Element

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:

1. For the initial testing of the indicator.
2. ~~For the evaluation of stationary indicators.~~
3. ~~3.~~ For software changes to a device with an existing CC.

2. Modify the "Introduction" portion of *Electronic Cash Register Interfaced with Retail Motor Fuel Dispenser Checklists and Procedures* as follows:

Introduction

This checklist is intended for use when conducting general evaluations of new electronic cash registers (ECR) that are to interface with retail motor fuel dispensers. It is assumed that the dispenser was previously evaluated, if not, the Liquid Measuring Device checklist must be applied to the dispenser sale system. The ECR must interface with a dispenser to perform this evaluation. Specific criteria that apply to service station control consoles are in the checklist for retail motor fuel dispensers and must be applied if the cash register also serves as the service station controller. As a minimum, two dispensers from different manufacturers, each of which includes all of the features to be listed on the ECR Certificate of Conformance (CC), must be evaluated with the ECR in order to have the statement "equivalent and compatible equipment" appear on the CC.

For field evaluation and permanence test criteria, see the "Field Evaluation" section in the NTEP Liquid-Measuring Devices – Field Evaluation and Permanence Tests for Metering Systems checklist.

This checklist is designed in a logical sequence for the user to determine and record the conformance of the device with the elements of NIST Handbook 44. The user should make copies of the checklist to serve as worksheets and preserve the original for reference. In most cases, the results of evaluation for each element can be recorded by checking the appropriate response. In some cases, the user is required to record values, results, or comments. In those cases, space is provided.

And,

3. Modify the LMD *Field Evaluation and Permanence Test for Metering Systems* as follows:

National Type Evaluation Program
Liquid Measuring Devices – **Laboratory/** Field Evaluation and Permanence Tests
For Metering Systems

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.

2. Identification of Certified Software.

Source:
NTEP Software Sector

Background:
The Measuring Sector was asked to review and comment on the following updated proposal forwarded from an August 2014 joint Weighing/Software Sector meeting. The Sector was also asked to discuss any alternative proposals from manufacturers on how an inspector can confirm that the software operating in a software-based measuring device is the same as what was evaluated and approved by the NTEP laboratory.

Amend NIST Handbook 44, G-S.1. Identification and G-S.1.1. Location of Marking Information for Not-Built-For-Purpose, Software-Based Devices as follows:

G-S.1. Identification. – All equipment, except weights and separate parts necessary to the measurement process but not having any metrological effect**,** shall be clearly and permanently marked for the purposes of identification with the following information:

(a) the name, initials, or trademark of the manufacturer or distributor;

(b) a model identifier that positively identifies the pattern or design of the device;

(1) The model identifier shall be prefaced by the word "Model," "Type," or "Pattern." These terms may be followed by the word "Number" or an abbreviation of that word. The abbreviation for the word "Number" shall, as a minimum, begin with the letter "N" (e.g., No or No.). The abbreviation for the word "Model" shall be "Mod" or "Mod." Prefix lettering may be initial capitals, all capitals, or all lowercase.
[Nonretroactive as of January 1, 2003]
(Added 2000) (Amended 2001)

(*c*) *a nonrepetitive serial number, except for equipment with no moving or electronic component parts and* ***~~not-built-for-purpose software-based software devices~~ software****;*
[Nonretroactive as of January 1, 1968]

(Amended 2003) **(Amended 20XX)**

(1) The serial number shall be prefaced by words, an abbreviation, or a symbol, that clearly identifies the number as the required serial number.
[Nonretroactive as of January 1, 1986]

(2) Abbreviations for the word "Serial" shall, as a minimum, begin with the letter "S," and abbreviations for the word "Number" shall, as a minimum, begin with the letter "N" (e.g., S/N, SN, Ser. No., and S. No.).
[Nonretroactive as of January 1, 2001]

(*d*) the current software version or revision identifier for not-built-for-purpose software-based devices**~~;~~ manufactured as of January 1, 2004 ~~through December 31, 2015~~, and all software based devices or equipment manufactured as of January 1, ~~2016~~ 2020;**
~~[Nonretroactive as of January 1, 2004]~~

(Added 2003) **(Amended 20XX)**

(1) The version or revision identifier shall be:

i. prefaced by words, an abbreviation, or a symbol, that clearly identifies the number as the required version or revision;
[Nonretroactive as of January 1, 2007]
(Added 2006)

Note: If the equipment is capable of displaying the version or revision identifier but is unable to meet the formatting requirement, through the NTEP type evaluation process, other options may be deemed acceptable and described in the CC.

ii. directly linked to the software itself; and
[Nonretroactive as of January 1, ~~2016~~ 2020]
(Added 20XX)

iii. continuously displayed* or be accessible via the display ~~menus~~. Instructions for displaying the version or revision identifier shall be described in the CC. As an exception, permanently marking the version or revision identifier shall be acceptable providing the device does not have an integral interface to communicate the version or revision identifier.
[Nonretroactive as of January 1, ~~2016~~ 2020]
(Added 20XX)

~~*The version or revision identifier shall be displayed continuously on software based equipment with a digital display manufactured as of January 1, 20XX and all software based equipment with a digital display as of January 1, 20YY.~~

(2) Abbreviations for the word "Version" shall, as a minimum, begin with the letter "V" and may be followed by the word "Number." Abbreviations for the word "Revision" shall, as a minimum, begin with the letter "R" and may be followed by the word "Number." The abbreviation for the word "Number" shall, as a minimum, begin with the letter "N" (e.g., No or No.). Prefix lettering may be initial capitals, all capitals, or all lowercase.
[Nonretroactive as of January 1, 2007]

(Added 2006)

(e) a National Type Evaluation Program (NTEP) Certificate of Conformance (CC) *number or a corresponding CC Addendum Number for devices that have a CC.*

(1) *The CC Number or a corresponding CC Addendum Number shall be prefaced by the terms "NTEP CC," "CC," or "Approval." These terms may be followed by the word "Number" or an abbreviation of that word. The abbreviation for the word "Number" shall, as a minimum, begin with the letter "N" (e.g., No or No.)*
[Nonretroactive as of January 1, 2003]

The required information shall be so located that it is readily observable without the necessity of the disassembly of a part requiring the use of any means separate from the device. (Amended 1985, 1991, 1999, 2000, 2001, 2003, ~~**and,**~~ 2006 **and 201X**)

G-S.1.1. Location of Marking Information for Not-Built-For-Purpose ~~All~~ Software-Based Devices. *– For* ***not-built-for-purpose,*** *software-based devices, either:*

(a) The required information in G-S.1. Identification. (a), (b), (d), and (e) shall be permanently marked or continuously displayed on the device; or

(b) The CC Number shall be:

(1) permanently marked on the device;

(2) continuously displayed; or

(3) accessible through an easily recognized menu and, if necessary, a submenu. Examples of menu and submenu identification include, but are not limited to, "Help," "System Identification," "G-S.1. Identification," or "Weights and Measures Identification."

Note: *For (b), clear instructions for accessing the information required in G-S.1. (a), (b), and (d) shall be listed on the CC, including information necessary to identify that the software in the device is the same type that was evaluated.*
[Nonretroactive as of January 1, 2004]
(Added 2003) (Amended 2006 **and 20XX**)

The Measuring Sector was asked to consider recommending the following text be added to NCWM Publication 14:

Identification of Certified Software:

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

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

The Measuring Sector was also asked to review and comment on the following proposed definition developed by the joint Software Sector/Weighing Sector:

Software Based Device. – Any device utilizing metrologically significant software.

This item originated as an attempt to answer the question "How does the field inspector know that the software running in a software-based weighing or measuring device is the same software evaluated and approved during an NTEP evaluation?" In previous meetings it was shown that the international community has already addressed this issue through both WELMEC and OIML.

At the 2012 NTETC Software Sector Meeting, there was some discussion as to where the terminology regarding inextricably linking the software version or revision to the software itself belonged. The Software Sector recommended proposed language to add to NCWM Publication 14. The proposed language was thoroughly discussed at the 2013 Measuring Sector meeting and rejected. During that meeting, several manufacturers asked for additional time to consider the proposal and carry it back to their respective companies' software engineers for input. The Sector agreed to carry this item over to its next meeting to allow these manufacturers time to study this issue and bring back alternative(s) to consider. See the 2013 NTEP Measuring Sector Meeting Summaries for additional details.

The Software Sector and the Weighing Sector met in August 2014 to discuss this item. In September 2014, Mr. Truex asked that an alternative proposal for modifications to paragraphs G-S.1. and G.S.1.1 along with a proposed addition to NCWM Publication 14 (both from the joint Software Sector and Weighing Sector meeting in August) be included with the 2014 Measuring Sector agenda for consideration. These proposed changes appear in the proposal above. The two Sectors also noted that the S&T Committee feels a definition is needed for "Software Based Device" and proposed a definition as shown in the proposal above.

The following discussion on this issue at the August 2014 joint Software Sector/Weighing Sector meeting was provided by the Mr. Truex (NTEP Director):

There was concern about using the terminology "manufactured:" in G-S.1.(d). Some manufacturers may still be building old designs.

Mr. Richard Harshman (NIST, OWM) is of the opinion that the S&T Committee will be satisfied with progress we have made during this joint meeting. Mr. Harshman, Mr. Truex, and Mr. Darrell Flocken (NCWM, NTEP) are hopeful that it will become an Informational Item. It likely will not become Voting quite so soon.

Given the new revisions to G-S.1., do any revisions need to be made to G-S.1.1. as written in NIST Handbook 44? If the proposed revisions to G-S.1.1. are implemented, it would relax the requirement to hard-mark the CC on built-for-purpose devices. We should perhaps retain the strike-out of (d) in the proposed revision. If we do not, there will be a conflict in 2020. On the other hand, it may not be an issue. We are currently planning to leave the wording of G-S.1.1. as it stands in NIST Handbook 44.

G-S.1.(d)(i) may create a problem for some exiting built-for-purpose equipment that currently does not preface the version number with "V." After much discussion, Mr. Jim Pettinato suggested that we craft a note outside of the meeting to address this particular exception (built-for-purpose devices with limited display capability) that can be reviewed on August 28, 2014.

At the end of August 27, 2014, Mr. Scott Henry proposed a change to G-S.1.(d)(i) and G-S.1.(d)(iii) to create a loophole for equipment that has difficulty meeting the display requirements, but is not completely incapable of doing so. We discussed it on August 28, 2014. His suggested wording was problematic, so Mr. Truex suggested, as an alternative, carving out a specific exception along the lines of, "If the device is incapable of prefacing the software version/revision with a "V" or "R," then NTEP inspectors may agree to allow a different method of indication."

We are not certain whether the "Note" after G-S.1.(d)(i) regarding corner cases is entirely necessary, but we would like feedback from the S&T Committee whether it is necessary and/or acceptable. This is a requirement that built-

for-purpose software devices previously had not been bound by. Also, you are going to have to go to the CC anyway to find all the details.

Discussion: (Note: Due to similarities, Items 2, 3, and 4 were all part of the same discussions.)

On behalf of the Software and Weighing Sectors, Mr. Adam Oldham (Gilbarco, Inc.) who represented the Software Sector to present pertinent information from the joint Software and Weighing Sector meeting in August of this year. Mr. Truex pointed out that NTEP plans to conduct a joint meeting of the Software and Measuring Sectors in October 2015 to continue to develop these software items that are common to all Sectors.

Mr. Oldham's presentation was applicable to the Measuring Sector's agenda Items 2, 3, and 4. Mr. Oldham stated that the Software Sector proposes to amend NCWM Publication 14 and then to subsequently amend NIST Handbook 44 to bring them into concert with one another. Mr. Keilty pointed out it is NIST Handbook 44 that drives NCWM Publication 14, not the other way around. However, Mr. Keilty also noted that some NCWM Publication 14 technical policy amendments cannot always be directly referenced in NIST Handbook 44.

Some Sector members stated it is desirable that the software version number be linked to the actual software application itself. The Sector discussed questions and concerns about separating the metrological from the non-metrological portions of the software. Mrs. Tina Butcher (NIST, OWM) stated that most current software does not separate metrological from non-metrological portions. Mr. Truex stated that the software version number is listed on the NTEP CC and also the CC covers any higher versions.

Concerns were expressed about how inspectors can ensure the software has not been changed in routine field enforcement. Mr. Oldham stated that it will be on the honor system to a degree. If someone alters the software, it will be discovered at some point. Mr. Truex reinforced the point that a lot of trust is placed in the manufacturers to ensure the metrological parameters of the software have not been adversely altered. Mr. Oldham stated manufacturers who deal with international requirements do not have a problem with potential misuse of software and that laboratories may or may not want things changed. Mrs. Butcher reminded everyone that NCWM Publication 14 states a device or software must be designed such that it does not allow an audit trail to be circumvented or cleared out. Mr. Truex agreed this matter is very controversial.

Mr. Randy Moses (Wayne) stated he agrees with this proposal in principle; however, he expressed serious concerns about whether or not anyone really knows what is going on within the software, and its metrological impact on a device. Furthermore, he stated that not requiring the software version (V) be recorded is a major gap in the proposal.

Mr. John Roach (CDFA DMS) stated that he supports the proposal and its overall direction in principle. However, he questioned whether the device manufacturer cannot display the NTEP CC through the software, then how would anyone know to look at the CC? Mr. Truex stated that is where the exception is noted in the NTEP CC and the manufacturer would have to prove the software was in compliance.

Mr. Keilty asked what the Measuring Sector could do to help the NCWM S&T Committee with this item. Mr. Keilty stated he would like this item to move forward as a Voting item at the 2015 NCWM Annual Meeting. However, Mr. Truex stated that it will likely have to go another year before it would be ready for Voting status; however, it may be moved to Informational depending on what the Sector and Regional comments are.

After very thorough discussion of this item, Mr. Rich Miller (FMC) asked the Measuring Sector support this language as proposed. Mr. Roach agreed.

Decision:
The Sector agreed to forward a recommendation to the SWMA and the NCWM S&T Committees that the proposal to modify G-S.1. remain an Informational item. The Sector agrees with the general direction of the proposal, but believes additional work is needed before recommending the item for a Vote.

3. Software Protection/Security

Source:
NTEP Software Sector

Recommendation:
The Measuring Sector was asked to discuss and consider the following proposal developed during the August 2014 joint Software Sector and Weighing Sector Meeting.

Add the following new paragraph to Section 1.10. General Code of NIST Handbook 44:

G-S.9. Metrologically Significant Software Updates. – ***A software update that changes the metrologically significant software shall be considered a sealable event.***
[Nonretroactive as of January 2, 20XX)
(Added 20XX)

The Measuring Sector was also asked to discuss any alternative proposals from manufacturers to develop a checklist for NCWM Publication 14 on evaluating software protection and security.

Background:
A draft checklist was proposed for NCWM Publication 14 to evaluate the protection and security of software. At the 2013 Measuring Sector meeting, the proposal was thoroughly discussed and debated. The Sector rejected the proposal; however, manufacturers committed to studying the issue and bringing back alternative(s) to consider at the 2014 Sector meeting. **See the 2013 NTEP Measuring Sector Meeting Summaries for additional details.**

The Software Sector and the Weighing Sector discussed this item in a joint meeting on August 27, 2014. In September 2014, Mr. Truex forwarded a recommendation from the joint Software Sector/Weighing Sector meeting to add a new section to NIST Handbook 44 as shown in the "Recommendation" above.

Discussion:
At its 2014 meeting, the NTEP Measuring Sector heard many comments on this proposed amendment to add a new paragraph G-S.9. to NIST Handbook 44. Much of the discussion was on the checklist that had been reviewed and rejected by the Measuring Sector at their 2013 meeting.

Mr. Roach (CDFA DMS), Mr. Miller (FMC), and Mr. Keilty (Endress+Hauser Flowtec AG) all stated that they support this proposed amendment. In addition, Mr. Keilty stated he would like to see sealable parameters added to the measuring device portion of NCWM Publication 14 and to recommend the same thing to the other NTEP Sectors.

There was discussion to add language to NIST Handbook 44, General Code, *G-S.8. Provision for Sealing Electronic Adjustable Components*, to further address security concerns; however, there was not a consensus on specific language to propose. Mr. Oldham (Gilbarco, Inc.) stated the Software Sector debated this for at least six hours, and they are still struggling with it.

There was much discussion and vigorous debate on this proposed new paragraph. There was not agreement on what was a metrologically significant change to the software and what was simply an update. It was not clear how this proposal would apply to software that does not currently separate metrologically significant and non-metrologically significant portions within itself. The Measuring Sector also discussed that this be added to the list of sealable parameters, but was advised that the Software Sector does not view a software update as a sealable "parameter" or a "feature." The Measuring Sector is amenable to adding this to the table but recognized concerns about the terminology.

Decision:
The Measuring Sector did not reach a consensus on this proposal. The Sector believes this item needs additional work and clarity on how it would be applied. The Sector also believes this comment needs to be passed onto the Software Sector and the S&T Committee for further review and Development.

4. Software Maintenance and Reconfiguration

Source:
NTEP Software Sector

Recommendation:
The Measuring Sector was asked to discuss any alternative proposal(s) from manufactures to add language into NCWM Publication 14 on how to secure their software.

Background/Discussion:
The Software Sector posed the following question to the Measuring Sector, "After the software is completed, what do the manufacturers use to secure their software?" At the 2013 Measuring Sector meeting, proposals were discussed and debated to address this issue. The Sector rejected the proposals; however, manufacturers committed to studying the issue and bringing back alternative(s) to the 2014 Sector meeting. (See Appendix B for the proposals that were discussed at the 2013 Measuring Sector meeting. Also see the 2013 NTEP Measuring Sector meeting summaries for additional details. See Appendix B for the proposals that were discussed at the 2013 Measuring Sector meeting summaries for details.)

In July 2014, Mr. Jim Truex (NTEP Director) reported he had not received any new information on this issue.

Discussion:
At its 2014 meeting, the Measuring Sector discussed this item and reviewed Appendix B; *NTEP Measuring Sector 2014 Agenda, Software Maintenance and Reconfiguration, Excerpts from 2013 Measuring Sector Summary*. However, no alternatives were brought forth, nor were there any alternatives provided by the Software Sector.

The Measuring Sector noted that the information included in Appendix B is basically what is covered in OIML D 31.

Mr. Oldham (Gilbarco, Inc.) stated that portions of this were discussed at the August 2014 Software Sector meeting but not as an entire unit. Mr. Truex stated there were many comments made at the Software Sector meeting including those from Mr. Ambler Thompson (NIST, OWM). This proposed language be added into G-S.8., and from Mr. Rick Harshman (NIST, OWM) who suggested it be added as a new G-S.9.

Mr. Rich Tucker (RL Tucker Consulting, LLC) stated that it sounds like the Measuring Sector's Item 3 is to address software changes in the field whereas this agenda item (Item 4) is to address changes made at the manufacturer's facility. He noted this agenda item includes all of the checking and verification to assure that the changes were implemented the way in which they were intended. Mr. Oldham stated the procedures in this item go through the process of what happens behind the scenes when software is upgraded or changed.

Decision:
The Sector did not have any additional input and did not provide any recommendations for further action on this issue

New Items:

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

Background:
The 99th National Conference on Weights and Measures (NCWM) adopted the following items that will be reflected in the 2015 Edition of NIST Handbook 44 and NCWM Publication 14. These items were included on the Sector's agenda to inform the Measuring Sector of the NCWM actions and recommend changes to NCWM Publication 14.

Source:
NCWM S&T Committee

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

At the 2014 NCWM Annual Meeting, NIST Handbook 44, LMD Code, paragraph N.4.2.4.was amended as follows:

N.4.2.4. Wholesale Devices. – "Special" tests shall be made to develop the operating characteristics of a measuring system and any special associated or attached elements and accessories. "Special" tests shall include a test at **or slightly above** the slower of the following rates:

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

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

In no case shall the test be performed at a flow rate less than the minimum discharge rate marked on the device.
(Amended 20XX)

Recommendation:
The Measuring Sector was asked to review and, if acceptable, recommend to the NTEP Committee adoption of the following changes to NCWM Publication 14, Field Evaluation and Permanence Tests for Metering Systems, based upon changes to NIST Handbook 44:

D. Initial Evaluation and Permanence Tests for Wholesale Positive Displacement (PD) Meters

The following tests are considered to be appropriate for metering systems on Wholesale PD Meters:

1. Four test drafts at each of five flow rates.
   1.1. "Special" tests shall include a test at or slightly above the slower of the following rates:
   1.1.1. 20 % of the marked maximum discharge rate; or
   1.1.2. The minimum discharge rate marked on the device.

   In no case shall the test be performed at a flow rate less than the minimum discharge rate marked on the device.

2. Only one meter is required for the initial test; after which, the meter will be reevaluated for permanence. The minimum throughput criterion for these meters is the maximum rated flow in units per minute × 2000.

3. Following the period of use, the tests listed above are to be repeated. All results within the range of flow rates to be included on the Certificate of Conformance (CC) must be within the applicable tolerances. Extended flow range testing performed at the manufacturer's discretion may be included on the CC provided the results are within the acceptable tolerances.

Technical Advisor's Note: At the 2014 NCWM Annual Meeting, the S&T Committee heard comments from Mr. Dmitri Karimov (Liquid Controls) that the phrase, "slightly above" is ambiguous and suggested that the phrase be replaced with similar language to that contained in Measurement Canada's Bulletin V-03 (rev. 4), Section 4.5.3. Slow Flow Rate shown below.

4.5.3. Slow Flow Rate: The slow flow test is performed at a flow rate greater than the minimum rated flow rate of the meter. To ensure the rate is above the minimum, the target flow rate should be determined by summing the following:

- For all meters other than dispensers and refuellers

(Minimum Approved Flow Rate) + (10 % of Minimum Approved Flow Rate)

The Technical Advisor suggested that the Measuring Sector also discuss whether or not more specific guidance is needed during type evaluation.

Discussion:
At the 2014 Sector meeting, the Technical Advisor discussed this item. Mt. Clark Cooney (NIST, OWM) reviewed this new amendment to NIST Handbook 44 and the associated proposed change to Publication 14 with the Sector.

At the 2014 Sector meeting, Mr. Truex stated that this NIST Handbook 44 amendment must be recognized in NCWM Publication 14.

Mr. Karimov stated that the Measurement Canada regulation referenced above is applicable to "all meters other than dispensers and refuellers" and suggested this language could be used.

Mr. Karimov questioned how this proposal applies to turbine meters. Mrs. Butcher (NIST, OWM) commented that Mr. Karimov makes a good point and that this also needs to be addressed in NCWM Publication 14, LMD Part H, *Field Evaluation and Permanence Test for Turbine Meters*.

Decision: The 2014 Measuring Sector agreed to recommend the language in the "Recommendation" above be added to NCWM Publication 14, LMD *Field Evaluation and Permanence Tests for Metering Systems*, in both Parts D ***and*** H, to reflect the corresponding amendments in the 2015 NIST Handbook 44. However, the Sector does not believe more specific language, such as that in Measurement Canada's Bulletin V-03 (rev. 4), Section 4.5.3. Slow Flow Rate, is necessary and it decided to not recommend it.

B. G-S.5.6. Recorded Representations, 2014 NCWM Item 310-2

At the 2014 NCWM Annual Meeting, NIST Handbook 44 General Code was amended as follows:

G-S.5. Indicating and Recording Elements.

G-S.5.6. Recorded Representations. – Insofar as they are appropriate, the requirements for indicating and recording elements shall also apply to recorded representations. All recorded values shall be printed digitally. **In applications where recorded representations are required, the customer may be given the option of not receiving the recorded representation. For systems equipped with the capability of issuing an electronic receipt, ticket, or other recorded representation, the customer may be given the option to receive any required information electronically (e.g., via cell phone, computer, etc.) in lieu of or in addition to a hard copy.**

(Amended 1975 **and 2014**)

Recommendation:
The Measuring Sector was asked to review and, if acceptable, recommend the following changes be included in NCWM Publication 14, Checklists and Test Procedures:

Code Reference: G-S.5.6. Recorded Representations

2.10.	All recorded values shall be digital. *See also G-UR.3.3.*	☐ Yes ☐ No ☐ N/A
2.11.	In applications where recorded representations are required, the customer may be given the option of not receiving the recorded representation.	☐ Yes ☐ No ☐ N/A
2.12.	For systems equipped with the capability of issuing an electronic receipt, ticket, or other recorded representations, the customer may be given the option to receive any required information electronically (e.g., via cell phone, computer, etc.) in lieu of or in addition to a hard copy.	☐ Yes ☐ No ☐ N/A

The electronic copy is provided:

2.12.1. In lieu of a hard copy of the recorded representation.	☐ Yes ☐ No ☐ N/A
2.12.2. In addition to a hard copy of the recorded representation.	☐ Yes ☐ No ☐ N/A
Describe the options provided:	
2.12.3. Via Cell phone.	☐ Yes ☐ No ☐ N/A
2.12.4. Computer.	☐ Yes ☐ No ☐ N/A
2.12.5. Other (describe).	☐ Yes ☐ No ☐ N/A

(Renumber the subsequent paragraphs.)

Discussion: Mr. Cooney and Mrs. Butcher stated that the reference described above already exists in NCWM Publication 14, but this proposal adds additional criteria to reflect the new amendments to NIST Handbook 44, G-S.5.6. Mr. Truex (NTEP Director) stated that an immense amount of work was done to amend NIST Handbook 44, LMD S.1.6.7. and S.1.6.8., a couple of years ago and that the Sector does not want to lose this.

The NTEP Laboratories represented at the 2014 Measuring Sector supported having the checklist only in the General Section so that they do not have to complete the same review in multiple locations within NCWM Publication 14.

The Sector pointed out that in the opening sentence for paragraphs 2.12.1. and 2.12.2., the word, "hard", needs to be amended to, "electronic." This amendment was made during the meeting and shows correctly in this copy of the agenda.

Decision:
The 2014 NTEP Measuring Sector agreed to propose that NCWM Publication 14 be modified as shown in the "Recommendation" above. Furthermore, the Sector agreed to retain the language in NCWM Publication 14 checklist that pertain to Code References S.1.6.7. and S.1.6.8. because it does not conflict with G-S.5.6.

C. S.1.6.7. and S.1.6.8. Recorded Representations NCWM S&T Item 330-1.

At the 2014 NCWM Annual Meeting, NIST Handbook 44, Liquid-Measuring Devices code was amended as follows:

S.1.6.7. Recorded Representations. – Except for fleet sales and other price contract sales and for transactions where a post-delivery discount is provided, a printed receipt providing the following information shall be available through a built-in or separate recording element for all transactions conducted with point-of-sale systems or devices activated by debit cards, credit cards, and/or cash:

(a) the total volume of the delivery;

(b) the unit price;

(c) the total computed price; and

(d) the product identity by name, symbol, abbreviation, or code number.

~~**For systems equipped with the capability to issue an electronic receipt, the customer may be given the option to receive the receipt electronically (e.g., via cell phone, computer, etc.)**~~
~~**[Nonretroactive as of January 1, 1986]**~~
(Added 1985) (Amended 1997, 2012, and 2014)

and,

S.1.6.8. Recorded Representations for Transactions Where a Post-Delivery Discount(s) is Provided. – Except for fleet sales and other price contract sales, a printed receipt providing the following

information shall be available through a built-in or separate recording element that is part of the system for transactions involving a post-delivery discount:

(a) the product identity by name, symbol, abbreviation, or code number;

(b) transaction information as shown on the dispenser at the end of the delivery and prior to any post-delivery discount(s), including the:

(1) total volume of the delivery;

(2) unit price; and

(3) total computed price of the fuel sale.

(c) an itemization of the post-delivery discounts to the unit price; and

(d) the final total price of the fuel sale after all post-delivery discounts are applied.

~~**For systems equipped with the capability to issue an electronic receipt, the customer may be given the option to receive the receipt electronically (e.g., via cell phone, computer, etc.).**~~

(Added 2012) **(Amended 2014)**

Recommendation:
The Measuring Sector was asked to review and, if acceptable, recommend to the NTEP Committee adoption of the following changes to NCWM Publication 14, Checklists and Test Procedures for Retail Motor Fuel Dispensers, based upon changes to NIST Handbook 44:

Code References: S.1.6.7. Recorded Representations and S.1.6.8. Recorded Representations for Transaction Where a Post-Delivery Discount(s) is Provided.

Except for fleet sales and other price contract sales, for transactions conducted with point-of-sale systems or devices activated by credit cards, debit cards, or cash, a printed receipt containing information about the transaction shall be available to the customer as outlined in the following items. A printed receipt must always be available to the customer upon request and printing of the receipt may be initiated at the option of the customer. In addition, some systems may be equipped with the capability to issue an electronic receipt; for those systems, the customer may be given the option to receive the receipt electronically (e.g., via cell phone, computer, etc.). ***See also NCWM Publication 14, Code Reference: G-S.5.6. Recorded Representations.***

Discussion:
Mr. Truex stated that this language also needs to be added to the "cash acceptors" checklist and other places where S.1.6.7. and S.1.6.8. are referenced.

Decision:
The Sector agreed to recommend NCWM Publication 14 be modified as shown in the "Recommendation" above.

D. S.1.5.3. Recorded Representations, Point-of-Sale Systems.

At the 2014 NCWM Annual Meeting, NIST Handbook 44, Liquefied Petroleum Gas and Anhydrous Ammonia Liquid-Measuring Devices code was amended as follows:

S.1.5.3. Recorded Representations, Point-of-Sale Systems. – Except for fleet sales and other price contract sales, a printed receipt providing the following information shall be available through a built-in

or separate recording element for all transactions conducted with point-of-sale systems or devices activated by debit cards, credit cards, and/or cash:

(a) the total volume of the delivery;

(b) the unit price;

(c) the total computed price; and

(d) the product identity by name, symbol, abbreviation, or code number.

Recommendation:
The Measuring Sector was asked to review and, if acceptable, recommend to the NTEP Committee adoption of the following changes to NCWM Publication 14, Checklists and Test Procedures for Liquefied Petroleum Gas (LPG) Liquid-Measuring Devices, based upon changes to NIST Handbook 44:

Code Reference: S.1.5.3. Recorded Representations, Point-of-Sale Systems

28.13. A printed receipt providing the following information is available through a built-in or separate recording element for all transactions conducted with point-of-sale systems or devices activated by debit cards, credit cards, and/or cash. This does not apply to fleet sales and other price contract sales.	☐ Yes ☐ No ☐ N/A
28.13.1. The total volume of the delivery printed.	☐ Yes ☐ No ☐ N/A
28.13.2. The unit price printed.	☐ Yes ☐ No ☐ N/A
28.13.3. The total computed price printed.	☐ Yes ☐ No ☐ N/A
28.13.4. The product identity by name. symbol, abbreviation, or code number.	☐ Yes ☐ No ☐ N/A

Renumber the subsequent paragraphs.

Discussion:
The Sector briefly discussed this item; however, there were very few comments.

Decision:
The Sector agreed to recommend that NCWM Publication 14 be modified as shown in the "Recommendation" above.

6. Add Instructions to NCWM Publication 14 Field Evaluation and Permanence Tests for Metering Systems, Paragraph B.

Source:
Mr. John Roach, California Department of Food and Agriculture (CDFA), Division of Measurement Standards (DMS).

Recommendation:
The Sector was asked to consider the following changes to NCWM Publication 14:

Modify Section E of the Technical Policy in the Liquid-Measuring Devices Checklist as follows:

E. Meter Sizes to be Included on a Certificate of Conformance (CC)

Based upon the test of a meter (or meters), meters larger and smaller than the meter(s) tested and meeting the following criteria may be covered by the CC:

1. Meter sizes with rated maximum flow rates of 50 % to 200 % of the rated maximum flow rate of the meter tested; and

2. Meter sizes with rated minimum flow rates of 50 % to 200 % of the rated minimum flow rate of the meter tested.

3. The maximum flow rate achieved in an installation is considered to be 80 % of the maximum flow rate to be listed on the CC.

In order to include additional meter sizes (on a new CC or a CC including previously evaluated meters) beyond these ranges, additional testing, including permanence testing, is required.

Modify the following sections of the "Field Evaluation and Permanence Testing for Metering Systems" portion of the Liquid-Measuring Devices Checklist as follows:

A. Field Evaluation and Permanence Test of New-Design Meters in Retail Motor Fuel Dispensers.

All new-design meters are subject to a permanence test. If a meter is the same as one in a previously tested dispenser, a permanence test is not required. NTEP National Type Evaluation Program reserves the right to require a permanence test based on the result of the initial examination.

…

Subsequent Examination
Following the period of use, the tests listed above are to be repeated. All results within the range of flow rates to be included on the Certificate of Conformance (CC) must be within the applicable tolerances. Extended flow range testing performed at the manufacturer's discretion may be included on the CC provided the results are within the acceptable tolerances **for both the initial and subsequent portion of the permanence test. See also Technical Policy Section E "Meter Sizes to be Included on a Certificate of Conformance (CC)" for requirements regarding the inclusion of additional meter sizes and flow rates**.

B. Field Evaluation Test of Previously Evaluated Components in ~~Retail Motor Fuel Dispensers~~ Metering Systems Using Different Previously Evaluated Meters.

Different Previously Evaluated Meter
Previously evaluated dispensers using a previously type evaluated meter and indicator (register) will be subject to **an** initial test. Based on the test results of the initial test, National Type Evaluation Program (NTEP) may require a permanence test.

In order to include additional meter sizes and/or flow rates for a system that uses a previously evaluated meter beyond the ranges listed on the original CC for the meter, additional testing, including permanence testing, is required.

Non-metrological Changes
A technical administrative review shall be conducted to issue a new Certificate of Conformance (CC) or amend an existing CC for previously evaluated devices because of non-metrological changes. Based on the results of the technical administrative review, NTEP may require additional tests.

C. Field Evaluation and Permanence Test for Vehicle-Tank; Except for LPG, Cryogenic and CO2 Meters.

…

Following the period of use, the tests listed above are to be repeated. All results within the range of flow rates to be included on the Certificate of Conformance (CC) must be within the applicable tolerances. Extended flow range testing performed at the manufacturer's discretion may be included on the CC provided the results are within the acceptable **tolerances for both the initial and subsequent portion of the permanence test. See also Technical Policy Section E "Meter Sizes to be Included on a Certificate of Conformance (CC)" for requirements regarding the inclusion of additional meter sizes and flow rates**.

D. Initial Evaluation and Permanence Tests for Wholesale Positive Displacement (PD) Meters.

The following tests are considered to be appropriate for metering systems on Wholesale PD Meters:

1. Four test drafts at each of five flow rates.

2. Only one meter is required for the initial test, after which the meter will be reevaluated for permanence. The minimum throughput criterion for these meters is the maximum rated flow in units per minute × 2000.

3. Following the period of use, the tests listed above are to be repeated. All results within the range of flow rates to be included on the Certificate of Conformance (CC) must be within the applicable tolerances. Extended flow range testing performed at the manufacturer's discretion may be included on the CC provided the results are within the acceptable tolerances **for both the initial and subsequent portion of the permanence test. See also Technical Policy Section E "Meter Sizes to be Included on a Certificate of Conformance (CC)" for requirements regarding the inclusion of additional meter sizes and flow rates**.

E. Field Evaluation and Permanence Test for LPG and Cryogenic Meters.

…

Following the period of use, the tests listed above are to be repeated. All results within the range of flow rates to be included on the Certificate of Conformance (CC) must be within the applicable tolerances. Extended flow range testing performed at the manufacturer's discretion may be included on the CC provided the results are within the acceptable tolerances **for both the initial and subsequent portion of the permanence test. See also Technical Policy Section E "Meter Sizes to be Included on a Certificate of Conformance (CC)" for requirements regarding the inclusion of additional meter sizes and flow rates**.

F. Field Evaluation and Permanence Test for LPG Vapor Meters.

…

Following the period of use, the tests listed above are to be repeated. All results within the range of flow rates to be included on the Certificate of Conformance (CC) must be within the applicable tolerances. Extended flow range testing performed at the manufacturer's discretion may be included on the CC provided the results are within the acceptable tolerances **for both the initial and subsequent portion of the permanence test. See also Technical Policy Section E "Meter Sizes to be Included on a Certificate of Conformance (CC)" for requirements regarding the inclusion of additional meter sizes and flow rates**.

H. Field Evaluation and Permanence Test for Turbine Meters.

…

Following the period of use, the tests listed above are to be repeated. All results within the range of flow rates to be included on the Certificate of Conformance (CC) must be within the applicable tolerances. Extended flow range testing performed at the manufacturers" discretion may be included on the CC provided the results are within the acceptable tolerances **for both the initial and subsequent portion of the permanence test. See also Technical Policy Section E "Meter Sizes to be Included on a Certificate of Conformance (CC)" for requirements regarding the inclusion of additional meter sizes and flow rates.** Following evaluation of test data and analysis of the data presented by the manufacturer for meter performance over temperature and viscosity ranges, the evaluating laboratory may require additional testing prior to issuing a CC for the meter.

I. Field Evaluation and Permanence Tests for Mass Flow Meters.

…

Test Data

…

Following the initial test, the meters will be placed into service for the permanence test. The minimum throughput criterion recommended for these meters are 60 days, or 2000 × maximum rated flow in units per minute. Following the period of use, the tests listed above are to be repeated. All results within the range of flow rates to be included on the certificate of conformance must be within the applicable tolerances. Extended flow range testing performed at the manufacturer's discretion may be included on the certificate of conformance provided the results are within the acceptable tolerances **for both the initial and subsequent portion of the permanence test. See also Technical Policy Section E "Meter Sizes to be Included on a Certificate of Conformance (CC)" for requirements regarding the inclusion of additional meter sizes and flow rates.**

Background:
This item was proposed to ensure that NTEP laboratories are consistent in determining performance and throughput requirements for extending flow rates beyond what is currently approved. Mr. John Roach (CDFA DMS) proposed that instructions be added to NCWM Publication 14 to clarify requirements for extending flow rates for systems that are incorporating a previously approved meter beyond what is currently covered on the NTEP CC for the meter. Mr. Roach provided four examples along with proposed testing requirements; these examples are included in Appendix C.

NCWM Publication 14, Liquid-Measuring Devices Checklist, Technical Policy Section E, "Meter Sizes to be Included on a Certificate of Conformance (CC)", includes guidance on meter sizes and flow rates that can be included based on testing conducted on a meter. However, it makes no reference to permanence test requirements. The changes in

the "Recommendation" propose including a clear statement in Section E that makes reference to permanence test requirements. Note that Section, "New Product Applications for Meters", already includes such references.

Criteria for field evaluations, including permanence test criteria, are included in the "Field Evaluation and Permanence Tests for Metering Systems" portion of the checklist, and individual sections within that portion of the checklist may make reference to the "initial" testing and "permanence" testing. Section B. "Field Evaluation Test of Previously Evaluated Components in Retail Motor Fuel Dispensers Using Different Previously Evaluated Meters" provides some guidelines on what testing is required; however, this section does not adequately address some of the scenarios that are being posed to the NTEP Laboratories. Additional guidance is needed to ensure consistency among the NTEP Laboratories and to ensure that manufacturers have a clear understanding of what testing will be required. It is also suggested that the reference to "Retail Motor Fuel Dispensers" be replaced with "Metering Systems" since the principles in this section should be applicable to any metering system.

The following statement is found in multiple sections of the Field Evaluation and Permanence Tests for Metering Systems" section and was added based on Sector action in 2006: "Extended flow range testing performed at the manufacturer's discretion may be included on the CC provided the results are within the acceptable tolerances." Because this statement appears as part of the "Subsequent Examination" portion of these sections, questions have been raised about whether or not testing of an extended flow rate only needs to be done during the subsequent portion of the examination in order to cover the extended rates on the CC. To clarify the application of this statement, the Sector is asked to consider adding a statement that this applies to both the initial and subsequent portion of the permanence test and to also add a statement acknowledging additional criteria regarding the addition of flow rates and meter sizes in the Technical Policy section of NCWM Publication 14.

The Sector was also asked to discuss other questions about permanence requirements for mass flow meters relative to other meter technologies. For example, the performance of a positive displacement meter might be affected by repeated use and throughput, which might cause wear and tear on components in the system that can affect accuracy. Is this same premise true of a mass flow meter's sensor, which has no moving parts? What would the effects be on a fixed orifice meter?

The Technical Advisor suggested the Sector may also wish to consider adding additional text to these sections explaining the need for the holder of the CC for a previously evaluated meter to grant permission for the use of the test results as a means to eliminate permanence testing. While this practice may be well understood from an administrative perspective, a clear statement or reference in the checklist will improve consistency in its application and better understanding of the requirements by manufacturers. While specific language is not suggested in the recommendation, the examples included in the accompanying Appendix C include narrative that could be used.

Discussion:
The Sector discussed this item at great length and vigorously debated it.

To help them understand the purpose and need for his proposal, Mr. Roach (CDFA DMS) reviewed the examples in the 2014 Sector's agenda summary Appendix C. He stated that he is getting questioned by manufacturers and he needs clarification in NCWM Publication 14.

A lot of confusion was expressed by the Sector. Some of the questions and comments included:

1. Why is a permanence test needed for electronics?

2. Transmitters cannot be separated from the mass flow meter and still have a functional system.

3. If these were assembled into a retail motor fuel dispenser system, then it would need a full permanence test.

Mr. Rodney Cooper (Tuthill Transfer Systems) spoke at length and carefully described how the transmitter is an integral part of the mass flow meter system. He stated that if the transmitter is changed out, then a new meter has been created and it would need to go through a full permanence test again. Mr. Moses (Wayne) agreed with Mr. Cooper.

The Measuring Sector agreed that if the manufacturer extends the range beyond what the system was originally tested for, then it must go through initial and permanence tests.

The Sector thoroughly discussed the original proposed amendments to NCWM Publication 14 Technical Policy LMD checklist, Section E, "Meter Sizes to be Included on a Certificate of Conformance (CC)" and modifying the sections within "Field Evaluation and Permanence Testing for Metering Systems", and the examples and proposed test requirements in Appendix C.

Decision:
The Sector did not believe the original proposed amendments to NCWM Publication 14 were necessary but it agreed with the test requirements shown in Appendix C (2014 Sector's Agenda Summary), Examples A and B. However, it made the following amendments and conclusions regarding the application of NCWM Publication 14 to Examples C and D:

- Appendix C; Example C. There must be a full permanence test conducted, not just a 30-day test. If there is not an NTEP Certificate of Conformance (CC) for the meter system using the new transmitter, then the full permanence testing must be conducted. Consequently, the proposed test requirements in Example C need to be amended to reflect this. The changing of the transmitter is metrologically significant and this would be considered a new meter.

- Appendix C; Example D. The conclusion is the same as in Example C above. The change of the transmitter is metrologically significant. If the meter, including the sensor or transmitter, has not been tested as a complete system, then both an initial and permanence test is required.

7. Eliminate Permanence Testing for Point of Sale (POS) Systems.

Source:
Randy Moses, Wayne Fueling Systems, LLC.

Background/Recommendation: The NTEP Measuring Sector was asked to consider the following proposed amendment to the section of the Liquid-Measuring Devices checklist of NCWM Publication 14, titled, *Field Evaluation and Permanence Test for Metering Systems*:

Field Evaluation

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 days 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.) **Only an initial evaluation is required for Electronic Cash Registers.**

And a proposal to amend NCWM Publication 14, *Electronic Cash Register Interfaced with Retail Motor Fuel Dispenser Checklists and Test Procedures*, "Introduction" section as follows:

Introduction

This checklist is intended for use when conducting general evaluations of new electronic cash registers (ECR) that are to interface with retail motor fuel dispensers. It is assumed that the dispenser was previously evaluated, if not, the Liquid Measuring Device checklist must be applied to the dispenser sale system. The ECR must interface with a dispenser to perform this evaluation. Specific criteria that apply to service station control consoles are in the checklist for retail motor fuel dispensers and must be applied if the cash register also serves as the service station controller. As a minimum, two dispensers from different manufacturers, each of which includes all of the features to be listed on the ECR Certificate of Conformance (CC), must be evaluated with the ECR in order to have the statement "equivalent and compatible equipment" appear on the CC.

For field evaluation and permanence test criteria, see the "Field Evaluation" section in the NTEP Liquid-Measuring Devices – Field Evaluation and Permanence Tests for Metering Systems checklist.

This checklist is designed in a logical sequence for the user to determine and record the conformance of the device with the elements of NIST Handbook 44. The user should make copies of the checklist to serve as worksheets and preserve the original for reference. In most cases, the results of evaluation for each element can be recorded by checking the appropriate response. In some cases, the user is required to record values, results, or comments. In those cases, space is provided.

The submitter of this item states that the 2014 NCWM Publication 14, LMD – *Field Evaluation and Permanence Tests for Metering Systems; Permanence Test Procedures for Meters*, paragraph *A; Field Evaluation and Permanence Test of New-Design Meters in Retail Motor Fuel Dispensers*, currently requires a permanence test to be performed on point of sale (POS) systems. The submitter believes that a permanence test needs to be performed on a device that is subject to wear. However, he believes that wear is not an issue with POS systems, thus, a permanence test should not be required. He acknowledges that there is the possibility that an electronic component may fail, but in this case, the test would be started over. The submitter believes that if that were to happen, it would likely pass the test the second time. He states that the tests should be limited to verifying the proper operation just one time.

In reviewing this item, the Technical Advisor noted that there is no reference to the field evaluation and permanence test criteria in NCWM Publication 14, *Electronic Cash Register Interfaced with Retail Motor Fuel Dispenser Checklists and Test Procedures*. Consequently, the Sector was also asked to consider adding a statement to the "Introduction" section of the, *Electronic Cash Register Interfaced with Retail Motor Fuel Dispenser Checklist and Test Procedures*, checklists as shown in the recommendations.

Discussion:
The Sector discussed both agenda Item 1, *Add Testing Criteria to NTEP Policy U "Evaluating Electronic Indicators Submitted Separate from a Measuring Element"* and this agenda Item 7, *Eliminate Permanence Testing for Point of Sale (POS) Systems*, simultaneously due to the overlap of the two Items. Refer to the Sector's agenda Item 1 for the discussion on this Item.

Decision:
Since the Sector discussed both agenda Item 1 and Item 7 simultaneously, its decision on this item is recorded in Item 1.

8. NIST Handbook 44: Section 3.32. LPG and Anhydrous Ammonia Liquid-Measuring Devices, N.3. Test Drafts; Section 3.37. Mass Flow Meters, N.3. Test Drafts.

Source:
Michael Keilty, Endress + Hauser Flowtec AG

Recommendation:
The Measuring Sector was asked to discuss and comment on two proposals that have been submitted to the four regional weights and measures associations (CWMA, NEWMA, SWMA, and WWMA). These proposals would amend NIST Handbook 44, LPG and Anhydrous Ammonia Liquid-Measuring Devices and Mass Flow Meters codes, Notes Section, and Test Drafts, to allow transfer standards (master meters) to test and place into service dispensers and flow meters.

Background/Discussion:
The submitter of this item, Mr. Mike Keilty (Endress + Hauser Flowtec AG), noted that the use of transfer standards (master meters) are recognized in NIST Handbook 44, Sections 3.34. Cryogenic Liquid-Measuring Devices; 3.38. Carbon Dioxide Liquid-Measuring Devices; and 3.39. Hydrogen Gas-Measuring devices – Tentative Code. He stated that field evaluation of LPG meters, CNG dispensers, and LNG dispensers are very difficult using volumetric and gravimetric field standards and test methods. He also stated that the tolerances for these applications are such that using transfer meter standards are more efficient and safer. In LPG, CNG, and LNG applications, the transfer standard meters are placed in-line with the delivery system as it used to deliver product to tanks and vehicles.

Section 3.37. Mass Flow Meters, UR.3.8. Return of Product to Storage, Retail Compressed Natural Gas Dispensers, requires, in essence, provisions to be made for returning the product to storage or disposing of the product in a safe and timely manner. Mr. Keilty states that: 1) this is difficult to do and most often is not complied with when the test vessel contents are released into the atmosphere; 2) the use of transfer standards eliminates return to storage issues; and 3) the use of transfer standards is easier and faster compared to traditional field standards and the cost of using and transporting transfer standards is much less than that of traditional field provers and standards. Recognition of transfer standards in these particular sections of NIST Handbook 44 will enable states to allow this equipment to place systems into service and for field enforcement.

Mr. Keilty notes that, in some applications, transfer standard meters are not more accurate than the meters being tested and for that reason, longer test drafts and possibly more tests need to be conducted. According to Mr. Keilty, the State of California conducted a short study of master meters in the past, but the conclusion did not lead to wide adoption of the practice. However, he indicates that California uses a mass flow meter as a master meter for carbon dioxide flowmeter enforcement, Colorado uses a master meter to test LPG truck-mounted meters, and Nebraska has used a mass flow meter to test agricultural chemical meters.

The following two proposals to amend NIST Handbook 44, Sections 3.32. LPG and NH_3 and 3.37. Mass Flow Meters have been submitted to the four regional weights and measures associations:

3.32. Liquefied Petroleum Gas and Anhydrous Ammonia Liquid-Measuring Devices.

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.~~:~~

N.3.2. Transfer Standard Test. – When comparing a meter with a calibrated transfer standard, the test draft shall be equal to at least the amount delivered by the device in 2 minutes at its maximum discharge rate.

(Amended 1982 and 20XX)

3.37. Mass Flow Meters.

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. (Also see T.3. Repeatability.)

N.3.2. Transfer Standard Test. – When comparing a meter with a calibrated transfer standard, the test draft shall be equal to at least the amount delivered by the device in two minutes at its maximum discharge rate.

(Amended 20XX)

The submitter also suggested that the S&T Committee might consider amending Section 3.30. Liquid-Measuring Devices and Section 3.31. Vehicle-Tank Meters codes to allow transfer standard meters. However, no formal proposals have been submitted for such changes.

Discussion:
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.

Some Sector members commented that master meters would resolve many issues currently being faced when testing not only LPG and NH_3 measuring devices, but also measuring devices of various alternative fuels such as compressed natural gas (CNG) and liquefied natural gas (LNG). Such issues include, but are not limited to, multiple steps in measurement by mass, safe handling, and what to do with the product following a test (e.g., compressing it back into storage or venting it into the atmosphere).

The Sector noted that transfer standards (master meters) are allowed in NIST Handbook 44's Cryogenic, Carbon Dioxide, and Hydrogen Gas (tentative) codes. Mr. Cooney (NIST OWM) pointed out that within each of these codes, there is a more lenient tolerance when using transfer standards. These tolerances are all very similar to each other in that there shall be an amount added to the basic tolerance that is equal to two times the standard deviation of the applicable transfer standard when compared to a basic reference standard.

Ms. Butcher (NIST, OWM) stated that the NIST U.S. National Working Group (USNWG) on alternate test methods (ATMs) was created to evaluate transfer standards; however, much of the work done to this point has been on closed loop provers vs. typical neck type provers. She also pointed out that a draft NIST Handbook 105 for LPG master meters was developed by the National Propane Gas Association (NPGA) and posted for group review, although, she is not aware of any comments received.

Some manufacturers stated that they would like transfer standards (master meters) to be allowed for all measuring device technologies. Mr. Karimov (Liquid Controls) stated that master meter requirements need to be the same across

all measuring device codes equally. Mr. Katalinic (North Carolina Weights and Measures) agreed that it does not matter what technology is used, provided that it meets accuracy and other applicable criteria.

Mr. Moses (Wayne) stated that transfer standards are clearly not as accurate as actually weighing the product on an appropriate weighing device. However, he stated that the reality is that some measuring devices for products such as CNG and LNG are not being tested at all due to the difficulty of current test procedures. He believes that transfer standards are effective in these applications. Ms. Butcher (NIST, OWM) stated that it is time to examine transfer standards as an effective way to test measuring devices of products that are not easily tested or not tested at all. She continued to emphasize that uncertainties, procedures, specifications, legal traceability, and other technical requirements for transfer standards (master meters) must be established first.

Mr. Cooney (NIST, OWM) stated that a comment at the WWMA meeting pointed out the need for master meters and that they would resolve several issues testing meters used to measure certain products. Another comment was heard that the uncertainties of these types of measurements must be fully evaluated prior to adopting any test methods. The WWMA S&T Committee agreed that this technology would more easily facilitate examinations; however, it chose to make this proposal Developmental (D) pending more comprehensive evaluations of the equipment, testing procedures, and uncertainties and to allow more time for the Submitter to provide a more in-depth analysis.

Mr. Cooney suggested that manufacturers of transfer standards (master meters) should work through the NIST USNWG on ATMs to pursue the development of standards and recognition of alternative types of test methods, including transfer standards. This work would include industry conducting research, documenting data, conducting analysis, and sharing this information for review and verification.

Decision:
The Sector believes transfer standards are valuable in verifying devices that are not easily tested when used to measure certain products (e.g., CNG and LNG). The Sector supports this item moving forward as a Voting item at the 2015 NCWM Annual Meeting.

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

9. Appendix D – Definitions: Remote Configuration Capability, NCWM S&T Committee Item 360-2 (D).

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

Recommendation:
This item was included in the 2014 Measuring Sector agenda to allow the Sector to provide any additional input.

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

> **remote configuration capability. –** The ability to adjust a weighing or measuring device or change its sealable parameters from or through some other device that ~~**is not**~~ **may or may not** itself **be** necessary to the operation of the weighing or measuring device or ~~**is not**~~ **may or may not be** a permanent part of that device. [2.20, 2.21, 2.24, 3.30, 3.37, 5.56(a)]
>
> (Added 1993, **Amended 20XX**)

During its Open Hearings at the 2013 NCWM Interim Meeting, the S&T Committee heard comments from NIST, OWM that changes to this definition may affect other types of devices and ever emerging technologies.

Rather than the changes proposed, another option was offered to add onto the current definition of "remote configuration capability" as follows:

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

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

This item was discussed at the 2013 Measuring Sector meeting and whether or not additional guidance might be needed on what is covered by each sealing category. However, the Sector concluded that the definitions are adequate as currently written.

At the 2014 NCWM Interim Meeting, the SMA indicated that proposed changes for the Grain Analyzer Sector are acceptable. However, the Committee received comments from the Measuring Sector indicating opposition to the proposed language and suggesting that the current definition is adequate. The Committee also heard comments from NIST, OWM expressing concern that the proposed language does not clearly define when a device is considered "remotely configurable." OWM noted that it is continuing to develop this issue and has approached the various NTEP Sectors for additional input regarding the capabilities of new technology with regard to metrologically significant adjustments. During their 2013 meeting, the Weighing Sector asked its members to assist OWM in identifying the various types of removable storage media used in weighing equipment. The Committee acknowledged comments from OWM expressing concern that the issue be carefully considered to avoid unintentional consequences. The Committee agreed to maintain the Developing status of item in consideration of the ongoing work of OWM to further develop this item.

At the 2014 NCWM Annual Meeting, the S&T Committee heard several comments that this proposal should remain a "Developing Item" and they agreed to keep it designated as such.

NIST, OWM believes that much further development of this item is required and needs to include other remote configuration technologies that may be used in other weighing and measuring devices. NIST OWM does not believe the proposed changes to the definition of "remote configuration capability" are appropriate, but it does not have an alternative to offer at this time. It plans to continue working on this item after the 2014 NCWM Annual Meeting.

Additional background information on NCWM S&T Item 360-2 is contained in the *2014 NCWM Publication 16* and is available at:
http://www.ncwm.net/resources/dyn/files/1217541z1019c056/_fn/4-ST-Pub16-2014-CORRECTED-06-12-2014.pdf.

Discussion:
Mr. Truex stated this item originated from the Grain Analyzer Sector. He stated that not much has happened recently and that it is still developing. Mrs. Butcher (NIST, OWM) stated that she is not aware of any further work or changes to the item.

The Measuring Sector discussed this extensively as to how these devices work and the different categories of devices. Mrs. Butcher stated that all grain analyzers covered by NTEP are Category 3 devices.

Decision:
The Sector reiterated its comments from its 2013 meeting and concluded that the definition in NIST Handbook 44 for "remote configuration capability" is adequate as currently written.

10. N.4.2.5. Initial Verification and UR.2.5.1. Initial Verification Proving Reports, Wholesale Devices; NCWM Item 330-4 (D)

Source:
Minnesota Weights and Measures Division (2014).

Recommendation:
This item is included on the Sector's agenda to make members aware of this proposal to add new paragraphs to NIST Handbook 44, Liquid-Measuring Devices, Notes Section and to ask for input from the Sector on the recommended changes. This item appeared on the 2014 NCWM S&T Committee agenda as a Developing item. NIST OWM is recommending the "Examples" in the proposal are more appropriately included in the EPO's and training materials rather than in NIST Handbook 44.

Background/Discussion:
Ms. Julie Quinn (Minnesota Weights and Measures Division) reported that a group of interested parties has been collaborating to discuss requirements for wholesale meter systems with the capability to be calibrated at different flow rates and for different products.

During the 2014 NCWM Annual Meeting, this group met and developed suggested language to address this issue. Ms. Quinn asked that the S&T Committee include the suggested language in this item for further review and comments by the regional associations and others in the fall. The following language, along with a change to the title of the item (see 2014 NCWM Publication 16), was suggested:

> **N.4.2.5. Initial Verification. – A wholesale liquid measuring device shall be tested at all flow rates and with all products for which a calibration factor has been electronically programmed prior to placing it into commercial service for the first time or after being repaired or replaced.**
>
> **A wholesale liquid measuring device not equipped with means to electronically program its flow rates and calibration factors shall be tested at a low and high flow rate with all products delivered prior to placing it into commercial service for the first time or after being repaired or replaced.**
>
> **Example: A meter is electronically programmed to deliver regular and premium gasoline at a startup/shutdown flow rate of 150 gpm, a normal operating flow rate of 650 gpm, and a fall-back rate of 450 gpm. The meter is to be tested with regular gasoline at 150 gpm, 450 gpm and 650 gpm; and with premium gasoline at 150 gpm, 450 gpm and 650 gpm.**
>
> **The official with statutory authority has the discretion to determine the flow rates and products at which a meter will be tested on subsequent verifications.**
>
> **UR.2.5.1. Initial Verification Proving Reports. – Initial verification proving reports for wholesale liquid measuring devices equipped with means to electronically program flow rates shall be attached to and sent with placed-in-service reports when the regulatory agency with statutory authority requires placed-in-service reports.**

Members of this group have agreed to do a presentation at each of the 2014 fall regional meetings to explain this item and other related proposals.

Discussion:

The 2014 NTEP Measuring Sector discussed agenda Items 10, 11, 12, 13, and 14 together since they are all closely related and involve multiple point calibration capability. Consequently, the following notes apply to each of the Sector's multiple point calibration agenda items.

Mr. Dmitri Karimov (Liquid Controls) provided a presentation developed by the Multiple Point Calibration Group (MPCG). It is very important to note that this group is *not* officially appointed by the NCWM Board of Directors. This presentation will also be given to all regional weights measures meetings. The purpose of the presentation was to explain the reasoning behind the proposal and to attempt to answer any questions or concerns. The primary objective of the proposal is to linearize the meter's error across its operation, in other words, to flatten the typical error curve that is registered in measuring device.

Mr. Cooney (NIST, OWM) stated that Mr. Doug Deiman (Alaska Weights and Measures) provided the same presentation to the Western Weights and Measurers Association (WWMA) Annual Technical Conference at its September 2014 meeting. Testimony was received at the WWMA that the examples in the proposal need to be removed and perhaps placed into the appropriate NIST Examination Procedure Outline (EPO) or into training materials, but should not be placed into NIST Handbook 44. Mr. Cooney stated that there was significant misunderstanding among the participants at first, but following discussions, they appeared to grasp the concept and supported it. Mr. Cooney stated that the WWMA recommended grouping the related multiple point calibration items together for discussion and status assignment. The WWMA made all of the multiple point calibration proposals Voting Consent (VC) and they all passed.

Mr. Karimov stated that he will be giving this presentation to the 2014 Southern Weights and Measures Association (SWMA) meeting that followed immediately after this Measuring Sector meeting. He stated that he and the MPCG would like the Measuring Sector's support of this and the related proposals and to recommend moving them forward for a Vote at the 2015 NCWM Annual Meeting.

Significant discussion and vigorous debate ensued. Participants from the NTEP laboratories present at this meeting stated that nothing is changed to the applicable tolerances and this would only result in a great amount of additional testing with minimal improvement in the results.

Mr. Luciano Burtini (Measurement Canada) stated that Canada conducts tests at multiple points; however, they do fewer points and leave the choice to the field official. He believes that this proposal could require a lot of time to complete the tests. Mr. Karimov stated that this proposal does not require testing at every point that the device is capable of programming, only for the ones which calibration factors have been entered.

Mrs. Butcher (NIST, OWM) asked Mr. Burtini if they have other criteria in place in their selection process such as the direction of factors. Mr. Burtini responded that yes, they do. Measurement Canada sets a limit on how far apart they can be and the magnitude of the differences.

Mr. Katalinic (North Carolina Weights and Measures) stated that this proposal does not tighten up the tolerances in NIST Handbook 44 and, consequently, will not have any practical effect. In addition, he believes it will cause significant more time for the field official and increased disruption of the businesses for very little improvement in accuracy of the system. He stated that at best, it tightens up the tolerances for the Normal Test but does nothing for the Special Test. He continued that the ramp up and ramp down time for the system is very short. In addition, he uses a 1300 gal prover that is similar in size to typical compartments in a truck and yet he observes a difference of 0.1 %. He stated that he observed very good results in both turbine and positive displacement (PD) meters. He further indicated that loading terminals hold the meters to even tighter tolerances than those published in NIST Handbook 44 and if this proposal requires all of the additional work, then the applicable NIST Handbook 44 tolerances should be reduced.

Some Sector members stated that the existing NIST Handbook 44 Special Test reference in the Notes section of both the LMD and VTM codes currently allow for these additional tests at multiple calibration points to be conducted, thus, there is no need for this proposal.

Decision:
The 2014 NTEP Measuring Sector did not reach consensus on this item nor its related Items, 11, 12, 13, and 14. No recommendation was presented from the Sector.

11. N.4.6. Initial Verification and UR.1.5. Initial Verification Proving Reports; NCWM Item 331-1 (D)

Source:
Minnesota Weights and Measures Division (2014).

Recommendation:
This item is included on the Sector's agenda to make members aware of this proposal to add new paragraphs to NIST Handbook 44, Vehicle-Tank Meters, Notes Section and to ask for input from the Sector on the recommended changes. This item appeared on the 2014 NCWM S&T Committee agenda as a Developing item. NIST OWM is recommending the "Examples" in the proposal are more appropriately included in the EPO's and training materials rather than in NIST Handbook 44.

Background/Discussion:
Ms. Julie Quinn (Minnesota Weights and Measures Division) reported that a group of interested parties formed what they refer to as the "Multiple Point Calibration Group" and have been collaborating to discuss requirements for vehicle-tank meter systems with the capability to be calibrated at different flow rates and for different products.

During the 2014 NCWM Annual Meeting, this group met and developed suggested language to address this issue. Ms. Quinn asked that the S&T Committee include the suggested language in this item for further review and comments by the regional associations and others in the fall. The following language, along with a change to the title of the item (see 2014 NCWM Publication 16), was suggested:

> **N.4.6. Initial Verification. – A vehicle tank meter shall be tested at all flow rates and with all products for which a calibration factor has been electronically programmed prior to placing it into commercial service for the first time or after being repaired or replaced.**
>
> **A vehicle tank meter not equipped with means to electronically program its flow rates and calibration factors shall be tested at a low and high flow rate with all products delivered prior to placing it into commercial service for the first time or after being repaired or replaced.**
>
> **Example: A vehicle tank meter is electronically programmed to deliver regular and premium gasoline at a startup/shutdown flow rate of 20 gpm, a normal operating flow rate of 100 gpm, and an intermediate rate of 65 gpm. The meter is to be tested with regular gasoline at 20 gpm, 65 gpm and 100 gpm; and with premium gasoline at 20 gpm, 65 gpm and 100 gpm.**
>
> **The official with statutory authority has the discretion to determine the flow rates and products at which a vehicle tank meter will be tested on subsequent verifications.**
>
> **UR.1.5. Initial Verification Proving Reports. - Initial verification proving reports for vehicle tank meters equipped with means to electronically program flow rates shall be attached to and sent with placed-in-service reports when the regulatory agency with statutory authority requires placed-in-service reports.**

Members of this group have agreed to do a presentation at each of the 2014 fall regional meetings to explain this item and other related proposals.

Discussion:
The 2014 NTEP Measuring Sector heard discussion on this item at the same time as the other related multiple point calibration items. The discussions, comments, and concerns were the same as agenda Item 10 above (see the summary under agenda Item 10 for the details).

Decision:
The 2014 NTEP Measuring Sector did not reach consensus on this item nor its related Items 10, 12, 13, and 14. No recommendation was presented by the Sector.

12. 3.30. Liquid-Measuring Devices, N.4.1.3. Normal Tests on Wholesale Multi-Point Calibration Devices.

Source:
Multi-Point Calibration Group (MPCG) (2014).

Recommendation:
No action is asked of the Measuring Sector at this time. This update is being provided to make members of the Measuring Sector aware of this proposal to add new paragraphs to NIST Handbook 44, Liquid-Measuring Devices. A group of experts led by Ms. Julie Quinn (Minnesota), referred to as the "Multiple Point Calibration Group (MPCG)," has developed a new proposal to establish the tests to be conducted on wholesale meters with multiple point calibration capability.

Background/Discussion:
The MPCG states that new technology makes it possible to use linearization factors to optimize accuracy at every speed for which a wholesale meter is programed to deliver. A special tolerance has traditionally been applied to slow flow tests for various flow test on wholesale meters with mechanical single-point calibrators because accuracy could only be optimized at one flow rate. A wholesale meter programmed with multi-point calibration does not require a special tolerance at any flow rate since every flow rate can be adjusted as close to zero as the repeatability of the meter allows.

The MPCG proposes to add a new paragraph to Section 3.30. LMD Code is as follows:

> **N.4.1.3. Normal Tests on Wholesale Multi-Point Calibration Devices. – The normal test of a wholesale liquid-measuring device with electronically programmed linearization factors for various flow rates shall be made at the maximum discharge rate developed by the installation. Any additional test conducted at flow rates down to and including the indicated minimum discharge flow rate shall be considered normal tests.**
>
> **(Added 20XX)**

Discussion:
The 2014 NTEP Measuring Sector heard discussion on this item at the same time as the other related multiple point calibration items. See the summary under agenda Item 10 above for the details.

Decision:
The 2014 NTEP Measuring Sector did not reach consensus on this item nor its related Items 10, 11, 13, and 14. No recommendation was presented by the Sector.

13. 3.31. Vehicle-Tank Meters, N.4.1.4. Normal Tests on Multi-Point Calibration Devices.

Source:
Multi-Point Calibration Group (MPCG) (2014).

Recommendation:
No action is asked of the Measuring Sector at this time. This update is being provided to make members of the Measuring Sector aware of this proposal to add new paragraphs to NIST Handbook 44, Vehicle-Tank Meters. A group of experts led by Ms. Julie Quinn (Minnesota), referred to as the "Multiple Point Calibration Group (MPCG)," has developed a new proposal to establish the tests to be conducted on vehicle-tank meters with multiple point calibration capability.

Background/Discussion:
The MPCG states that new technology makes it possible to use linearization factors to optimize accuracy at every speed for which a vehicle-tank meter is programed to deliver. A special tolerance has traditionally been applied to slow flow tests on vehicle-tank meters with mechanical single-point calibrators because accuracy could only be optimized at one flow rate. A vehicle-tank meter programmed with multi-point calibration does not require a special tolerance at any flow rate since every flow rate can be adjusted as close to zero as the repeatability of the meter allows.

The MPCG proposes to add a new paragraph to Section 3.31. VTM Code is as follows:

> **N.4.1.4. Normal Test on Multi-Point Calibration Devices. – The normal test of a vehicle-tank meter with electronically programmed linearization factors for various flow rates shall be made at the maximum discharge rate developed by the installation. Any additional tests conducted at flow rates down to and including the rated minimum discharge flow rate shall be considered normal tests.**
>
> **(Added 20XX)**

Discussion:
The 2014 NTEP Measuring Sector heard discussion on this item at the same time as the other related multiple point calibration items. See the summary under agenda Item 10 above for the details.

Decision:
The 2014 NTEP Measuring Sector did not reach consensus on this item nor its related Items 10, 11, 12, and 14. No recommendation was presented by the Sector.

14. Appendix D – Definitions: Calibration Parameter and Multi-Point Calibrated Device.

Source:
Multi-Point Calibration Group (MPCG) (2014).

Recommendation:
No action is asked of the Measuring Sector at this time. This update is being provided to make members of the Measuring Sector aware of this proposal to amend NIST Handbook 44, Definitions. A group of experts led by Ms. Julie Quinn (Minnesota), referred to as the "Multiple Point Calibration Group (MPCG)," has developed a new proposal to amend the existing definition of *calibration parameter* and to add a new definition for *Multi-Point Calibrated Device*.

Background/Discussion:
The MPCG noted that in 2006, NIST Handbook 44, Sections 3.31., 3.32., 3.34., and 3.35., were amended, and referenced calibration parameters. Consequently, the definition needs to be updated to include references to these sections.

The MPCG also noted that a definition for "Multi-point Calibrated Device" needs to be added to recognize new technology that makes it possible to use linearization factors to optimize accuracy at multiple measurement points on devices such as meters and scales. This new technology requires a term so that devices capable of being optimized at multiple measurement points can be distinguished from devices with single-point calibration.

The MPCG's proposes the following amendments and addition to Appendix D – Definitions:

> **calibration parameter.** – Any adjustable parameter that can affect measurement or performance accuracy and, due to its nature, needs to be updated on an ongoing basis to maintain device accuracy, (e.g., span adjustments, linearization factors, and course zero adjustments). [2.20, 2.21, 2.24, 3.30, **3.31, 3.32, 3.34, 3.35,** 3.37, 5.56(a)]
>
> (Added 1993) **(Amended 20XX)**

Multi-point Calibrated Device. – A device equipped with means to electronically program linearization factors at multiple measurement points.

(Added 20XX)

Discussion:
The 2014 NTEP Measuring Sector heard discussion on this item at the same time as the other related multiple point calibration items. See the summary under agenda Item 10 above for the details.

Decision:
The 2014 NTEP Measuring Sector did not reach consensus on this item nor its related Items 10, 11, 12, and 13. No recommendation was presented by the Sector.

15. NCWM S&T Item 332-1 D – S.1.4.3. Provisions for Power Loss; S.1.5.1.1. Unit Price; S.1.5.1.2. Product Identity; S.1.6. For Retail Motor Fuel Dispensers Only; S.1.7. For Wholesale Devices Only; UR.2.7. Unit Price and Product Identity; and UR.2.8. Computing Device.

Source:
California Department of Food and Agriculture (CDFA), Division of Measurement Standards (DMS).

Recommendation:
The Measuring Sector was asked for their input on this item. This update is being provided to make members of the Measuring Sector aware of this proposal that appeared on the 2014 NCWM S&T Committee agenda as a Developing item to amend NIST Handbook 44, LPG and Anhydrous Ammonia Liquid-Measuring Device, Specification and User Requirement codes.

See the 2014 Measuring Sector Agenda, Appendix D for the entire proposal along with NIST OWM's comments as they appeared in the 2014 NCWM Publication 16.

Background:
The purpose is to add similar Specifications and User Requirements of other retail motor-fuel devices to NIST Handbook 44, Section 3.32. Liquefied Petroleum Gas (LPG) and Anhydrous Liquid-Measuring Devices Code similar to those in Section 3.30. Liquid-Measuring Devices; Section 3.37. Mass Flow Meters; and Section 3.39. Hydrogen-Gas Measuring Devices, Tentative Code.

The NCWM S&T Committee supports the objective of making changes to align the LPG and the LMD Code with respect to requirements for retail motor-fuel dispensing applications.

During the 2014 NCWM Annual Meeting, the S&T Committee heard numerous comments that additional work on this item is needed. The Committee agreed to recommend this item remain Developmental.

Discussion:
The 2014 NTEP Measuring Sector heard many comments on this item.

It was discussed that there is an ever-increasing number of liquefied petroleum gas (LPG) dispensers being installed that are intended for and used in retail motor fueling applications. Mr. Roach (CDFA DMS) stated that this proposed language is needed because devices used to dispense LPG are specifically exempted from NIST Handbook 44, Section 3.30. Liquid-Measuring Devices, in A.2. Exceptions (b), and that Section 3.32. LPG and NH_3 does not have adequate requirements addressing retail motor fueling applications.

At the 2014 Western Weights and Measures Association (WWMA) meeting, the submitter of this proposal, Mr. Steve Cook (CDFA DMS), provided a revised version for consideration. See the WWMA S&T Committee's Final Report on the NCWM web site for that revision. Mr. Cook stated that it is acceptable to him for this item remain Informational (I) to allow for further input.

Decision:
The 2014 NTEP Measuring Sector decided to keep this item on its agenda for next year (2015). It supports the concept that LPG retail motor fuel dispenser (RMFD) requirements should be the same as those in NIST Handbook 44, Section 3.30. However, the Sector wishes to take time and carefully go through the proposal to make sure that there are no conflicts with other codes and to assure that it applies to RMFD only.

16. Event Logger; Electronic Transfer of Information.

Source:
Gordon Johnson, Gilbarco (2014)

Recommendation:
This item is included on the Sector's agenda to make members of the Measuring Sector aware of this proposal to amend NIST Handbook 44, Section 3.30. Liquid-Measuring Devices, *Table S.2.2. Categories of Device and Methods of Sealing*, and to allow the Sector opportunity to discuss and comment on the item.

Background:
This item has been submitted by Mr. Gordon Johnson (Gilbarco) to the 2014 Southern and Western Weights and Measures Association S&T Committees for their consideration. The intent of the proposal is to allow electronic means (e.g., a thumb drive, flash drive, laptop computer, e-mail, or cell phone) as an alternative to providing event logger information for Category 3 devices in hard copy form.

Discussion:
The 2014 NTEP Measuring Sector thoroughly discussed and debated this item.

This item is titled, *Table S.2.2. Categories of Device and Methods of Sealing*, on the WWMA and SWMA S&T Committee's agendas.

Mr. Cooney (NIST, OWM) reported that Mr. Johnson (Gilbarco, Inc.) made a presentation on this item to the 2014 WWMA Annual Technical Conference and described the limitation with onsite printing devices. Part of his presentation was rolling out a very long roll of paper that the audit trail information is currently printed on from one of his company's dispensers. He described the difficulty of physically sorting through the list of data on the printout. However, he stated that if this information were provided electronically, then it could be sorted much more efficiently. Furthermore, the printers often sit unused inside of his dispensers resulting in necessary repair or replacement and maintaining rolls of paper in the device.

In addition, Mr. Cooney reported that the WWMA S&T Committee believes that this item has merit and would more easily facilitate examination of an audit trail; however, they have concerns regarding the security of the information that is downloaded and the potential for data manipulation. They also expressed concerns that the term, "electronic means," in this proposal may include other means that are not listed in the table and that providing examples of the "electronic means" may not be appropriate. Furthermore, the Committee has concerns on what equipment weights and measures officials will need in the field and that they may not have access to in order to retrieve the event data on-site and in a timely manner. The WWMA S&T Committee gave this item Developing (D) status on their agenda to allow the submitter time to refine the proposal. For further details, see the WWMA S&T Committee's Final Report on the NCWM website.

Ms. Butcher (NIST, OWM) pointed out that some regulatory inspectors do not have electronic access capabilities. She continued that if adopted, this proposal would create a major hurdle to these jurisdictions to be able to have immediate access to audit trail information in printed form, be able to study the information, and to in turn, provide the printed information with their reports. Mr. Katalinic (North Carolina Weights and Measures) stated that the provision for a printed copy of the information should be available whether or not the device provides the information electronically. Mr. Roach (CDFA DMS) agreed and stated that a printed copy must always be required.

Upon first reading of this proposal, members of the Measuring Sector believed that this proposal should be placed into all Category 3 requirements in NIST Handbook 44.

Some members of the Sector acknowledged concerns that some businesses and governmental agencies do not permit devices such as "thumb drives" to be inserted into their equipment.

Mr. Moses (Wayne) suggested that perhaps requiring every device have an onsite printer as opposed to an internal one. Mr. Tucker (RL Tucker Consulting, LLC) stated that the specific device would need to be identified electronically so that when the information was downloaded onto a thumb drive and then it was taken to a printer, that device identity would be printed along with the other information.

Ms. Butcher stated that if a printed copy was going to be required anyway, then the amendments are not necessary. She stated that currently the information may be sent to a printer electronically. She suggested a possible compromise would be to allow the equipment to supply only electronic information and require that there be an onsite printer from which the event logger information may be printed. This would be accomplished by adding a User Requirement (UR) to NIST Handbook 44 LMD code that a capable printer be provided at the location by the operator. Mrs. Butcher acknowledged the direction of electronics; however, she once again emphasized that not all inspectors have the ability to access information electronically.

The manufacturers represented at the Sector supported the item as written; however, the NTEP Laboratories present at the meeting did not. The Laboratories believe a printed record must be required.

Various amendments to those proposed in this item were discussed at length. The Measuring Sector agreed to amend the original proposal in Table S.2.2. Categories of Device and Methods of Sealing as follows:

Table S.2.2.
Categories of Device and Methods of Sealing

Categories of Device	***Methods of Sealing***
Category 1: (No changes)	(No changes)
Category 2: (No changes)	(No changes)
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.* ***The use of an electronic means such as a thumb drive, flash drive, laptop computer, Email, cell phone may be used to receive the event logger information from the device or another on-site device.*** *A printed copy of the information must be available through the device or through another on-site device* ***if the device is not equipped to offer an electronic means of supplying the information.*** *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.)*

[Nonretroactive as of January 1, 1995]

(Table Added 1993) (Amended 1995, 1998, 1999, ~~and~~ 2006, and 20XX)

Decision:

The 2014 Sector decided that this proposal needs further development and to carry it over to its 2015 agenda.

17. S&T Committee Carryover Item 337-2 Equivalent Units for Natural Gas.

Recommendation:
The NCWM S&T Committee is deliberating on proposed changes to NIST Handbook 44 to recognize "alternative units" for natural gas. The S&T Committee would value input from the Sector on this issue. The Sector is asked to review and provide comment to the S&T Committee on this issue.

The S&T Committee proposed the following changes to NIST Handbook 44, Appendix D. Definitions and Section 3.37. Mass Flow Meters Code at the 2014 NCWM Annual Meeting. The proposal did not receive sufficient support for adoption and was returned to the Committee for further consideration.

Amend NIST Handbook 44, Appendix D to include new definitions as follows:

diesel gallon equivalent (DGE). – means 6.384 pounds of compressed natural gas or 6.059 pounds of liquefied natural gas. [3.37]

diesel liter equivalent (DLE). – means 0.765 kilograms of compressed natural gas or 0.726 kilograms of liquefied natural gas. [3.37]

Amend NIST Handbook 44, Appendix D. Definitions as follows:

gasoline gallon equivalent (GGE). – Gasoline gallon equivalent (GGE) means 5.660 pounds of compressed natural gas. [3.37]

gasoline liter equivalent (GLE). – Gasoline liter equivalent (GLE) means 0.678 kilograms of compressed natural gas. [3.37]

(Added 1994)

Amend NIST Handbook 44, Mass Flow Meters Code paragraphs S.1.2., S.1.3.1.1., and UR.3.8.; delete paragraph S.5.2.; and add new paragraph S.1.3.1.2. as follows:

S.1.2. Compressed Natural Gas and Liquefied Natural Gas Dispensers. – Except for non-retail fleet sales and other price contract sales, a compressed natural gas **and liquefied natural gas** dispensers used to refuel vehicles shall be of the computing type and shall indicate the quantity, the unit price, and the total price of each delivery. The dispensers shall display the mass measured for each transaction either continuously on an external or internal display accessible during the inspection and test of the dispensers, or display the quantity in mass units by using controls on the device.

(Added 1994)

S.1.3. Units

S.1.3.1.1. Compressed Natural Gas Used as an Engine Fuel. – When compressed natural gas is dispensed as an engine fuel, the delivered quantity shall be **measured in mass and** indicated in "gasoline liter equivalent (GLE) units," "gasoline gallon equivalent (GGE) units," **diesel liter equivalent (DLE) units, or diesel gallon equivalent (DGE) units.** (Also see definitions.)

(Added 1994)

S.1.3.1.2. Liquefied Natural Gas Used as an Engine Fuel. – When liquefied natural gas is dispensed as an engine fuel, the delivered quantity shall be measured in mass and indicated in "diesel liter equivalent (DLE) units" or "diesel gallon equivalent (DGE) units." (Also see definitions.)

~~**S.5.2. Marking of Gasoline Volume Equivalent Conversion Factor. – A device dispensing compressed natural gas shall have either the statement "1 Gasoline Liter Equivalent (GLE) is Equal to 0.678 kg of**~~

~~**Natural Gas" or "1 Gasoline Gallon Equivalent (GGE) is Equal to 5.660 lb of Natural Gas" permanently and conspicuously marked on the face of the dispenser according to the method of sale used.**~~

~~**(Added 1994)**~~

UR.3.8. Return of Product to Storage, Retail Compressed Natural Gas and Liquefied Natural Gas Dispensers. – Provisions at the site shall be made for returning product to storage or disposing of the product in a safe and timely manner during or following testing operations. Such provisions may include return lines, or cylinders adequate in size and number to permit this procedure.

(Added 1998)

Background:
The gasoline gallon equivalent (GGE) unit was defined by NCWM in 1994 to allow users of natural gas vehicles to compare costs and fuel economy of light-duty compressed natural gas vehicles with equivalent gasoline powered vehicles. More background on the efforts of NIST/NCWM is available in the Reports of the 78th and 79th NCWM in NIST Special Publication 854 and 870 (see pages 322 and 327, respectively). Natural gas is sold as a vehicle fuel as either Compressed Natural Gas (CNG) or Liqufied Natural Gas (LNG). For medium and heavy duty natural gas vehicles in widespread use today, there is a need to officially define a unit allowing a comparison of cost and fuel economy with diesel powered vehicles. The submitter stated that the official definition of a DLE and a DGE will likely provide justification for California, Wisconsin, and many other states to permit retail sales of CNG for heavy-duty vehicles in these convenient units. The submitter has provided a mathematical justification for the specific quantity (mass) of compressed natural gas in a DLE and DGE, which found in the S&T Committee's 2014 Interim Report.

At the 2014 NCWM Annual Meeting, the Committee heard numerous comments in both opposition to and support of the proposal shown in the Item Under Consideration in NCWM Publication 16. These comments are summarized below:

Support:

- Numerous letters of support were received from U.S. Senators, Governors, with wide bipartisan support.
- Allows consumers who may be familiar with volumetric units to make value comparisons.
- Allows for cost comparison between multiple fuel types.
- The proposal is supported by those who build and supply the equipment, vehicle manufacturers, and producers and distributors of natural gas.
- If action isn't taken, the decision will be taken out of the Weights and Measures jurisdictions' hands at the state and local levels.
- The "GGE" has been in use and accepted for many years.
- If the primary method of sale is mass, it dictates price, sale, and advertising be in mass. Mass units are not consumer friendly. Consumers don't understand price per kilogram or pound for fuel sales.
- Industry stated that equivalent units are what consumers want.
- At least one company reported that all of their business is built around the "DGE" and they would need to retrofit their dispensers if required to measure in mass.
- Natural gas retail dispensers measure in mass and are inspected and tested using mass units.

Opposition:

- Use of the word approximate.
- This is a marketing rather than technical issue.
- Will there be potential for proliferation of other equivalent units for other alternative fuels?
- There are questions concerning the validity of the conversion values and whether adequate research has been done to develop the values.
- Including more than one equivalent value could lead to consumer confusion.
- The proposal is not aligned with how natural gas is being sold in the rest of the world.
- A jurisdiction stated that consumers hadn't been asked how they want natural gas sold.
- Is there a need for ongoing value comparisons if a vehicle is dedicated to run on natural gas fuel?
- Measurement science needs to be based on traceable standards. Equivalent units are not traceable.
- Consumers may need to make comparisons with multiple different fuel types such as diesel, biodiesel, gasoline, fuel ethanol, electric, hydrogen, LNG, and others. What is the most appropriate means to provide sufficient information to customers attempting to make value comparisons?
- Equivalent units would be better provided as supplemental information rather than the basis for commercial transactions.

Other technical points that were raised include the following:

- NTEP certificates have already been issued for five LNG dispensers that measure and indicate in mass units only. How will the proposed changes affect this equipment?

The Committee received an alternative proposal from NIST, OWM that would require dispensers to measure, indicate, and calculate the total selling price based on mass units (pounds or kilograms), but permit the posting of supplemental information regarding approximate equivalents to other fuels for use by consumers when making value comparisons or for use by tax agencies. Based upon multiple requests from the regional weights and measures association meetings during the 2014 NCWM Annual Meeting and the Committee's open hearings, the Committee agreed to include this proposal in its Final Report. These proposed changes to Section 3.37. Mass Flow Meters Code are shown in the following table.

Summary of Compromise Proposal:
This alternative proposal was offered as a compromise that would phase in requirements for natural gas vehicle dispensers to measure, indicate, and calculate the total selling price based on mass units (pounds or kilograms), but permit the posting of supplemental information regarding approximate equivalents to other fuels for use by consumers in making value comparisons or by tax agencies while preserving the integrity of the measurement process. With this approach, customers could still be provided with supplemental information through mechanisms such as pump toppers or other displays that provide information about estimated equivalent units of measurement for deliveries indicated in mass as well as information on web sites such as those that already provide information about fuel economy. This approach might also reduce complaints from some suppliers about the accuracy of equivalent values relative to their product.

S.1. Indicating and Recording Elements.

…

S.1.2. ~~Compressed~~ Natural Gas Dispensers. – Except for fleet sales and other price contract sales, a **~~compressed~~** natural gas dispenser used to refuel vehicles shall be of the computing type and shall indicate the quantity, the unit price, and the total price of each delivery. **~~The dispenser shall display the mass measured for each transaction either continuously on an external or internal display accessible during the inspection and test of the dispenser, or display the quantity in mass units by using controls on the device.~~**
(Added 1994) **(Amended 20XX)**

S.1.3. Units.

S.1.3.1. Units of Measurement. – Deliveries shall be indicated and recorded in grams, kilograms, metric tons, pounds, tons, and/or liters, gallons, quarts, pints and decimal subdivisions thereof. The indication of a delivery shall be on the basis of apparent mass versus a density of 8.0 g/cm3. The volume indication shall be based on the mass measurement and an automatic means to determine and correct for changes in product density.
(Amended 1993 and 1997)

S.1.3.1.1. ~~Compressed~~ Natural Gas Used as an Engine Fuel. – When **~~compressed~~** natural gas is dispensed as an engine fuel, the delivered quantity shall be indicated **as follows:**

(a) ***Effective and Nonretroactive as of January 1, 2016, the delivered quantity shall be indicated in mass units in terms of kilograms or pounds and decimal subdivisions thereof.***
This paragraph will become retroactive on January 1, 2017.
(Added 20XX)

(b) **For dispensers manufactured prior to January 1, 2016, the dispenser shall display the mass measured for each transaction, either continuously on an external or internal display accessible during the inspection and test of the dispenser, or display the quantity in mass units by using controls on the device. The delivered quantity shall be indicated** in **mass or in** "gasoline liter equivalent (GLE) units" or "gasoline gallon equivalent (GGE) units." (Also see ~~d~~Definitions.)

(Added 1994) **(Amended 20XX)**

Paragraph S.1.3.1.1.(b) will be removed in the 2017 edition of NIST Handbook 44 when paragraph S.1.3.1.1.(a) becomes retroactive.

S.1.3.1.2. Natural Gas Used as an Engine Fuel, Supplemental Information. – Dispensers of natural gas dispensed as an engine fuel may include supplemental information to assist consumers in making value comparisons with gasoline and diesel fuel and for use by taxation departments and other agencies that may need an approximation thereof. Supplemental information shall not appear adjacent or in close proximity to the primary display and shall be positioned far enough from that display so as to ensure that the quantity, unit price, and total price for the transaction are clear and easily understood.

Supplemental units shall be clearly designated with the phrase "The following information is provided for comparison with other vehicle fuels and is not to be used as a basis for commercial transactions."

Supplemental units shall be displayed using one or more of the following statements.

For compressed natural gas:

1 kg of Compressed Natural Gas is Equal to 1.4749 Gasoline Liter Equivalent (GLE)
1 kg of Compressed Natural Gas is Equal to 0.3896 Gasoline Gallon Equivalent (GGE)
1 kg of Compressed Natural Gas is Equal to 1.3072 Diesel Liter Equivalent (DLE)
1 kg of Compressed Natural Gas is Equal to 0.3455 Diesel Gallon Equivalent (DGE)

1 lb of Compressed Natural Gas is Equal to 0.669 Gasoline Liter Equivalent (GLE)
1 lb of Compressed Natural Gas is Equal to 0.177 Gasoline Gallon Equivalent (GGE)
1 lb of Compressed Natural Gas is Equal to 0.593 Diesel Liter Equivalent (DLE)
1 lb of Compressed Natural Gas is Equal to 0.157 Diesel Gallon Equivalent (DGE)

For liquefied natural gas:

1 kg of Liquefied Natural Gas is Equal to 1.3768 Diesel Liter Equivalent (DLE)
1 kg of Liquefied Natural Gas is Equal to 0.3638 Diesel Gallon Equivalent (DGE)

1 lb of Liquefied Natural Gas is Equal to 0.625 Diesel Liter Equivalent (DLE)
1 lb of Liquefied Natural Gas is Equal to 0.165 Diesel Gallon Equivalent (DGE)

…

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) *Effective and nonretroactive as of January 1, 2016, the maximum value of the mass division for dispensers of natural gas used to refuel vehicles shall not exceed 0.001 kg or 0.001 lb.*

Note: Paragraph S.1.3.3.(b) will become retroactive effective January 1, 2017.

(c) For dispensers of ~~**compressed**~~ natural gas used to refuel vehicles **and manufactured prior to January 1, 2016**, 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.

Note: Paragraph S.1.3.3.(c) will be removed in the 2017 edition of NIST Handbook 44 when Paragraph S.1.3.3.(b) becomes retroactive.

(Amended 1994 **and 20XX**)

…

S.5. Markings. …

S.5.2. Marking of Gasoline Volume Equivalent Conversion Factor. – ~~**A device**~~ **Dispensers manufactured prior to January 1, 2016,** dispensing compressed natural gas shall have either the statement "1 Gasoline Liter Equivalent (GLE) is Equal to 0.678 kg of Natural Gas" or "1 Gasoline Gallon Equivalent (GGE) is Equal to 5.660 lb of Natural Gas" permanently and conspicuously marked on the face of the dispenser according to the method of sale used.

As of January 1, 2017, devices must indicate as specified in S.1.3.1.1.(a) and any information providing equivalent units may only be included as supplemental information as specified in S.1.3.1.2.

Paragraph S.5.2. will be removed from the 2017 edition of NIST Handbook 44 when paragraph S.1.3.1.1.(a) becomes retroactive.

(Added 1994) **(Amended 20XX)**

UR.3. Use of Device.

…

UR.3.8. Return of Product to Storage, Retail Compressed Natural Gas and Liquefied Natural Gas Dispensers. – Provisions at the site shall be made for returning product to storage or disposing of the product in a safe and timely manner during or following testing operations. Such provisions may include return lines, or cylinders adequate in size and number to permit this procedure.

(Added 1998) **(Amended 20XX)**

Because many of these issues are dependent upon defining the proper method of sale, the Committee met jointly with the L&R Committee to discuss the comments received on the S&T and L&R proposals on the issues relating to natural gas.

The S&T Committee identified the method of sale by mass versus equivalent volumetric units as the most significant concern based on comments heard on this proposal. In addition to support for this proposal, there were also concerns regarding the use of the word "approximately" for labeling purposes; "multiple equivalent units" labeled on the same dispenser; "tax issues;" and other less commonly expressed issues. It was decided to eliminate the labeling altogether and not delay the effective date, thereby, addressing all three concerns. Consequently, based upon the comments received and its deliberations, the Committee agreed to modify the Item Under Consideration shown in NCWM Publication 16. The revised version of the Committee's proposal appears in the "Recommendation" above.

Discussion:
The 2014 NTEP Measuring Sector discussed this item.

Mr. Moses (Wayne) and Mr. Drube (Chart Industries) updated the Measuring Sector on discussions at the 2014 Western Weights and Measures Association (WWMA) meeting.

Mr. Cooney (NIST, OWM) stated that the same positions and arguments that were expressed at the WWMA meeting were much the same as those at the 2014 NCWM Annual Meeting. He stated that the Natural Gas Steering Committee is discussing and working through proposals to bring to the 2015 NCWM Interim Meeting in January. The Steering Committee hopes that progress will be made to move this matter forward at the 2015 NCWM Annual Meeting.

Decision:
The 2014 NTEP Measuring Sector agreed that significant discussion, vigorous debate, hard work, and potential compromise solutions have gone into this item. The Sector had no additional input and supports the work of the Natural Gas Steering Committee. The Sector is looking forward to the results of the Steering Committee's deliberations and what they will present to the upcoming 2015 NCWM Interim Meeting.

End of the 2014 NTEP Measuring Sector's Final Report Summary.

Appendix D/Sub-Appendix A

National Type Evaluation Program

Draft Checklist for Testing Electronic Digital Indicators – with Limited Editorial Notes

This checklist is used for Technical Policy U. Evaluating electronic digital indicators submitted separate from a measuring element, this section is intended for lab testing only.

Is permanence necessary? If new evaluation (yes) if updating existing CC (no).

Code Reference: G-S.1. Identification

All equipment shall be clearly and permanently marked on an exterior visible surface after installation. It must contain the following information (prefix lettering may be initial capitals, all capitals, or all lower case):

1.1.	Name, initials, or trademark of the manufacturer.	**Yes ☐ No ☐ N/A ☐**
1.2.	A model designation that positively identifies the pattern or design. The Model designation shall be prefaced by the word "Model", "Type", or "Pattern". These terms may be followed by the term "Number" or an abbreviation of that word. The abbreviation for the word "Number" shall, at a minimum, begin with the letter "N" (e.g., No or No.) The abbreviation for the word "Model" shall be "Mod" or "Mod.".	**Yes ☐ No ☐ N/A ☐**
1.3.	Except for not built-for-purpose, software-based devices, a nonrepetitive serial number. The serial number shall be prefaced by words, an abbreviation, or a symbol, that clearly identifies the number as the required serial number. Abbreviations for the word "Serial" shall, as a minimum, begin with the letter "S," and abbreviations for the word "Number" shall, as a minimum, begin with the letter "N" (e.g., S/N, SN, Ser. No, and S No.).	**Yes ☐ No ☐ N/A ☐**
1.4.	For not built-for-purpose, software-based devices the current software version or revision designation. The version or revision identifier shall be prefaced by the word "Version" or "Revision" as appropriate and either word may be followed by the word "Number." The abbreviations for the word “Version” shall, as a minimum, begin with the letter "V". The abbreviation for the word “Number” shall, as a minimum, begin with the letter "N" (e.g., No or No.).	**Yes ☐ No ☐ N/A ☐**

Code Reference G-S.1. (e).

1.5. The NTEP Certificate of Conformance (CC) Number or a corresponding CC addendum number for devices that have a CC. The number shall be prefaced by the terms "NTEP CC", "CC", or "Approval". These terms may be followed by the word "Number" or an abbreviation for the Word "Number". The abbreviation shall as a minimum begin with the letter "N" (e.g., No or No.). **Yes ☐ No ☐ N/A ☐**

The device must have an area, either on the identification plate or on the device itself, suitable for the application of the Certificate of Conformance Number. If the area for the CC Number is not part of an identification plate, then note its intended location below and how it will be applied. Ex. May be part of W&M display screen, using the requirements of section 1.6.2.

Location of CC Number if not located with the identification:

_____

_____

Code Reference: G-S.1.1. Location of Marking Information for Not Built-for-Purpose, Software-Based Devices Not Built-for-Purpose Devices, Software-Based

1.6. For not built-for-purpose, software-based devices the following shall apply:

1.6.1. The required information in G-S.1 Identification. (a), (b), (d), and (e) shall be permanently marked or continuously displayed on the device; or

1.6.2. The Certificate of Conformance (CC) Number shall be:

- permanently marked on the device; or
- continuously displayed; or
- accessible through an easily recognized menu and, if necessary, a submenu. Examples of menu and submenu identification include, but are not limited to "Help," "System Identification," "G-S.1. Identification," or "Weights and Measures Identification."

Note: For (1.6.2.), clear instructions for accessing the information required in G-S.1. (a), (b), and (d) shall be listed on the CC, including information necessary to identify that the software in the device is the same type that was evaluated.

Code Reference: G-S.2. Facilitation of Fraud

This applies to all metering system indicators installed at a fixed location or vehicle tank meter applications and controlled remotely or within the device itself.

This requirement addresses the process of changing the unit price or unit prices set in a metering system.
Other item fall under facilitation of fraud, needs more input.
Example if Cat 3 device verify passwords and audit trail is correct….

1.9. The system shall prevent a change of unit price during a delivery. **Yes ☐ No ☐ N/A ☐**

~~**Code Reference: G-S.3. Permanence How would this be conducted or not?**~~

~~Equipment shall be of such materials, design, and construction that, under normal service conditions:~~

~~1.10.~~	~~Accuracy will be maintained.~~	~~Yes ☐ No ☐ N/A ☐~~
~~1.11.~~	~~Operating parts will continue to function as intended,~~	~~Yes ☐ No ☐ N/A ☐~~
~~1.12.~~	~~Adjustments will remain reasonably permanent.~~	~~Yes ☐ No ☐ N/A ☐~~

AK - This is not a lab issue, this is a field requirement due to the fact that the equipment is being lab evaluated, the evaluator will not see the end use installation.

Code Reference: G-S.4. Interchange or Reversal of Parts

If a metering system has parts that may be interchanged or reversed in normal field assembly, the system shall either be constructed so that reversal will not affect the accuracy of the system or the parts must be marked to indicate their proper position. For most metering devices, this applies only to the reversal of connectors of cables to peripheral devices.

If a metering system has any parts that may be interchanged or reversed in normal field assembly, the parts must either be:

1.13.	Constructed so that reversal will not affect performance,	**Yes ☐ No ☐ N/A ☐**
1.14	Marked or keyed to indicate their proper positions. May have multiple cable connections but not interchangeable due to different plug styles, or;	**Yes ☐ No ☐ N/A ☐**
1.15.	Cables are connected but are not removable without breaking a seal and opening housing. (Note: may need HB 44 requirement to cover this.)	**Yes ☐ No ☐ N/A ☐**

2. Indications, and Recorded Representations Look at different codes

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

Several general requirements 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. Metering devices must be capable of indicating the maximum quantity and money values that can normally be expected in a particular application.

2.1. **Minimum quantity value indications.**

2.1.1.	Display is capable of 1~~.0~~	**Yes ☐ No ☐ N/A ☐**
2.1.2.	Display is capable of 0.1	**Yes ☐ No ☐ N/A ☐**
2.1.3.	Display is capable of 0.01	**Yes ☐ No ☐ N/A ☐**
2.1.4.	Display is capable of 0.001	**Yes ☐ No ☐ N/A ☐**
2.1.5.	Display is capable of other (fill in blank): needs comment section	

2.2. **Money value display.**

2.2.1.	a. Money value is properly displayed and verify rounding	**Yes ☐ No ☐ N/A ☐**
	b. Verify the presents of currency symbol **i.e. dollar sign "$" or "Dollars"**	**Yes ☐ No ☐ N/A ☐**

3.2. **The indications must be clear, definite, and accurate.**

2.2.1. Values must be clear, definite, and accurate **Yes ☐ No ☐ N/A ☐**

2.2.2. Unit of measure is programmable Gallon, Liter, Pound **Yes ☐ No ☐ N/A ☐**

2.2.2. Unit of measure is applied by permanent marking on indicator housing **Yes ☐ No ☐ N/A ☐**

2.3. The indications must be easily read under normal operating conditions. **Yes ☐ No ☐ N/A ☐**

2.4. Symbols for decimal points shall clearly identify the decimal position. (Generally acceptable symbols are dots, small commas, or x.) **Yes ☐ No ☐ N/A ☐**

2.5. **The zero indication must consist of at least the following minimum indications as appropriate:**

2.5.1. One digit to the left and all digits to the right of a decimal point. **Yes ☐ No ☐ N/A ☐**

2.5.2. If a decimal point is not used, at least one active decade must be displayed. **Yes ☐ No ☐ N/A ☐**

2.6. 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 ☐**

Code Reference: G-S.5.2.2. Digital Indication and Representation

Basic operating requirements for devices:

2.7. All digital values of like value in a system shall agree with one another. **Yes ☐ No ☐ N/A ☐**

2.8. A digital value coincides with its associated analog value to the nearest minimum graduation. **Yes ☐ No ☐ N/A ☐**

2.9. Digital values shall round off to the nearest minimum unit that can be indicated or recorded. **Yes ☐ No ☐ N/A ☐**

2.10. When a digital zero display is provided, the zero indication shall consist of at least one digit to the left and all digits to the right of the decimal point. **Yes ☐ No ☐ N/A ☐**

Agreement of indications shall be checked for several deliveries. The totalizer shall be checked for accuracy and agreement with individual deliveries and with other totalizers in the system.

2.11. All digital values of like value in a system agree with one another. **Yes ☐ No ☐ N/A ☐**

2.12. Digital values coincide with associated analog values to the nearest minimum graduation. **Yes ☐ No ☐ N/A ☐**

2.13. Digital values "round off" to the nearest minimum unit that can be indicated or recorded. **Yes ☐ No ☐ N/A ☐**

2.14. The device totalizer shall agree with the total of the individual deliveries and with other totalizers in the system. **Yes ☐ No ☐ N/A ☐**

Code Reference: G-S.5.2.3. Size and Character

Digits used for comparable values must be uniform in size and character, but subordinate values may be displayed in different and less prominent digits than more significant values. The latter more likely occurs on analog devices. In digital indications, the digits are usually of uniform size throughout a particular display. The size of digits may differ for different quantities, for example, the quantity and unit price digits may be smaller than the total price digits.

2.15. **Yes ☐ No ☐ N/A ☐**

2.16. Indications and recorded representations shall be appropriately portrayed or designated. **Yes ☐ No ☐ N/A ☐**

Code Reference: G-S.5.2.4. Values Defined

2.17. Values shall be adequately defined by a sufficient number of figures, words, symbols, or combinations, which are uniformly placed so that they do not interfere with the accuracy of the reading. **Yes ☐ No ☐ N/A ☐**

Code Reference: G-S.5.2.5. Permanence

2.18. Indications, or recorded representations and their defining figures, words, and symbols shall be of such character that they will not tend to easily become obliterated or illegible. **What permanence quantities should be verified for electronic devices with graphical displays?** **Yes ☐ No ☐ N/A ☐**

Code Reference: G-S.5.3., G-S.5.3.1. Values of Graduated Intervals or Increments

2.19. Digital indications, and recorded representations shall be uniform in size, character, and value throughout any series. Quantity values shall be defined by the specific unit of measure in use. **Yes ☐ No ☐ N/A ☐**

2.20. Indications shall be uniform throughout any series. **Yes ☐ No ☐ N/A ☐**

2.21. Quantity values shall be identified by the unit of measure. **Yes ☐ No ☐ N/A ☐**

Code Reference: G-S.5.4. Repeatability of Indications

The quantity measured by a device shall be repeatable within tolerance for the same indication. One condition that may create a problem is that the value of the quantity division may be large relative to the tolerance. A delivery must be within tolerance wherever the delivery is stopped within the nominal indication of the test draft. Meters that may be at the tolerance limit may be out of tolerance at an extreme limit of the nominal quantity indication.

2.22. When a digital indicator is tested, the delivered quantity shall be within tolerance at any point within the quantity-value division for the test draft. **Yes ☐ No ☐ N/A ☐**

Code Reference: G-S.5.6. Recorded Representations

2.23. All recorded values shall be digital. (See also G-UR.3.3.) **Yes ☐ No ☐ N/A ☐**

Code Reference: G-S.6. Marking, Operational Controls, Indications, and Features

All operational controls, indications, and features shall be clearly and definitely identified. Nonfunctional keys and annunciators shall not be marked because their marking implies that the key or annunciator is functional and should be inspected or tested by the enforcement official. Keys and operator controls that are visible to a customer in a direct sale transaction shall be marked with words or symbols to the extent that they can be understood by the customer and aid in understanding the transaction. Keys that are visible only to the console operator need to be marked only to the extent that a trained operator can understand the function of each key.

2.25. All operational controls, indications, and features including switches, lights, displays, and push buttons shall be clearly and definitely identified. **Yes ☐ No ☐ N/A ☐**

2.26. All dual function (multi-function) keys or controls shall be marked to clearly identify all functions. **Yes ☐ No ☐ N/A ☐**

2.27. Non-functional controls and annunciators shall not be marked in the graphical display example they would be dimmed etc.) **Yes ☐ No ☐ N/A ☐**

Code Reference: G-S.7. Lettering, Readability

2.28. Required markings and instructions shall be permanent and easily read. **Yes ☐ No ☐ N/A ☐**

Code Reference: G-S.8. Sealing Electronic Adjustable Components, and Provision for Sealing of Adjustable Components or Audit Trial

2.29. Electronic adjustable components that affect the performance of a device shall provide for an approved means of security (e.g., data change audit trail) or for physically applying a security seal. These components include the following: (1) mechanical adjustment mechanism for meters, (2) the electronic calibration factor and automatic temperature compensator for electronic meter registers, (3) selection of pressure for density correction capability and correction values. **Yes ☐ No ☐ N/A ☐**

The following philosophy and list of sealable parameters applies to provision for sealing all liquid-measuring devices.

An electronic data audit trail is a means of allowing a weights and measures inspector to review how many times any electronic adjustment, which affects the accuracy of a volume measurement has been changed. The information contained in the audit trail shall consist of a cumulative and non-destructible number (even if a power failure occurs) which increments each time any of the adjustments required to be sealed have been changed. The electronic data audit trail information shall be capable of being recalled by the official on the main display of the device.

As a minimum, devices which use an audit trail to provide security for sealable parameters shall satisfy the following criteria and shall use the format set forth in Appendix A of the checklist for Liquid-Measuring Devices.

Philosophy for Sealing

Typical Features to be Sealed

Principles for Determining Features to be Sealed

The need to seal some features depends upon:

- The ease with which the feature or the selection of the feature can be used to facilitate fraud; and
- The likelihood that the use of the feature will result in fraud not being detected.

Features or functions which the operator routinely uses as part of device operation, such as setting the unit prices on dispensers and maintaining unit prices in price look-up codes stored in memory, are not sealable parameters and shall not be sealed.

If a parameter (or set of parameters) selection would result in performance that would be obviously in error, such as the selection of parameters for different countries, then it is not necessary to seal the selection of these features.

If individual device characteristics are selectable from a "menu" or a series of programming steps, then access to the "programming mode" must be sealable. (Note: If an audit trail is the only means of security, then the audit trail shall update only after at least one sealable parameter has been changed; simply accessing the sealable parameters via a menu shall not update the audit trail.)

If a physical act, such as cutting a wire is required to change a parameter setting and physically repairing the cut is required to reactivate the parameter, then this physical repair process would be considered an acceptable way to select parameters without requiring a physical seal or an audit trail.

Typical Features and Parameters to be Sealed

The following provides examples of configuration and calibration parameters that are to be sealed. The examples are provided for guidance and are not intended to cover all possible parameters.

Calibration Parameters: Calibration parameters are those parameters whose values are expected to change as a result of accuracy adjustments. Examples include the following.

1. Measuring element adjustments where linearity corrections are used, e.g., flow rate 1 and meter factor 1, flow rate 2 and meter factor 2, etc.

2. Mass flow meter adjustments for zero adjustments (not simply setting the display to zero) and span settings.

Configuration Parameters: Configuration parameters are those parameters whose values are expected to be entered only once and not changed after all initial installation settings are made. Examples include the following.

1. Octane or other blend setting ratios

2. Temperature, pressure, density, and other sensor settings for zero, span, and offset values

3. Measurement units

4. Temperature compensation table, liquid coefficient of expansion, or compressibility factors or tables

5. Liquid density setting and allowable liquid density input range

6. Vapor pressures of liquids if used in calculations to establish the quantity

7. Meter or sensor temperature compensation factors

8.

9. On/off status of automatic temperature, pressure, or density correction

10. Automatic or manual data input for sensors

11.

12.

13. Filtering constants

Liquid-Measuring Device Features and Parameters	
Typical Features or Parameters to be Sealed	**Typical Features or Parameters Not Required to be Sealed**
Measuring element adjustment (both mechanical and electronic)	Analog-to-digital converters
Linearity correction values	Quantity division value (display resolution)
Measurement units (e.g., gallons to liters)	Double pulse counting
Octane blend setting for retail motor-fuel dispensers	Communications
Any tables or settings accessed by the software or manually entered to establish the quantity (e.g., specific gravity, pressure, etc.)	
Density ranges	
Temperature probes and temperature offsets in software (S.2.5.4 VT)	
Flow control settings, e.g., flow rates for slow-flow start, quantity for slow-flow start and stop	
Temperature compensating systems (on/off)	
As a point of clarification, the flow control settings referenced above are those controls typically incorporated into the installations of large-capacity meters (wholesale meters). The reference does not include the point at which retail motor-fuel dispenser's slow product flow during a prepaid transaction to enable the dispenser to stop at the preset amount.	

Note: The above examples of adjustments, parameters, and features to be sealed are to be considered "typical" or "normal." This list may not be all inclusive. Some parameters other than those listed, which affect the metrological performance of the device, must be sealed. If listed parameters or other parameters, which may affect the metrological function of the device, are not sealed, the manufacturer must demonstrate that all settings comply with the most stringent requirements for the application of the device (i.e., the parameter does not affect compliance with NIST Handbook 44).

Category 1 Devices (Devices with No Remote Configuration Capability):

- The device is sealed with a physical seal or it has an audit trail with two event counters (one for calibration, the second for configuration). **Yes □ No □ N/A □**
- A physical seal must be applied without exposing electronics. **Yes □ No □ N/A □**

- Event counters are non-resettable and have a capacity of at least 000 to 999. **Yes ☐ No ☐ N/A ☐**
- Event counters increment appropriately. **Yes ☐ No ☐ N/A ☐**
- The audit trail information must be capable of being retained in memory for at least 30 days while the device is without power. **Yes ☐ No ☐ N/A ☐**
- Accessing the audit trail information for review shall be separate from the calibration mode. **Yes ☐ No ☐ N/A ☐**
- Accessing the audit trail information must not affect the normal operation of the device. **Yes ☐ No ☐ N/A ☐**
- Accessing the audit trail information shall not require removal of any additional parts other than normal requirements to inspect the integrity of a physical security seal. (e.g., a key to open a locked panel may be required). **Yes ☐ No ☐ N/A ☐**

Category 2 Devices (Devices with Remote Configuration Capability but Controlled by Hardware):

- The physical hardware enabling access for remote communication must be on-site. **Yes ☐ No ☐ N/A ☐**
- The physical hardware must be sealable with a security seal or **Yes ☐ No ☐ N/A ☐**
- The device must be equipped with at least two event counters: one for calibration, the second for configuration parameters **Yes ☐ No ☐ N/A ☐**

  - calibration parameters event counter
  - configuration parameters event counter

- Verify that all metrological relevant parameters are logged to Event Counter (S.2.2.) **Yes ☐ No ☐ N/A ☐**

  - Adequate provision must be made to apply a physical seal without exposing electronics. **Yes ☐ No ☐ N/A ☐**

- Event counters are non-resettable and have a capacity of at least 000 to 999. **Yes ☐ No ☐ N/A ☐**
- Event counters increment appropriately. **Yes ☐ No ☐ N/A ☐**
- Event counters may be located either: **Yes ☐ No ☐ N/A ☐**

  - at the individual measuring device or
  - at the system controller

- If the counters are located at 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. **Yes ☐ No ☐ N/A ☐**

- An adequate number (see table below) of event counters must be available to monitor the calibration and configuration parameters of each individual device. **Yes ☐ No ☐ N/A ☐**

- The device must either: **Yes ☐ No ☐ N/A ☐**

  -clearly indicate when it is in the remote configuration mode or

  -the device shall not operate while in the remote configuration mode.

- If capable of printing in the calibration mode, it must print a message that it is in the calibration mode. **Yes ☐ No ☐ N/A ☐**

- The audit trail information must be capable of being retained in memory for at least 30 days while the device is without power. **Yes ☐ No ☐ N/A ☐**

- The audit trail information must be readily accessible and easily read. **Yes ☐ No ☐ N/A ☐**

Minimum Number of Counters Required		
	Minimum Counters Required for Devices Equipped with Event Counters	**Minimum Event Counter(s) at System Controller**
Only one type of parameter accessible (calibration or configuration)	One (1) event counter	One (1) event counter for each separately controlled device, or one (1) event counter, if changes are made simultaneously.
Both calibration and configuration parameters accessible	Two (2) event counters	Two (2) event counters for each separately controlled device, or two (2) or more event counters if changes are made to all controlled devices simultaneously.

Category 3 Devices (Devices with Unlimited Remote Configuration Capability):

Category 3 devices have virtually unlimited access to sealable parameters or access is controlled though a password.

- The device must either: **Yes ☐ No ☐ N/A ☐**
  - Clearly indicate when it is in the remote configuration mode, or
  - The device shall not operate while in the remote configuration mode
- The device is equipped with an event logger **Yes ☐ No ☐ N/A ☐**

- Verify that all metrological relevant parameters are logged to Audit trail (S.2.2.) **Yes ☐ No ☐ N/A ☐**
  - The event logger automatically retains the identification of the parameter changed, the date and time of the change, and the new value of the parameter. **Yes ☐ No ☐ N/A ☐**
- Event counters are nonresettable and have a capacity of at least 000 to 999. **Yes ☐ No ☐ N/A ☐**
- The system is designed to attach a printer, or other communications device (i.e., Ethernet, Serial Communications, USB, Wi-Fi, Bluetooth etc.) which will allow an interface to a printer or allow for the creation of a digital copy (file) for future reference. **Yes ☐ No ☐ N/A ☐**
- The audit trail information must be capable of being retained in memory for at least 30 days while the device is without power. **Yes ☐ No ☐ N/A ☐**
- The event logger must have a capacity to retain records equal to ten times the number of sealable parameters in the device, but not more than 1000 records are required. **Yes ☐ No ☐ N/A ☐**
- The event logger drops the oldest event when the memory capacity is full and a new entry is saved. **Yes ☐ No ☐ N/A ☐**
- Describe the method used to seal the device or access the audit trail information.

_____

_____

Code Reference: G-UR.1.1. Suitability of Equipment

A register/indicator must be properly designed and have sufficient capacity to be suitable to use in a particular application. A register/indicator must measure the appropriate characteristics of a commodity to accurately determine the quantity, have sufficient capacity to indicate the quantity measured and the associated total price if it is a computing device. The register/indicator must have the proper capacity to operate over the actual frequency range for the application, and the device must have a quantity division appropriate for the application.

The equipment is suitable for its intended application. Remove? **Yes ☐ No ☐ N/A ☐**

2.26.	**Simulator tests: All tests shall have a minimum of 10,000 pulses applied to the device for each test. Test with a minimum of two API/Density settings** **Notes, items that need to be added to table/Checklist:** **a. Information needs to be added to capture different K-Factor values** **b. All API tables to be included on certificate shall be verified** **c. Verify extreme endpoints and a center point of each table**

Product:		**Meter Factor:**	**K Factor:**	
1	Test with liquid temperature between 55 F – 65 F at the manufactures rated maximum frequency/pulse rate.	API Gravity/Density: Temperature:		**Yes □ No □ N/A □**
2	Test with liquid temperature between 55 F – 65 F at manufactures rated minimum frequency/pulse rate.	API Gravity/Density: Temperature:		**Yes □ No □ N/A □**
3	Test with liquid temperature below 35 F at manufactures rated maximum frequency/pulse rate.	API Gravity/Density: Temperature:		**Yes □ No □ N/A □**
4	Test with liquid temperature below 35 F at manufactures rated minimum frequency/pulse rate.	API Gravity/Density: Temperature:		**Yes □ No □ N/A □**
5	Test with liquid temperature above 100 F at manufactures rated maximum frequency/pulse rate.	API Gravity: Temperature:		**Yes □ No □ N/A □**
6	Test with liquid temperature above 100 F at manufactures rated minimum frequency/pulse rate.	API Gravity: Temperature:		**Yes □ No □ N/A □**
7	Test with liquid temperature between 55 F – 65 F at the manufactures rated maximum frequency/pulse rate.	API Gravity/Density: Temperature:		**Yes □ No □ N/A □**
8	Test with liquid temperature between 55 F – 65 F at manufactures rated minimum frequency/pulse rate.	API Gravity/Density: Temperature:		**Yes □ No □ N/A □**
9	Test with liquid temperature below 35 F at manufactures rated maximum frequency/pulse rate.	API Gravity/Density: Temperature:		**Yes □ No □ N/A □**
10	Test with liquid temperature below 35 F at manufactures rated minimum frequency/pulse rate.	API Gravity/Density: Temperature:		**Yes □ No □ N/A □**
11	Test with liquid temperature above 100 F at manufactures rated maximum frequency/pulse rate.	API Gravity/Density: Temperature:		**Yes □ No □ N/A □**
12	Test with liquid temperature above 100 F at manufactures rated minimum frequency/pulse rate.	API Gravity/Density: Temperature:		**Yes □ No □ N/A □**

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Appendix D/Sub-Appendix B

National Type Evaluation Program

Software Maintenance and Reconfiguration
Excerpts from 2013 Measuring Sector Summary

The following was excerpted from the 2013 Measuring Sector agenda on Software Maintenance and Reconfiguration and is provided to give background on the previous discussions of this item.

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

1. Verify that the update process is documented (OK).

2. For traced updates, installed Software is authenticated and checked for integrity.

   Technical means shall be employed to guarantee the authenticity of the loaded software (i.e., that it originates from the owner of the type approval certificate). This can be accomplished (e.g., by cryptographic means like signing). The signature is checked during loading. If the loaded software fails this test, the instrument shall discard it and either use the previous version of the software **or become inoperative**.

   Technical means shall be employed to guarantee the integrity of the loaded software (i.e., that it has not been inadmissibly changed before loading). This can be accomplished (e.g., by adding a checksum or hash code of the loaded software and verifying it during the loading procedure). If the loaded software fails this test, the instrument shall discard it and either use the previous version of the software **or become inoperative**.

   Examples are not limiting or exclusive.

3. Verify that the sealing requirements are met.

   The Sector asked, "What sealing requirements are we talking about"?

   This item is **only** addressing the **software update**; it can be either verified or traced. It is possible that there are two different security means, one for protecting software updates (software log) and one for protecting the other metrological parameters (Category I, II, or III method of sealing). Some examples provided by the Sector members include but are not limited to:

   Physical Seal, software log

   Category III method of sealing can contain both means of security.

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

   The question before the group is, "Can this be made mandatory"?

   The manufacturer shall ensure by appropriate technical means (e.g., an audit trail) that traced updates of metrologically significant software are adequately traceable within the instrument for subsequent verification and surveillance or inspection. This requirement enables inspection authorities, which are responsible for the metrological surveillance of legally controlled instruments, to back-trace traced updates of metrologically

significant software over an adequate period of time (that depends on national legislation). The statement in italics will need to be reworded to comply with US weights and measures requirements.

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

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

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

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

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

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

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

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

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

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

Mr. Truex, NTEP Administrator, indicated his opinion that the above sentence is unnecessary since it's self-evident. It was agreed by the group however to ask the other sectors for feedback on the value of this addition.

Though the Sector is currently considering only the single sentence be incorporated into NCWM Publication 14 for the time being, ultimately, the Sector may wish to advance the remaining language of the original item submission.

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

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

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

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

- LMD Checklist:
  - General, Section 2. Graduations, Indications and Recorded Representations, Code Reference G-S.8.
  - RMFDs, Section 9. Measuring Elements, Code Reference S.2.2. Provision for Sealing and Code Reference: S.2.2.1. Multiple Measuring Devices with a Single Provision for Sealing
  - Wholesale & Loading Rack Meters, Section 19. Measuring Elements, Code Reference S.2.2. Provision for Sealing and Code Reference: S.2.7.3. Provision for Sealing - Automatic Temperature Compensation
  - Vehicle-Tank Meters, Section 26. Measuring Elements, Code Reference S.2.2. Provision for Sealing and Code Reference: S.2.6.2. Provision for Sealing
  - LPG & NH3 Meters, Section 31. Measuring Elements, Code Reference S.2.2. Provision for Sealing
  - Mass Flow Meters, Section 36. Measuring Elements, Code Reference: S.3.5. Provision for Sealing
  - Water Meters Checklist, Section 45 Measuring Elements, Code Reference: S.2.1. Provision for Sealing
  - Hydrogen Gas Measuring Devices, Section 51. Design of Measuring Elements and Measuring Systems, Code Reference: S.3.3. Provision for Sealing
  - LMD Checklist Appendix B Requirements for Metrological Audit Trails
- ECR-LMD Checklist
  - Section 4. Provisions for Sealing, Code Reference: G-S.8. Provision for Sealing Electronic Adjustable Components

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

1. The audit trail data shall be:

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

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

Discussion:
At the 2013 Measuring Sector meeting, Mr. Jim Truex (NTEP Director) described feedback from the Weighing Sector and Grain Sectors in their discussions of this item. Mr. Dennis Beattie (Measurement Canada) noted that the software described in the recommendation policies the authenticity of the existing software in an electronic weighing or measuring system. This software would be separate from audit trail information and the event of a change in software would be considered a metrologically significant event. In discussing this item, some NCWM Publication 14.

Decision:
The 2013 Measuring Sector rejected the recommendation to include the proposed changes in NCWM Publication 14. Measuring Sector manufacturers were unable to add any contributions during the meeting that would lead to agreement to include the proposed changes in NCWM Publication 14; however, they committed to the task of taking this issue to their companies' software engineers to flesh out the proposal. The Sector agreed to carry this item over to its next meeting to allow the manufacturers time to study this issue and bring back alternative(s) to consider.

Appendix D/Sub-Appendix C

National Type Evaluation Program

Applying Permanence Test Criteria - Examples and Testing Requirements

The following examples and testing requirements were developed by Mr. John Roach (CDFA DMS, NTEP Laboratory) to illustrate and clarify the technical policy and field evaluation and permanence test criteria. These examples and testing requirements were discussed, amended, and agreed upon by the 2014 NTEP Measuring Sector.

Example A:

- A CNG RMFD metering system uses a previously evaluated mass flow meter covered by a separate CC.
- The CC for the CNG RMFD included both initial and permanence testing over the flow range listed on the CNG RMFD CC.
- The meter used in the CNG RMFD uses the *same transmitter model* as that covered by the separate meter CC.
- The CC for the CNG RMFD metering system currently covers a flow range of: 3.0 to 75 lb/min
- The CC for the previously evaluated meter covers flow rates of: 2.5 to 130 lb/min
- The CNG RMFD manufacturer wants the CNG RMFD system to include flow rates of: 2.5 to 130 lb/min

Testing Requirements:

The requested maximum flow rate does not extend beyond the flow rate covered under the CC for the meter. However, the holder of the CC for the meter owns the rights to the test results from that CC.

If the holder of the meter CC provides written permission for the CNG RMFD to use the results from the testing conducted for the meter, the CNG RMFD CC may be expanded to include the higher flow rate without additional testing.

If permission is not obtained, then additional testing, including permanence testing (including throughput as specified for mass flow meters) is required to include the extended flow rate.

Example B:

- A CNG RMFD metering system uses a previously evaluated mass flow meter covered by a separate CC.
- The CC for the CNG RMFD included both initial and permanence testing over the flow range listed on the CNG RMFD CC.
- The meter used in the CNG RMFD uses the *same transmitter model* as that covered by the separate meter CC.
- The CC for the CNG RMFD metering system currently covers a flow range of: 3.0 to 75 lb/min
- The CC for the previously evaluated meter covers flow rates of: 2.5 to 130 lb/min
- The CNG RMFD manufacturer wants the CNG RMFD system to include flow rates of: 2.5 to 250 lb/min

Testing Requirements:

The requested maximum flow rate extends beyond the flow rate covered under the CC for the meter.

Based on Technical Policy E "Meter Sizes to be Included on a Certificate of Conformance," additional testing, including permanence testing (including throughput as specified for mass flow meters) is required to include the extended flow rate.

Example C:

- A CNG RMFD metering system uses a previously evaluated mass flow meter covered by a separate CC.
- The CC for the CNG RMFD included both initial and permanence testing over the flow range listed on the CNG RMFD CC.
- The meter used in the CNG RMFD uses a ***different*** *transmitter model* than the meter covered by the separate meter CC.
- The CC for the CNG RMFD metering system currently covers a flow range of: 3.0 to 75 lb/min
- The CC for the previously evaluated meter covers flow rates of: 2.5 to 130 lb/min
- The CNG RMFD manufacturer wants the CNG RMFD system to include flow rates of: 2.5 to 130 lb/min

Testing Requirements:

Testing requirements must consider both the extension of the flow rate and the change in transmitter.

Transmitter Change. The transmitter used in the CNG RMFD is different. The changing of the transmitter is significant and this would be considered a new meter. Thus, a full permanence test is required for the CNG RMFD using the new transmitter at the higher flow rate.

Flow Rate Extension. With regard for the request extension of the flow rate, the requested maximum flow rate does not extend beyond the flow rate covered under the CC for the meter. However, the holder of the CC for the meter owns the rights to the test results from that CC.

If the holder of the meter CC provides written permission for the CNG RMFD to use the results from the testing conducted for the meter, the CNG RMFD CC may be expanded to include the higher flow rate with only the 30-day permanence test described above.

If permission is not obtained, then full permanence testing (including throughput as specified for mass flow meters) is required to include the extended flow rate.

Example D:

- A CNG RMFD metering system uses a previously evaluated mass flow meter covered by a separate CC.
- The CC for the CNG RMFD included both initial and permanence testing over the flow range listed on the CNG RMFD CC.
- The meter used in the CNG RMFD uses a ***different*** *transmitter model* than the meter covered by the separate meter CC.

- The CC for the CNG RMFD metering system currently covers a flow range of: 3.0 to 75 lb/min
- The CC for the previously evaluated meter covers flow rates of: 2.5 to 130 lb/min
- The CNG RMFD manufacturer wants the CNG RMFD system to include flow rates of: 2.5 to 250 lb/min

Proposed Testing Requirements:

Testing requirements must consider both the extension of the flow rate and the change in transmitter.

Transmitter Change. The transmitter used in the CNG RMFD is different. The changing of the transmitter is significant and this would be considered a new meter. Thus, a full permanence test is required for the CNG RMFD using the new transmitter at the higher flow rate. And the flow rate change will necessitate a full permanence test in this example.

Flow Rate Change. The requested maximum flow rate extends *beyond* the flow rate covered under the CC for the meter.

Based on Technical Policy E "Meter Sizes to be Included on a Certificate of Conformance," additional testing, including permanence testing (including throughput as specified for mass flow meters) is required to include the extended flow rate.

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Appendix D/Sub-Appendix D

National Type Evaluation Program

2014 S&T Agenda Proposals to Change LPG Code

332-1 D S.1.4.3. Provisions for Power Loss; S.1.5.1.1. Unit Price; S.1.5.1.2. Product Identity; S.1.6. For Retail Motor Vehicle Fuel Devices Only; S.1.7. For Wholesale Devices Only; UR.2.7. Unit Price and Product Identity; and UR.2.8. Computing Device.

Source:
California Department of Food and Agriculture Division of Measurement Standards (2014)

Purpose:
Add similar Specifications and User Requirements for other retail motor-fuel devices to Handbook 44 Section 3.32. Liquefied Petroleum Gas (LPG) and Anhydrous Liquid-Measuring Devices Code similar to those in Section 3.30. Liquid-Measuring Devices, Section 3.37. Mass flow Meters, and Section 3.39 Hydrogen-Gas Measuring Devices Tentative Code.

Item Under Consideration:
Amend NIST Handbook 44, Liquefied Petroleum Gas and Anhydrous Liquid-Measuring Devices Code as follows:

S.1.4. For Retail Devices Only (No Change)

S.1.4.1. Indication of Delivery (No Change)

S.1.4.2. Return to Zero (No Change)

S.1.4.3. Provisions for Power Loss.

S.1.4.3.1. Transaction Information.

(a) In the event of a power loss, a computing retail liquefied petroleum dispensing device shall display the information needed to complete any transaction in progress at the time of the power loss (such as the quantity and unit price, or sales price) shall be determinable for at least 15 minutes at the dispenser or at the console if the console is accessible to the customer.

(b) In the event of a power loss, both an electronic digital retail non-computing stationary liquefied petroleum gas dispenser and a vehicle-mounted electronic digital liquefied petroleum gas dispenser shall display the information needed to complete any transaction in progress at the time of the power loss.

S.1.4.3.2. User Information. – The device memory shall retain information on the quantity of fuel dispensed and the sales price totals during power loss.

S.1.5. For Stationary Retail Devices Only.

S.1.5.1. Display of Unit Price and Product Identity. – ~~**In a device of the computing type, means shall be provided for displaying on each face of the device the unit price at which the device is set to compute or to**~~

~~**deliver as the case may be, and there shall be conspicuously displayed on each side of the device the identity of the product that is being dispensed. If a device is so designed as to dispense more than one grade, brand, blend, or mixture of product, the identity of the grade, brand, blend, or mixture being dispensed shall also be displayed on each face of the device.**~~

S.1.5.1.1. Unit Price.

(a) A computing or money-operated device shall be able to display on each face the unit price at which the device is set to compute or to dispense.

(b) Except for dispensers used exclusively for fleet sales, other price contract sales, and truck refueling (e.g., truck stop dispensers used only to refuel trucks), whenever a grade, brand, blend, or mixture is offered for sale from a device at more than one unit price, then all of the unit prices at which that product is offered for sale shall meet the following conditions:

(1) For a system that applies a discount prior to the delivery, all unit prices shall be displayed or shall be capable of being displayed on the dispenser through a deliberate action of the purchaser prior to the delivery of the product. It is not necessary that all of the unit prices for all grades, brands, blends, or mixtures be simultaneously displayed prior to the delivery of the product.

(2) For a system that offers post-delivery discounts on fuel sales, display of pre-delivery unit price information is exempt from (b)(1), provided the system complies with S.1.6.8. Recorded Representations for Transactions Where a Post-Delivery Discount(s) is Provided.

Note: When a product is offered at more than one unit price, display of the unit price information may be through the deliberate action of the purchaser: 1) using controls on the device; 2) through the purchaser's use of personal or vehicle-mounted electronic equipment communicating with the system; or 3) verbal instructions by the customer.

S.1.5.1.2. Product Identity.

(a) A device shall be able to conspicuously display on each side the identity of the product being dispensed.

(b) A device designed to dispense more than one grade, brand, blend or mixture of product also shall be able to display on each side the identity of the grade, brand, blend, or mixture being dispensed.

S.1.6. ~~For Wholesale Devices Only~~ For Retail Motor Vehicle Fuel Devices Only

S.1.6.1. Zero-Set-Back Interlock, 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.

S.1.6.2. Provisions for Power Loss.

S.1.6.2.1. Transaction Information. – In the event of a power loss, the information needed to complete any transaction in progress at the time of the power loss (such as the quantity and unit price, or sales price) shall be determinable for at least 15 minutes at the dispenser or at the console if the console is accessible to the customer.

S.1.6.2.2. User Information. – The device memory shall retain information on the quantity of fuel dispensed and the sales price totals during power loss.

S.1.6.3. Display of Unit Price and Product Identity. Except for fleet sales and other price contract sales, a motor vehicle fuel dispenser used to refuel vehicles shall be of the computing type and shall indicate the quantity, the unit price, and the total price of each delivery. The dispenser shall display the volume measured for each transaction.

S.1.6.4. Totalizers for Retail Motor-Fuel Dispensers. – Retail motor-fuel dispensers shall be equipped with a nonresettable totalizer for the quantity delivered through the metering device.

S.1.6.5. Money-Value Divisions. – A computing type shall comply with the requirements of paragraph G-S.5.5. Money-Values, Mathematical Agreement, and the total price computation shall be based on quantities not exceeding 0.05 L for devices indicating in metric units and 0.01 gal intervals for devices indicating in inch-pound units.

S.1.7. For Wholesale Devices Only. (Renumbered - No Change)

UR.2.7. Unit Price and Product Identity.

(a) The following information shall be conspicuously displayed or posted on the face of a retail dispenser used in direct sale:

(1) except for unit prices resulting from any post-delivery discount and dispensers used exclusively for fleet sales, other price contract sales, and truck refueling (e.g., truck stop dispensers used only to refuel trucks), all of the unit prices at which the product is offered for sale; and

(2) in the case of a computing type or money-operated type, the unit price at which the dispenser is set to compute.

Provided that the dispenser complies with S.1.5.1.1. Display of Unit Price, it is not necessary that all the unit prices for all grades, brands, blends, or mixtures be simultaneously displayed or posted.

(b) The following information shall be conspicuously displayed or posted on each side of a retail dispenser used in direct sale:

(1) the identity of the product in descriptive commercial terms; and

(2) the identity of the grade, brand, blend, or mixture that a multi-product dispenser is set to deliver.

UR.2.8 Computing Device – Any computing device used in an application where a product or grade is offered for sale at one or more unit prices shall be used only for sales for which the device computes and displays the sales price for the selected transaction.

The following exceptions apply:

(a) Fleet sales and other price contract sales are exempt from this requirement.

(b) A truck stop dispenser used exclusively for refueling trucks is exempt from this requirement provided that:

(1) all purchases of fuel are accompanied by a printed receipt of the transaction containing the applicable price per gallon, the total gallons delivered, and the total price of the sale; and
(Added 1993)

(2) unless a dispenser complies with S.1.6.4.1. Display of Unit Price, the price posted on the dispenser and the price at which the dispenser is set to compute shall be the highest price for any transaction which may be conducted.
(Added 1993)

(c) A dispenser used in an application where a price per unit discount is offered following the delivery is exempt from this requirement, provided the following conditions are satisfied:

(1) the unit price posted on the dispenser and the unit price at which the dispenser is set to compute shall be the highest unit price for any transaction;

(2) all purchases of fuel are accompanied by a printed receipt recorded by the system for the transaction containing:

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

b. transaction information as shown on the dispenser at the end of the delivery and prior to any post-delivery discount including the:

1. total volume of the delivery;

2. unit price; and

3. total computed price of the fuel sale prior to post-delivery discounts being applied.

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

d. the final total price of the fuel sale.

For systems equipped with the capability to issue an electronic receipt, the customer may be given the option to receive the receipt electronically (e.g., via cell phone, computer, etc.)

Background/Discussion:
NCWM Publication 14 checklist for Liquefied Natural Gas (LPG) Retail Motor Fuel Devices verifies compliance with specifications, such as: "Power Loss" (which requires a 15-minute power back up) and "Zero-Setback Interlocks." However, these specifications are not located in Section 3.32. of NIST Handbook 44.

There are LPG devices with NTEP Certificates of Conformance that meet current "power loss" and "zero-setback interlock" requirements. However, there are other LPG retail motor-fuel devices in the field that consist of an assembly of separable, compatible, and type-certified LPG measuring and indicating elements, key/card lock systems that do not meet the power loss and interlock requirements because those requirements are not within the LPG Code and have not been submitted for type evaluation. This creates unfair competition with holders of type certifications for LPG retail dispensers.

There are newer LPG dispensers coming in to use, where measuring, indicating, and computing elements are assembled in Gilbarco retail motor fuel dispenser housings. These LPG devices serve as both propane bottle fillers and as retail motor fuel devices using separate hoses and nozzles on a dispenser. Many of these dispensers, while they do have a good safety history, are not assembled in compliance with safety standards such as UL 495 or 1238, or NFPA 50. Nor are they typically installed in accordance with NFPA 30A or NFPA 70.

Existing retail LPG dispensers can be adapted to fuel LPG-powered motor vehicles by adding a simple adaptor, which attaches to the LPG nozzle on the dispenser's hose. There are currently five active and two inactive NTEP Certificates of Conformance for LPG retail motor-fuel dispensers listed in the NCWM Database.

At the 2014 NCWM Interim Meeting, Ms. Juana Williams (NIST, OWM) commented that OWM believes these changes will better align the LMD and LPG Code with regard to retail dispensing systems. OWM suggests that the following specific items be considered as the item is further developed:

Nonretroactive Status:
OWM notes that some of the paragraphs in the original proposal are suggested as nonretroactive requirements. In reviewing these paragraphs, consideration should be given as to the appropriate nonretroactive date to propose and whether or not the effective dates provided should mirror the effective dates of corresponding paragraphs in the LMD Code.

S.1.4.3. Provisions for Power Loss:
OWM questions whether or not the provisions for power loss in the proposed paragraph "S.1.4.3.1. Transaction Information" should be restricted to "computing" retail LPG dispensers. This corresponding requirement applies to *all* retail devices in the LMD Code, not just computing-type devices. If a power loss occurs during the use of a digital volume-only retail LPG dispenser, it would seem appropriate to require provisions to ensure that the quantity information can be recalled so that the transaction can be completed. It isn't clear why there would need to be a distinction between vehicle-mounted and stationary applications.

Additionally, the language proposed in S.1.4.3.1. Transaction Information has some language that doesn't read correctly. OWM offers the following alternative:

S.1.4.3. Provisions for Power Loss.

S.1.4.3.1. Transaction Information. – In the event of a power loss, the information needed to complete any transaction in progress at the time of the power loss (such as the quantity and unit price, or sales price) shall be determinable for at least 15 minutes at the dispenser or at the console if the console is accessible to the customer.

S 1.4.3.2. User Information. – The device memory shall retain information on the quantity of fuel dispensed and the sales price totals during power loss.

S.1.5.1.1. Unit Price – Consideration should be given to whether or not provision needs to be made for "blends" of product for this application. Additionally, the references to paragraph S.1.6.8. refers to an LMD Code paragraph; this reference should be deleted and, perhaps, replaced with a corresponding paragraph of the LPG Code.

Post-Delivery Discounts: For consistency with the LMD Code, the Committee may wish to consider whether provisions for post-delivery discounts should be added to the LPG Code.

S.1.4.1. Indication of Delivery:
OWM suggests that the Committee consider modifying paragraph S.1.4.1. Indication of Delivery as follows so that it mirrors the corresponding paragraph (S.1.6.1. Indication of Delivery) in the LMD Code, both in language and in

the requirement for electronic devices to inhibit indications until fueling conditions ensure that the delivery starts on zero.

S.1.4.1. Indication of Delivery. – A retail device shall ~~be constructed to show~~ automatically show on its face the initial zero condition and the ~~amounts~~ quantity delivered up to the nominal capacity of the device. However, the following requirements shall apply:

For electronic devices manufactured prior to January 1, 2006, the first 0.03 L (or 0.009 gal) of a delivery and its associated total sales price need not be indicated.

For electronic devices manufactured on or after January 1, 2006, the measurement, indication of delivered quantity, and the indication of total sales price shall be inhibited until the fueling position reaches conditions necessary to ensure that the delivery starts at zero.
[Nonretroactive as of January 1, 2006]
(Amended 2014)

OWM suggests the Committee consider what nonretroactive dates, if any, should be associated with this paragraph.

S.1.6.2. Provisions for Power Loss: It would seem that the provisions for power loss are already addressed in the proposed paragraph S.1.4.3. Power Loss. Therefore, OWM would suggest deleting S.1.6.2. and its subparagraphs S.1.6.2.1. and S.1.6.2.2.

S.1.6.3. Display of Unit Price: This proposed paragraph is logical. However, OWM questions whether the last sentence regarding volume display is needed given that the "quantity" is already required in the previous sentence.

UR.2.7.(a)(2) Unit Price and Product Identity Wholesale: The word "device" is missing after the word "type."

UR.2.8. Computing Device: Delete "Added" dates from parts (b)(1) and (b)(2).
This paragraph may also be impacted by action on Items 310-2 and 330-1, which address requirements for recorded representations in the General and LMD Codes. Should the proposal in Item 310-2 to reference the use of electronic receipts be adopted, the corresponding reference in this proposed paragraph (UR.2.8.) should be deleted.

Agreement Between Indications on Auxiliary Elements: Consideration should be given to including a paragraph corresponding to LMD Code paragraph S.1.6.6. which addresses agreement of indications with auxiliary elements such as consoles.

General: As part of this overall proposal, consideration should be given to modifying other sections of the LPG Code to mirror the LMD Code more exactly. This could be done by the Technical Advisor and presented to the submitter as the item is further developed if that would be helpful.

The Committee heard comments from Mr. John Young (Yolo County, California) in support of the proposed changes. The Committee heard comments from OWM (see above) and Mr. Rich Miller (FMC) regarding the need to more closely examine the power loss requirements and how these apply to specific categories of LPG metering systems. Mr. Miller noted concern in particular that separate batteries have been required for some vehicle-mounted applications in Europe and this has proven problematic for companies.

The Committee supports the objective of making changes to align the LPG and the LMD Code with respect to requirements for retail motor-fuel dispensing applications. Based on the comments received, the Committee believes that additional work is needed before considering the proposal for voting and decided to designate the item as a "Developing" Item to allow the submitter to address the points raised.

Regional Associations Comments:
The CWMA believes this item is sufficiently developed and forwarded it to NCWM, recommending that it be a Voting item.

The WWMA believes the proposal has merit and contains a complete proposal addressing the issues. The WWMA believes more time is needed for input from other stakeholders and regional associations. The WWMA forwarded this item to NCWM and recommended that it be an Informational Item.

SWMA did not receive any comments opposing the item if the section is the same as the LMD Code. The SWMA recommended the item be moved forward to the NCWM as a Voting Item.

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