SWMA Specifications and Tolerances Committee
2015 Annual Meeting Report

Dr. Matthew Curran, Committee Chair
Florida

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Biloxi, Mississippi

300 INTRODUCTION

The Specifications and Tolerances (S&T) Committee (hereinafter referred to as "Committee") submits its Report to the Western Weights and Measures Association (WWMA). The Report consists of the WWMA Agenda (NCWM Carryover and NEW items) and this Addendum. Page numbers in the tables below refer to pages in this Addendum. Suggested revisions to the handbook are shown in **bold face print** by **~~striking out~~** information to be deleted and **<u>underlining</u>** information to be added. Requirements that are proposed to be nonretroactive are printed in **bold-faced *italics.***

Presented below is a list of agenda items considered by the WWMA and its recommendations to the NCWM Specifications and Tolerances Committee.

Subject Series List

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Table B
Glossary of Acronyms and Terms

Acronym	Term	Acronym	Term
API	American Petroleum Institute	NCWM	National Conference on Weights and Measures
CC	Certificate of Conformance	NEWMA	Northeastern Weights and Measures Association
CNG	Compressed Natural Gas	NIST	National Institute of Standards and Technology
CWMA	Central Weights and Measures Association	NGSC	NCWM Natural Gas Steering Committee
DGE	Diesel Gallon Equivalent	NTEP	National Type Evaluation Program
DLE	Diesel Liter Equivalent	OIML	International Organization of Legal Metrology
DOT	Department of Transportation	OWM	Office of Weights and Measures
FALS	Fuels and Lubricants Subcommittee	RMFD	Retail Motor Fuel Dispenser
FHWA	Federal Highway Administration	S&T	Specifications and Tolerances
GGE	Gasoline Gallon Equivalent	SD	Secure Digital
GLE	Gasoline Liter Equivalent	SI	International System of Units
GMM	Grain Moisture Meter	SMA	Scale Manufactures Association
GPS	Global Positioning System	SWMA	Southern Weights and Measures Association
IEC	International Electrotechnical Commission	TC	Technical Committee
LMD	Liquid Measuring Devices	USNWG	U.S. National Work Group
LNG	Liquefied Natural Gas	WIM	Weigh-in-Motion
MMA	Meter Manufacturers Association	WWMA	Western Weights and Measures Association

Details of All Items
(In order by Reference Key)

310 HANDBOOK 44 - GENERAL CODE

310-1 D G-S.1. Identification. – (Software)

Source:
This item originated from the NTEP Software Sector and first appeared on NCWM S&T Committee's 2007 agenda as Developing Item Part 1, Item 1. and in 2010 as Item 310-3.

Purpose:
Provide marking requirements that enable field verification of the appropriate version or revision for metrological software, including methods other than "permanently marked," for providing the required information.

Item Under Consideration:
Amend *NIST Handbook 44:* G-S.1. Identification 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)

(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 and all software-based devices or equipment manufactured as of January 1, 2022;**
~~***[Nonretroactive as of January 1, 2004]***~~

(Added 2003) **(Amended 2017)**

(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.
(Added 2017)

ii. continuously displayed or be accessible via the display. Instructions for displaying the version or revision identifier shall be described in the CC. As an alternative, permanently marking the version or revision identifier shall be acceptable providing the device does not always have an integral interface to communicate the version or revision identifier.
[Nonretroactive as of January 1, 2022]
(Added 2017)

(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) **(Amended 2017)**

(e) an 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 2017**)

Background / Discussion:
The Item under Consideration above replaces that which was presented at the 100th NCWM Annual Meeting in July 2015 at the request of the NTEP Software Sector Committee.

Among other tasks, the NTEP Software Sector was charged by the NCWM Board of Directors to recommend NIST Handbook 44 specifications and requirements for software incorporated into weighing and measuring devices, which may include tools used for software identification. During its October 2007 meeting, the Sector discussed the value and merits of required markings for software, including possible differences in some types of software-based devices and methods of marking requirements. After hearing several proposals, the Sector agreed to the following technical requirements applicable to the marking of software:

1. The NTEP CC Number must be continuously displayed or hard-marked;

2. The version must be software-generated and shall not be hard-marked;
3. The version is required for embedded (Type P) software;
4. Printing the required identification information can be an option;
5. Command or operator action can be considered as an option in lieu of a continuous display of the required information; and
6. Devices with Type P (embedded) software must display or hard-mark the device make, model, and serial number to comply with G S.1. Identification.

In 2008, the Software Sector developed and submitted a proposal to the NCWM S&T Committee to modify G-S.1. and associated paragraphs to reflect these technical requirements. Between 2008 and 2011, this item appeared on the S&T Committee's main agenda and the Committee and the Sector received numerous comments and suggestions relative to the proposal. The Sector developed and presented several alternatives based on feedback from weights and measures officials and manufacturers. Among the key points and concerns raised during discussions over this period were how to address the following:

(a) **Limited Character Sets and Space.** – How to address devices that have limited character sets or restricted space for marking.

(b) **Built-for-Purpose vs. Not-Built-for-Purpose.** - Whether or not these should be treated differently.

(c) **Ease of Access.** – Ease of accessing marking information in the field.
- Complexity of locating the marking information
- Use of menus for accessing the marking information electronically
- Limits on the number of levels required to access information electronically
- Possibility of single, uniform method of access

(d) **Hard Marking vs. Electronic.** – Whether or not some information should be required to be hard marked on the device.

(e) **Continuous Display.** – Whether or not required markings must be continuously displayed.

(f) **Abbreviations and Icons.** – Establishment of unique abbreviations, identifiers, and icons and how to codify those.

(g) **Certificate of Conformance Information.** – How to facilitate correlation of software version information to a CC, including the use of possible icons.

Further details on the alternatives considered can be found in the Committee's Final Reports from 2008 to 2014.

Prior to the 2014 NTEP Weighing Sector (WS) meeting, members of OWM's Legal Metrology Devices Program (LMDP) amended the proposal appearing on the Committee's agenda in 2014; this after being asked by the NTEP Software Sector (SS) to provide additional input and draft modifications to paragraphs G-S.1. and G.S.1.1. in consideration of the goals of the SS and the comments provided during the 2014 Open Hearings of the S&T Committee relating to this item.

The following is a list of the goals provided by the SS in modifying G-S.1. and G.S.1.1. as communicated to the members of OWM's LMDP:

1. Remove the existing distinction between software identification requirements for built-for-purpose and not-built-for-purpose devices.
2. To require that <u>all</u> software-based devices have a software version or revision identifier for metrologically significant software.
3. Require that <u>certified</u> software versions or revision identifiers for metrologically significant software is recorded on the CC for access by inspectors.
4. Software itself does not require serial numbers.

5. Require that software-based devices version or revision identifier shall be accessible via the display and user interface and only if device's display is incapable of displaying the identifier or has no display and/or interface; then permanently marking the version or revision identifier shall be acceptable (e.g., digital load cell).
6. Nonretroactive as of January 1, 2016, if passed by the NCWM in July 2015.

OWM's LMDP developed the following proposed draft alternative changes to G-S.1. based on the SS's request for additional input on how best to meet its goals and forwarded them to the Chairman of the SS for consideration at the 2014 WS/SS joint meeting:

Amend NIST Handbook 44*:* G-S.1. 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 devices~~ software****;*
[Nonretroactive as of January 1, 1968]
(Amended 2003)

(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;**
~~[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)

ii. directly linked to the software itself; and
[Nonretroactive as of January 1, 2016]

(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]
(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.).
[Nonretroactive as of January 1, 2007]
(Added 2006)

(e) an 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**)

OWM's LMDP did not propose any changes to subparagraph G-S.1.1. since the SS had indicated earlier that it may be possible to eventually eliminate G-S.1.1. Additionally, OWM's LMDP made it known to the SS that the shaded portion of G-S.1.(d)(1)iii. of their draft alternative changes did not reflect any of the goals communicated by the SS and was being offered for consideration with the understanding that:

1. this change will make it easier in the future for inspectors to be able to identify software installed in equipment;
2. a reasonable amount of time for the changes to take effect can be specified;
3. it is probable that improvements in technology over time will make it easier for equipment manufacturers to comply.

NTEP Weighing and Software Sectors - Joint Meeting (August 2014):
At its 2014 meeting, the WS met jointly with the SS to consider the proposal as amended by OWM's LMDP. After further amending it, the two sectors agreed to submit the proposal as shown in Item Under Consideration to the weights and measures regional associations for consideration and requested its status be change from Developing to Informational.

It was also decided during the joint meeting that no changes to G-S.1.1. were necessary since the two sectors had agreed that the term "not-built-for-purpose software-based devices" in G-S.1.(d) would be retained.

2015 NCWM Interim Meeting:
During the 2015 NCWM Interim Meeting, representatives speaking on behalf of the SMA, MMA, and OWM commented that they believed progress had been made on this item at the joint meeting of the Software and Weighing Sectors in August 2014. The SMA reported it continues to support the work of the Software Sector and would like to see this item remain on the S&T Committee's agenda. OWM noted that during the joint meeting, members of both sectors had agreed to a number of proposed amendments to G-S.1. that had been developed by OWM's Legal Metrology Devices Program. OWM encouraged the Software Sector to continue working with the remaining NTEP sectors to try and reach consensus on a proposal that provides the means for officials to be able to easily determine whether or not software installed in a device is the same as that, which was evaluated by NTEP. Mr. Michael Keilty (Endress Hauser Flowtec AG), Chairman of the Measuring Sector, reported that Measuring Sector would be meeting with the Software Sector next October (2015) to consider the proposal.

In recognition of the progress that was reported and the planned future joint meeting of the Measuring and Software Sectors, the Committee agreed to keep the item on its agenda as a Developing item. However, because this item has remained on S&T's agenda for several years, the Committee also agreed it would withdraw the item if a proposal that can be presented for vote is not received before the next NCWM Interim Meeting.

2015 NCWM Annual Meeting:
At the 2015 NCWM Annual Meeting, Mr. Russ Vires (Mettler-Toledo, LLC), speaking on behalf of the SMA, commented that the SMA continues to support the work of the Software Sector and looks forward to the outcome of their joint meeting with the Measuring Sector.

Mrs. Tina Butcher (OWM) reported that significant progress was made at last year's joint meeting of the Software and Weighing Sectors. OWM continues to support the efforts of the Software Sector and looks forward to the outcome of their joint meeting with the Measuring Sector**,** in September 2015. She encouraged the Software Sector to continue working with the remaining NTEP Sectors to try and reach consensus on a proposal that provides the means for officials to be able to easily determine whether or not software installed in a device is the same as that evaluated by NTEP.

Committee member, Dr. Matthew Curran (FL) asked if it was still the plan of the SS to have the proposal developed to the extent that it could be a Voting item during the 2016 NCWM cycle. Mr. Richard Harshman (OWM), co-technical advisor to the Committee, responded that that was still his understanding.

The Committee also noted again that due to the age of the item on the Committee's agenda (8 years) that if proposed language for voting status consideration could not be presented to the Committee by the 2016 Interim meeting it would likely be withdrawn, but could be reintroduced when the sectors were able to provide such language.

In consideration of the comments received in support of the item, which also acknowledged the recent significant progress to further develop it, the Committee agreed to maintain the item on its agenda in a Developing status. The Committee also agreed to replace the Item Under Consideration with the most recent proposal; that which was agreed to by the Software Sector and Weighing Sector during their joint 2014 meeting and as now shown in Item Under Consideration.

Regional Association Meetings:
The CWMA recommended leaving this as a Developing item at its 2014 Interim Meeting due to the lack of new information from the Software Sector. At its 2015 Annual Meeting, the CWMA again recommended the item move forward as "Developing" due to comments heard during the open hearing and the upcoming meeting between the Software and Measuring Sectors.

WWMA heard testimony in open hearings of the 2014 WWMA Annual Meeting in support of the work being done and that the interested sectors are meeting to continue the effort. WWMA agreed that further work needs to be done with this item. WWMA recommended that this item remain a Developing item.

At its 2014 Annual Meeting, the SWMA recommended this item remain Developing despite having indicated last year that if no progress had been made by the next NCWM cycle the item would be withdrawn. While there were no specific updates provided, there were comments indicating progress has been made by the Software and Weighing Sectors. The Committee did not hear any comments in opposition to this item.

At its 2014 Interim Meeting, NEWMA recommended that the item be Withdrawn because no new information had been provide by the Software Sector. It was noted that if the Software Sector continues their work on this item and wants to bring this forward again with new information; the Committee could reconsider the item. At its 2015 Annual Meeting, NEWMA heard testimony indicating significant progress had been made on the item by the Software Sector. A question was raised concerning whether or not the current proposal would exempt software from being required to have a serial number. The Committee reported it believes the current proposal would exempt software. NEWMA agreed to recommend the item move forward as "Developing" because of the ongoing work being done to further develop this item.

SWMA Action: Item 310-1
Summary of comments considered by the regional committee (in writing or during the open hearings):
Mr. Lou Straub with the Scale Manufacturer's Association stated that the SMA is planning a meeting where the proposed language will be further considered. Mr. Michael Keilty (Endress Houser Flowtec) stated that the software sector may have some comments for the proposed language, but would be available at the Interim Meeting.
Item as proposed by the regional committee: ***(If different than agenda item)***
No change.
Committee recommendation to the region: ☒ Voting Item on the NCWM Agenda ☐ Information Item on the NCWM Agenda ☐ Withdraw the Item from the NCWM Agenda (*In the case of new items, do not forward to NCWM)* ☐ Developing Item on the NCWM Agenda *(To be developed by source)*
Reasons for the committee recommendation:
Based on the comments heard during open hearings and the Committee's position last year on the item the Committee recommends moving the item forward for voting as proposed.
COMPLETE SECTION BELOW FOLLOWING VOTING SESSION
Final updated or revised proposal from the region: ***(If different than regional committee recommendation)***
No change.
Regional recommendation to NCWM for item status: ☒ Voting Item on the NCWM Agenda ☐ Information Item on the NCWM Agenda ☐ Withdraw the Item from the NCWM Agenda (*In the case of new items, do not forward to NCWM)* ☐ Developing Item on the NCWM Agenda *(To be developed by source)* ☐ Unable to consider at this time *(Provide explanation in the "Additional Comments" section below)*
Regional Report to NCWM: Please provide your report in this section exactly how you want it to appear in the NCWM reports to represent your region's considerations, support or opposition, and recommendations. **This will replace any previous reports from your region on this item.**
Based on the comments heard during open hearings and the Committee's position last year on the item the Committee recommends moving the item forward for voting as proposed.

Additional letters, presentations and data may have been part of the committee's consideration. Please refer to http://www.ncwm.net/meetings/interim/publication-15 to review these documents.

New Item 15 G-S.9. Metrologically Significant Software Updates

Source:
NTEP Software Sector (2016)

Purpose:
Clarify that metrologically significant software shall be sealable.

Item Under Consideration:
Amend NIST Handbook 44 General Code as follows:

> **G-S.9. Metrologically Significant Software Updates**
> **A software update that changes the metrologically significant software shall be considered a sealable event.**
> **(Added 20XX)**

Background/Discussion:
The NTEP Software Sector believes that metrologically significant software is equally as important as other sealable parameters. While G-S.8. could be construed as requiring software to be sealable, it would be better to make the requirement explicit. G-S.8 refers to changing adjustable components, which may be interpreted as not being applicable to software.

The Software and Measuring Sector attendees, as well as the lab representatives, have consensus that the proposed G-S.9. should be moved forward to the S&T Committee to be considered as a voting item in 2016. The proposal was also reviewed with the Weighing Sector in 2014 and gained their consensus.

SWMA Action: New Item 15
Summary of comments considered by the regional committee (in writing or during the open hearings):
No comments were received on this item.
Item as proposed by the regional committee: ***(If different than agenda item)***
No change.
Committee recommendation to the region: ☒ Voting Item on the NCWM Agenda ☐ Information Item on the NCWM Agenda ☐ Withdraw the Item from the NCWM Agenda (*In the case of new items, do not forward to NCWM)* ☐ Developing Item on the NCWM Agenda *(To be developed by source)*
Reasons for the committee recommendation:
The Committee heard no comments in opposition to this item and feels it is ready to move forward as a voting item.
COMPLETE SECTION BELOW FOLLOWING VOTING SESSION
Final updated or revised proposal from the region: ***(If different than regional committee recommendation)***
No change.
Regional recommendation to NCWM for item status: ☒ Voting Item on the NCWM Agenda ☐ Information Item on the NCWM Agenda ☐ Withdraw the Item from the NCWM Agenda (*In the case of new items, do not forward to NCWM)* ☐ Developing Item on the NCWM Agenda *(To be developed by source)* ☐ Unable to consider at this time *(Provide explanation in the "Additional Comments" section below)*
Regional Report to NCWM: Please provide your report in this section exactly how you want it to appear in the NCWM reports to represent your region's considerations, support or opposition, and recommendations. **This will replace any previous reports**

from your region on this item.
The Committee heard no comments in opposition to this item and feels it is ready to move forward as a voting item.

Additional letters, presentations and data may have been part of the committee's consideration. Please refer to http://www.ncwm.net/meetings/interim/publication-15 to review these documents.

320 SCALES

New Item 17 S.1.1.3. Automated Batching Systems (See Related New Item 18)

This item was not submitted to your region.

New Item 1 S.5.4. Relationship of Load Cell Verification Interval to the Scale Division (See Related New Item 2)

Source:
Scale Manufacturers Association (2016)

Purpose:
Clarify the relationship of v_{min} with d with multiple independent load receivers.

Item Under Consideration:
Amend NIST Handbook 44 Scales Code as follows:

S.5.4 Relationship of Minimum Load Cell Verification Interval Value to the Scale Division. *– The relationship of the value for the* ***minimum*** *load cell verification interval, v_{min}, to the scale division, d, for a specific scale* ~~***installation***~~ *using NTEP* ***certified*** *load cells shall comply with the following formulae where N is the number of load cells in a single* ***independent[1] load-receiving element*** ~~***scale***~~ *(such as hopper,* ~~***or***~~ ***railroad track or*** *vehicle scale weighing/load receiving elements);*

(a) $V_{min} \leq d^* / \sqrt{N}$ *for scales without lever systems; and*

(b) $V_{min} \leq d^* / \sqrt{N}$ ~~x~~ *scale multiple for scales with lever systems*

[1] Independent means with a load-receiving element not attached to adjacent elements and with its own A/D conversion circuitry and displayed weight.

*[*When the value of the scale division, d, is different from the verification scale division, e, for the scale, the value of e must be used in the formulae above.]*

This requirement does not apply to complete weighing/load-receiving elements or scales, which satisfy all the following criteria:

- *the complete weighing/load-receiving element or scale has been evaluated for compliance with T.N.8.1. Temperature under the NTEP;*

- *the complete weighing/load-receiving element or scale has received an NTEP Certificate of Conformance; and*

- *the complete weighing/load-receiving element or scale is equipped with an automatic zero-tracking mechanism which cannot be made inoperative in the normal weighing mode. (A test mode which permits the disabling of the automatic zero-tracking mechanism is permissible, provided the scale cannot function normally while in this mode.*

[Nonretroactive as of January 1, 1994]

(Added 1993) (Amended 1996 **and 20XX**)

Background/Discussion:

Recently it has been discovered that there appear to be those who interpret paragraph S.5.4 as saying that N is to be the total number of ALL load cells in a scale comprised of two or more independent weighing platforms like those commonly found in highway weigh stations while others feel that N in the formulae contained in this paragraph refers to just the number of load cells in a SINGLE independent load receiving platform comprising part of the overall multiple-platform scale. Clarification is needed so that the interpretation of this section of the Handbook remains consistent.

The submitter provided the following statements along with a presentation which is available online at http://www.ncwm.net/meetings/interim/publication-15.

Relationship of the Minimum Load Cell Verification Interval, V_{min} , with the Scale Division, d, in Scales Comprised of Multiple Independent Load-Receiving Elements

Over the years industry and weights and measures officials have held different opinions regarding the relationship of the minimum load cell verification interval, v_{min} , to the scale division, d, when the weighing system is comprised of multiple independent load-receiving elements. There are those who feel that only the number of load cells used in each SINGLE load receiver should be used in the relationship while others feel that you should also use the total number of load cells in ALL of the independent load receiving elements comprising the scale system.

Some may be confused regarding just what is the minimum load cell verification interval, v_{min}. The majority of scales use one or more load cells where the working or measuring range of the load cell(s) is significantly less than the load cell's capacity. In these applications the value of the load cell minimum verification interval and load cell utilization are important. The minimum load cell verification interval is defined as the smallest value of a quantity (mass) which may be applied to a load cell without exceeding the maximum permissible error. To express it mathematically, $v_{min} = E_{max} / \Upsilon$ where E_{max} is the load cell's rated capacity and Υ represents a value specified by the load cell manufacturer.

The minimum measuring range, MMR, can be found by:

$MMR = v_{min} \times n_{max} / E_{max}$ so for a Class IIIL load cell with a 50,000 pound capacity and a 1.5 pound v_{min} the MMR is calculated as:

MMR = 1.5 pounds x 10,000 divisions / 50,000 pounds = 0.3 or 30% of the cell's capacity

This minimum measuring range can be applied over any part of the measuring range between the load cell's minimum load, E_{min} and the load cell's rated capacity, E_{max}.

With this in mind, in multiple load cell applications, the square root of the number of load cells, N, is used to account for the random errors found in a group of two or more load cells. That is, some load cell errors may be positive while others may be negative.

The multiple load-receiving elements are completely independent which means that they are not physically connected to adjacent load receivers and have their load cell output(s) converted to a digital value independently of the other load-receiving elements in the scale or weighing system. They have their own displayed weight value also set aside from the other displayed values. In this case, the measuring range and hence the v_{min} of the load cell(s) used in the load receiving element are also independent and separate from the measuring range of the load cell(s) used in the other load-receiving elements. For this reason, the relationship of the minimum load cell verification interval to the scale division is independent of the same relationships in the other load-receiving elements and should therefore be determined using the number of the load cells in or the lever multiple of the single independent load receiver.

In 1990 the NCWM voted to accept a Specifications and Tolerances Committee recommendation that stated in part

> *Multiple weighing elements (e.g., three axle-load scales permanently installed adjacent to one another or with a dead space between the weighing elements) used simultaneously to obtain a single weight in commercial applications shall be deemed to be a single system which shall meet the requirements of the applicable accuracy class.*

This recommendation stemmed from the question as to whether the total weight should be limited to 10 000 divisions and took place BEFORE the relationship of V_{min} to d was added in 1993. When this discussion took place, no consideration was given to the relationship of the minimum load cell verification to the scale division. In 1997 a footnote was added to Table 3 Parameters for Accuracy Classes in NIST Handbook 44 which states in part:

> [4] *…On a scale system with multiple load-receiving elements and multiple indications, each element considered shall not independently exceed the maximum specified for the accuracy class. If the system has a summing indicator, the* n_{max} *for the summed indication shall not exceed the maximum specified for the accuracy class.*

This footnote concerns the maximum number of divisions for the load-receiving elements and for the summing indicator if so equipped. It has nothing to do with the minimum load cell verification interval and its relationship to the scale division d and number of load cells in the load-receiving element, N.

It seems that a precedent was already set in 1986 with the addition of Paragraph T.N.4.1 in NIST Handbook 44. This paragraph states:

> ***T.N.4.1. Multiple Indicating/Recording Elements*** *– In the case of a scale or weighing system equipped with more than one indicating element or indicating element and recording element combination, where the indicators or indicator/recorder combination are intended to be used independently of one another, tolerances shall be applied independently to each indicator or indicator/recorder combination. (Amended 1986)*

Granted, this paragraph pertains to indicating elements but the same line of reasoning applies to multiple load-receiving elements where, when the load-receiving elements are intended to be used INDEPENDENTLY of each other, tolerances and other requirements are to be applied to each individual load-receiving element.

Further still, consider three independent electromechanical load-receiving elements placed side by side and used to weigh the axles of a vehicle. Each load-receiving element has its own displayed weight. A single total weight display that takes into account rounding errors is used to display the gross weight. Assume that each load receiver has its own unique multiple. If you believe that the relationship of v_{min} to the division value, d, is to be determined by the characteristics of the whole weighing system, how then would you apply the formula in S.5.4 for load receivers with lever systems? It states:

$$V_{min} \leq d / \sqrt{N} * \text{scale multiple}$$

You can apply this equation to each load receiver but how would you apply it to the whole weighing system?

Consider three independent load receivers each with its own NTEP certificate and each with its own digital indicating element and one summing device that sums their outputs taking into consideration rounding errors. This is a common type of weighing system and one that should be and is allowed by NTEP. The design of the load receiving elements is irrelevant. It makes no difference whether they are all mechanical or electronic or a combination of the two. The important thing is that they are all NTEP certified and that the indicator that shows the sum adds no error to the weighing system. If, however, the combination of these load-receiving elements is to be considered as a single scale, then you can consider it as essentially consisting of three NTEP certified digital load cells and a summing digital indicator. The design and technology used by the load cells is again irrelevant. It is simply a scale having three load cells and an indicator. If the former configuration is used, it should not be necessary to consider the total number of load cells in the weighing system but rather to simply consider only each scale's characteristics.

Because the summed display is NOT an additional scale and has no measuring function and is simply nothing more than the mathematical sum of the individual weights, applying the v_{min} relationship to the total number of load cells in all of the load-receiving elements contained in the weighing system has no metrological basis.

SWMA Action: New Item 1
Summary of comments considered by the regional committee (in writing or during the open hearings):
This item was grouped with New Item #2 during the open hearings and both items heard simultaneously. These were viewed as competing items and the Committee felt that only one, if any, could be moved forward. Mr. Steve Langford (Scale Manufacturer's Association) gave a presentation providing rational for the item. Mr. Henry Oppermann (Weights and Measures Consulting, LLC) provided written (these were made available online) and oral comments in opposition to this item and in support of New Item #2. Representatives from Florida and Arkansas had questions about the number and type of devices affected by this proposal. Mr. Langford and Mr. Lou Straub (Fairbanks Scales) provided information indicating there were a limited number of scales to which this applies, but there were other potential applications. Mr. Oppermann raised additional concerns over how V_{min} applies. Mr. Dick Suiter (Richard Suiter Consulting) stated that New Item #1 would be okay if treated as individual scales, but not if only summed afterward. He further added that he supported New Item #1 over New Item #2.
Item as proposed by the regional committee: ***(If different than agenda item)***
No change.
Committee recommendation to the region: ☒ Voting Item on the NCWM Agenda ☐ Information Item on the NCWM Agenda ☐ Withdraw the Item from the NCWM Agenda (*In the case of new items, do not forward to NCWM)* ☐ Developing Item on the NCWM Agenda *(To be developed by source)*
Reasons for the committee recommendation:
This item was grouped with New Item #2 during the open hearings and both items heard simultaneously. These were viewed as competing items and the Committee felt that only one, if any, could be moved forward. Based on the discussion during the open hearings the Committee decided to recommend moving this item forward as a voting

item. The Committee believed it was appropriate to move New Item #1 forward and withdraw New Item #2.
COMPLETE SECTION BELOW FOLLOWING VOTING SESSION
Final updated or revised proposal from the region: ***(If different than regional committee recommendation)***
No change.
Regional recommendation to NCWM for item status: ☒ Voting Item on the NCWM Agenda ☐ Information Item on the NCWM Agenda ☐ Withdraw the Item from the NCWM Agenda (*In the case of new items, do not forward to NCWM)* ☐ Developing Item on the NCWM Agenda *(To be developed by source)* ☐ Unable to consider at this time *(Provide explanation in the "Additional Comments" section below)*
Regional Report to NCWM: Please provide your report in this section exactly how you want it to appear in the NCWM reports to represent your region's considerations, support or opposition, and recommendations. **This will replace any previous reports from your region on this item.**
This item was grouped with New Item #2 during the open hearings and both items heard simultaneously. These were viewed as competing items and the Committee felt that only one, if any, could be moved forward. Based on the discussion during the open hearings the Committee decided to recommend moving this item forward as a voting item. The Committee believed it was appropriate to move New Item #1 forward and withdraw New Item #2.

Additional letters, presentations and data may have been part of the committee's consideration. Please refer to http://www.ncwm.net/meetings/interim/publication-15 to review these documents.

New Item 2 S.5.4. Relationship of Load Cell Verification Interval to the Scale Division (See Related New Item 1)

Source:
Weights and Measures Consulting (2016)

Purpose:
Ensure the correct application of the relationship of the load cell verification interval value to the scale division for weighing systems with multiple weighing/load-receiving elements with separate weight displays, particularly to vehicle scales with multiple weighing/load-receiving elements used to obtain axle weights and a summed weight display for the total weight of vehicles.

Item Under Consideration: (See Related New Item 1)
Amend NIST Handbook 44 Scales Code as follows:

> ***S.5.4 Relationship of Load Cell Verification Interval Value to the Scale Division. –*** *The relationship of the value for the load cell verification scale interval, v_{min}, to the scale division, d, for a specific scale installation using National Type Evaluation Program (NTEP) load cells shall comply with the following formulae where N is the number of load cells in the scale (such as hopper or vehicle scale weighing/load-receiving elements):*
>
> *(a)* $v_{\min} \le \frac{d*}{\sqrt{N}}$ *for scales without lever systems; and*
>
> *(b)* $v_{\min} \le \frac{d*}{\sqrt{N} \times (scale\ multiple)}$ *for scales with lever systems.*

*[*When the value of the scale division, d, is different from the verification scale division, e, for the scale, the value of e must be used in the formulae above.]*

[*If the weighing system has a summing indicator, the relationship of the load cell verification interval value to the scale division is based upon (1) the total number of load cells used in the weighing system that produces the summed weight indication and (2) the value of the smallest scale division used in the summed weight indication.]

This requirement does not apply to complete weighing/load-receiving elements or scales, which satisfy all the following criteria:

- *the complete weighing/load-receiving element or scale has been evaluated for compliance with T.N.8.1. Temperature under the NTEP;*
- *the complete weighing/load-receiving element or scale has received an NTEP Certificate of Conformance; and*
- *the complete weighing/load-receiving element or scale is equipped with an automatic zero-tracking mechanism which cannot be made inoperative in the normal weighing mode. (A test mode which permits the disabling of the automatic zero-tracking mechanism is permissible, provided the scale cannot function normally while in this mode.*

[Nonretroactive as of January 1, 1994]
(Added 1993) (Amended 1996)

Background/Discussion:
Recently it has been discovered that there appear to be those who interpret paragraph S.5.4 as saying that N is to be the total number of ALL load cells in a scale comprised of two or more independent weighing platforms like those commonly found in highway weigh stations while others feel that N in the formulae contained in this paragraph refers to just the number of load cells in a SINGLE independent load receiving platform comprising part of the overall multiple-platform scale. Clarification is needed so that the interpretation of this section of the Handbook remains consistent.

The submitter provided the following statements along with numerous supporting documents which are available online at http://www.ncwm.net/meetings/interim/publication-15.

1. Scales Code paragraph S.5.4. states that the relationship of v_{min} to the scale division for a specific scale **installation** must satisfy the relationship that $v_{min} \leq d/\sqrt{N}$ where N is the number of load cells. The installed vehicle scale does not comply with this requirement. There is no exception to say that only part of a vehicle scale is required to comply with this requirement.
2. The NCWM voted in 1990 S&T item 320-11 regarding the proper interpretation and application of Handbook 44 requirements to vehicle scales with multiple weighing/load-receiving elements. The vote was to unequivocally state, "The significance of this interpretation is that not only must each independent weighing device meet the requirements of Handbook 44, but the entire weighing system must meet all requirements that would apply if the device were a single scale." Note that the report says, "…the entire weighing system must meet **all** requirements…" There is no exception for the v_{min} relationship to the scale division nor should there be.
3. Handbook 44 categorizes weighing and measuring devices based upon the application and the method of operation of the device, not based upon the design of the device. T.N.1.1. Design states, "The tolerance for a weighing device is a performance requirement independent of the design principle used." The 1990 S&T Report, item 320-11, stated:
    a. The classification of a scale or weighing system into an accuracy class should be based upon its application and method of use, not on the design of the device.

b. A vehicle scale consisting of three weighing devices would then also have to meet T.N.4.4. across all of the sections.

4. The Scales Code requirements for n_{max} (Table 3. Parameters for Accuracy Classes) and T.N.4.4. Shift or Section Tests apply to the entire weighing system of vehicle scales with multiple weighing/load-receiving elements that sum the axle weights. Why would anyone think that S.5.4. applies to only part of the vehicle scale? The only reason that comes to mind is that someone wants to circumvent the requirement of S.5.4.
5. The scale manufacturer is selling and installing scales with a scale capacity of 385,000 lb, which is achieved by adding together the scale capacities for each weighing/load-receiving element. Based upon Scales Code N.3. and Table 4., to properly test a vehicle scale with a capacity of 385,000 lb, **the weights and measures official must test the scale with 48,125 lb of test weights (12.5% of the scale capacity) and test the scale with test loads to at least 96,250 lb (25% of the scale capacity)**. Unless this is done, weights and measures officials are not performing an adequate test to certify the scale.
6. The scale manufacturer claims that v_{min} was not considered when the NCWM adopted the interpretation in 1990 to require that vehicle scales meet all the requirements of Handbook 44. This claim is incorrect. The major changes to the Scales Code in 1984 were to add accuracy class parameters and to require accuracy of scales over ranges of influence factors (T.N.8.). NTEP added test procedures to determine compliance with the influence factors. Since large scales could not be tested in environmental chambers, compliance with influence factors is determined by testing load cells. The development of load cell test capabilities, test procedures and the applicable tolerances were critical to the implementation of the process to determine compliance with the influence factors requirements. Testing load cells and the value of v_{min} have always been part of the metrological system to determine compliance with influence factors. A NIST test program was established to provide NTEP with a resource with which to conduct load cell tests. In 1990, S&T item 320-12 (which immediately followed the interpretation in 320-11) addressed the relationship of v_{min} to the value of the scale division. Obviously, the v_{min} issue was on the agenda and W&M officials were aware of the relationship requirement. Please see the attachments for details of the extensive discussions on these subjects.
7. Enforcement of v_{min} was fully expected and considered essential to verify that installed scales comply with the influence factors requirements and to ensure fair completion. In 1987, the Executive Committee included the **summary** of the Weighing Sector meeting that was held on June 24, 1987. **The position of the Weighing Sector included the following.**
    a. The consensus appeared to be that the manufacturer should have the right to decide what constitutes adequate controls on manufacturing, but that it is the responsibility of weights and measures officials to verify that load cells and, ultimately, the final assembled scales meet the requirements of Handbook 44.
    b. As part of this issue is the verification that devices installed in the field comply with the original type and that the load cells in a scale have been tested and are being used within their prescribed performance parameters. Some of the load cell parameters must be checked in the field to verify that the scale and its major components are correct. For example: …

    5. The scale division must be such that the scale operates at a value not less than v_{min} for the load cell (for example, for a multiple-load cell vehicle scale, the value of the scale division divided by the number of load cells in the scale must be greater than or equal to v_{min} for the load cells)…

    c. The importance of field verification should be emphasized. The influence factors requirements in the U.S. market are implemented on there primary steps for weights and measures enforcement:
        i. Adoption of the influence factors requirements in Handbook 44;
        ii. Establishment of a type evaluation process to test new types of scales and load cells for compliance with the influence factors, and to all other appropriate requirements; and
        iii. Development and implementation of a verification process to assure that load cells used in scales and t he scales installed in the field comply with the influence factors requirements.

    Without an effective verification process (step 3), the first two steps are almost meaningless. An effective verification process is critical to assuring fair competition in the market place. (Emphasis added)
8. In 1989, the NCWM adopted the Scales Code paragraph S.6.9. (which is currently S.6.2.) to require access to the marking information for G-S.1. and for v_{min}. The S&T Committee and the NCWM specifically rejected the industry request to exempt large capacity scales and vehicle scales from this requirement, "…since weights and measures officials must do some disassembly **to verify that the v_{min} rating of a load**

cell is appropriate for the scale application, then the identification information could be located in a protected area, but still conveniently available to the official when verifying the load cell information."

9. The installation of a scale, the selection of the operational features, and the operation of a scale must comply with the requirements of Handbook 44. **Based upon the method of operation described by the scale manufacturer and the features that are operational, the installed vehicle scale with three weighing/load-receiving elements with separate weight indications cannot comply with all of the applicable requirements of Handbook 44.** The scale manufacturer says that the summed indication will switch to 50-lb divisions when the summed weight exceeds 200,000 lb. What happens to the weight indications for each weighing/load-receiving element when the summed display exceeds 200,000 lb? Either the weight indications stay in 20-lb scale divisions after the summed display exceeds 200,000 lb or the weight indications for each weighing/load-receiving element also change to 50-lb scale divisions. Either way, the vehicle scale cannot comply with all of the applicable Handbook 44 requirements. First, if the weight indications for each weighing/load-receiving element stay in 20-lb scale divisions after the summed display changes to 50-lb divisions, then the summed display and the sums of the three weight indications for each weighing/load-receiving element will not be in mathematical agreement most of the time. In the second case, if each of the three weight indications switch to 50-lb scale divisions when the summed display switches to 50-lb divisions, the capacity by division statements for each of the three weight indications will not be correct, because the weight indications will switch to 50-lb divisions at different points in the weighing ranges, due to different load distributions on the three weighing/load-receiving elements. Furthermore, this means that the scale divisions are not uniform throughout the series. In short, as designed by the manufacturer, the scale does not comply with Handbook 44.
10. What problem does the scale manufacturer want to fix? The scale manufacturer would like to have S.5.4. changed so that the scale, as sold and installed by the scale manufacturer, would comply with Handbook 44. However, there isn't any problem with Handbook 44. There are many load cells with capacities that may be used in vehicles scales with three weighing/load-receiving elements, 14 load cells, with 20-lb scale divisions, and still comply with Handbook 44. A review of active NTEP Certificates of Conformance (CCs) for load cells (as of September 6, 2014) shows that 65 of 70 load cells (about 93%) with a capacity of 75,000 lb are available and that satisfy the relationship of v_{min} to the scale division of the vehicle scale. If one were to use larger load cells (as listed on active NTEP CCs with capacities in the range of 88,000 to 110,000 lb, when the 75,000-lb capacity is not available) in the scale, then there are still 24 out of 35 load cells (about 69%) available that satisfy the relationship of v_{min} to the scale division of the vehicle scale. The scale company should simply design and build scales that comply with Handbook 44.
11. The motto of the NCWM is "That Equity May Prevail." A scale company is installing vehicle scales that do not comply with Handbook 44. The scale company wants the NCWM to change Handbook 44 to give them a "pass" regarding compliance with Handbook 44. The change that the scale company wants will benefit one company for one capacity of load cell for one scale application. This change would give the scale company a marketing and financial advantage over other scale manufacturers. How does such a requested change uphold equity in the marketplace?

Before 1989, Ohio Weights and Measures was requested to allow multiple-weighing-device systems to be installed as part of a vehicle scale weighing system. The scale company wanted to have the individual scales indicate in 2-lb scale divisions to permit higher resolution when weighing highway vehicles. Additionally, the summed weight display would have had more than 10,000 scale divisions, which would have exceeded the n_{max} allowed for Class III L scales. The Ohio Weights and Measures Director correctly stated that this design was not appropriate. This same logic applies to the claims made by the scale manufacturer to treat each weighing/load-receiving element as independent scales when weighing highway vehicles.

The scale manufacturer claims that each weighing/load-receiving element is a complete, separate and independent scale, since each weighing/load-receiving element is has its own analog-to-digital converter and its own separate weight display. The scale manufacturer sums the capacities of each weighing/load-receiving element to achieve the system scale capacity of 385,000 lb. Hence, the scale manufacturer argues that the calculation of v_{min} to the scale division should be based upon the number of load cells in each weighing/load-receiving element with its own weight display. The scale manufacturer claims that the relationship of v_{min} to the scale division was not considered in 1990 when the NCWM voted explicitly to adopt the following interpretation: "The significance of this interpretation is that not only must each independent weighing device

meet the requirements of Handbook 44, but the entire weighing system must meet all requirements that would apply if the device were a single scale." The claim that v_{min} was not part of the consideration is preposterous. The manufacturer justifies this claim by saying that S.5.4. was added to the Scales Code in 1993 after the vote in 1990. However, v_{min} was part and parcel of the determination of compliance to the influence factors requirements and NTEP load cell considerations since the "new Scales Code" was adopted in 1984.

The scale manufacturer is selling and installing scales with a scale capacity of 385,000 lb that has a 20-lb scale division for summed loads of 200,000 lb or less. The vehicle scale weighing system has 14 load cells with load cell capacities of 100,000 lb. Based upon the NTEP CC, the 100,000-lb capacity load cells have a load cell verification interval value of 7.6 lb. Based upon the v_{min} relationship specified in S.5.4., the v_{min} value for the load cell shall not exceed 5.34 lb. Consequently, the vehicle scale does not comply with Handbook 44.

The scale does not comply with NTEP policy. The NTEP Policy for Digital Electronic Scales states the following:

> **8.3. Modular Load-Cell Vehicle, Livestock, or Railroad Track Scales**
> *Note: These criteria apply if the scale is fully electronic (e.g., load cells comprise the sensors of the weighing/load- receiving element) and is of a modular design.*

Modular Scale
A vehicle, livestock, or railroad track scale made up of individual load-receiving elements of like design, which can be joined together to form a larger integral load-receiving element and can be separated at any time without structurally changing the individual load-receiving elements. This definition is to be applied for all new type evaluations and for applications to add new devices to an existing Certificate of Conformance (CC.) *See figure 3.* (Effective January 2001)

8.3.2. Range of Parameters for Modular Scales
The following range of parameters will be used to establish the sizes and capacities of modular load cell vehicle scales that will be covered on a CC based upon the test of a single scale.

a. Nominal capacities not more than 1.5 times CLC for a two-section scale to 135% of capacity of the device evaluated. The nominal capacity for the railroad track scale in a modular vehicle/railroad combination will be no greater than the capacity of the device submitted for evaluation.
b. Platform area not less than 50% of smallest two-section (four-cell) module incorporated in the device evaluated. Increased lengths for scales with two or more modules are not restricted as long as the width complies with 8.3.2. (e) **and the load cells meet the v_{min} formula (e.g., $v_{min} \leq d/\sqrt{n}$.)** [Emphasis added] Additional modules to increase length must be of the same type as those used in the device submitted for evaluation (e.g., 4-cell, 2-cell, and 0-cell.)

The installed scales are not covered by an NTEP CC. The NTEP CC cited by the scale manufacturer covers vehicle scales with capacities up to 270,000 lb; not to 385,000 lb. Additionally, the model number of the 385,000-lb vehicle scale does not match the model code listed on the NTEP CC. Furthermore, NTEP policy says that vehicle scales must be tested to 80% of the scale capacity. In the case of a 385,000-lb capacity, the scale must be tested to 308,000 lb to have a valid NTEP CC. To my knowledge, NTEP has never tested a vehicle scale to 308,000 lb.

The NTEP CC for the vehicle scale weighing/load-receiving element states that the installation must satisfy the relationship of $v_{min} \leq d/\sqrt{N}$ where N is the number of load cells. The installed vehicle scale does not comply with this condition of the NTEP CC.

Note 4 in Scales Code Table 3 states that, although a scale may have multiple weighing/load-receiving elements, the number of divisions for the weighing system must comply with the accuracy class parameters. Hence, the logic proposed by the scale manufacturer to treat each weighing/load-receiving element as a separate scale, rather than as a single weighing system, is not supported by Table 3.

The NCWM voted in 1990 to explicitly adopt S&T item 320-11 with the following interpretation: "The significance of this interpretation is that not only must each independent weighing device meet the requirements of Handbook 44, but the entire weighing system must meet all requirements that would apply if the device were a single scale." Note that the report says, "…the entire weighing system must meet **all** requirements…" There is no exception for the v_{min} relationship to the scale division.

The individual weighing/load-receiving elements are NOT independent scales as argued by the scale manufacturer. If the scales were independent, they would not have any communication among the "scales" nor would they perform a collective function. There is communication among the individual weighing/load-receiving elements, because the individual weight values are summed to obtain a legal-for-trade weight indication for the total weight of the vehicles weighed. The individual weighing/load-receiving elements work collectively to obtain a legal-for-trade weight. If each weighing/load-receiving element is independent, then there would not be a summed display. The individual axle-load weights are not legal for trade. The NTEP Digital Electronic Scales checklist states:

> 34.3.4. Sum only indication. The summed display shall be evaluated as an individual scale and must meet appropriate requirements. The indicator may provide a display for each load-receiving element, but the only display that will be considered "legal for trade" will be the summed display. In this case, the total number of divisions for the system shall not exceed 10 000 for Class III and IIIL.

Scales Code paragraph UR.3.3. states that split weighing is not allowed for commercial purposes. Handbook 44 defines a vehicle scale to be:

> **vehicle scale. –** A scale adapted to weighing highway, farm, or other large industrial vehicles (except railroad freight cars), loaded or unloaded.[2.20]

The platform sizes installed by the scale manufacturer as a law enforcement scale are 12' x 12', 12' x 12' and 12' x 44'. Not one of these "independent scales" as argued by the manufacturer, meet the Handbook 44 definition of vehicle scale. The individual platforms are not large enough to be independent vehicle scales and weigh the range of highway vehicles for which highway law enforcement is desired. The "independent scales" do not meet the suitability of equipment requirement for the application of a vehicle scale as required by General Code paragraph G-UR.1.1. The individual weighing/load receiving elements must work together to obtain legal-for-trade weight values. Hence, the three weighing/load-receiving elements are NOT independent scales, but a single weighing system, and must comply with S.5.4.

NTEP evaluates weighing and measuring devices to determine that the devices are capable of complying with Handbook 44. It is necessary that devices be properly installed, and the appropriate features selected and set up in order for the devices to comply with Handbook 44. Based upon how the operation of this particular type of vehicle scale and its features have been described, this vehicle scale cannot comply with other specific requirements of Handbook 44. Please see the attachments for a discussion of specific design and operational features that preclude compliance with Handbook 44 for this type of vehicle scale.

SWMA Action: New Item 2
Summary of comments considered by the regional committee (in writing or during the open hearings):
This item was grouped with New Item #1 during the open hearings and both items heard simultaneously. These were viewed as competing items and the Committee felt that only one, if any, could be moved forward. Mr. Steve Langford (Scale Manufacturer's Association) gave a presentation providing rational for the item. Mr. Henry Oppermann (Weights and Measures Consulting) provided written (these were made available online) and oral comments in opposition to this item and in support of New Item #2. Representatives from Florida and Arkansas had questions about the number and type of devices affected by this proposal. Mr. Langford and Mr. Lou Straub (Fairbanks Scales) provided information indicating there were a limited number of scales to which this applies, but there were other potential applications. Mr. Oppermann raised additional concerns over how V_{min} applies. Mr. Dick Suiter (Richard Suiter Consulting) stated that New Item #1 would be okay if treated as individual scales, but not if only summed afterward. He further added that he supported New Item #1 over New Item #2.

Item as proposed by the regional committee: ***(If different than agenda item)***
The item was recommended to be withdrawn.
Committee recommendation to the region: ☐ Voting Item on the NCWM Agenda ☐ Information Item on the NCWM Agenda ☒ Withdraw the Item from the NCWM Agenda (*In the case of new items, do not forward to NCWM)* ☐ Developing Item on the NCWM Agenda *(To be developed by source)*
Reasons for the committee recommendation:
This item was grouped with New Item #1 during the open hearings and both items heard simultaneously. These were viewed as competing items and the Committee felt that only one, if any, could be moved forward. Based on the discussion during the open hearings the Committee decided to recommend with item. The Committee believed it was appropriate to move New Item #1 forward and withdraw New Item #2.
COMPLETE SECTION BELOW FOLLOWING VOTING SESSION
Final updated or revised proposal from the region: ***(If different than regional committee recommendation)***
No change.
Regional recommendation to NCWM for item status: ☐ Voting Item on the NCWM Agenda ☐ Information Item on the NCWM Agenda ☒ Withdraw the Item from the NCWM Agenda (*In the case of new items, do not forward to NCWM)* ☐ Developing Item on the NCWM Agenda *(To be developed by source)* ☐ Unable to consider at this time *(Provide explanation in the "Additional Comments" section below)*
Regional Report to NCWM: Please provide your report in this section exactly how you want it to appear in the NCWM reports to represent your region's considerations, support or opposition, and recommendations. **This will replace any previous reports from your region on this item.**
This item was grouped with New Item #1 during the open hearings and both items heard simultaneously. These were viewed as competing items and the Committee felt that only one, if any, could be moved forward. Based on the discussion during the open hearings the Committee decided to recommend with item. The Committee believed it was appropriate to move New Item #1 forward and withdraw New Item #2.

Additional letters, presentations and data may have been part of the committee's consideration. Please refer to http://www.ncwm.net/meetings/interim/publication-15 to review these documents.

New Item 4 N.1.3.3.2. Prescribed Test Pattern and Test Loads for Livestock Scales with More Than Two Sections and Combination Vehicle/Livestock Scales *and* N.1.3.3.3. Prescribed Test Patterns and Test Loads for Two-Section Livestock Scales.

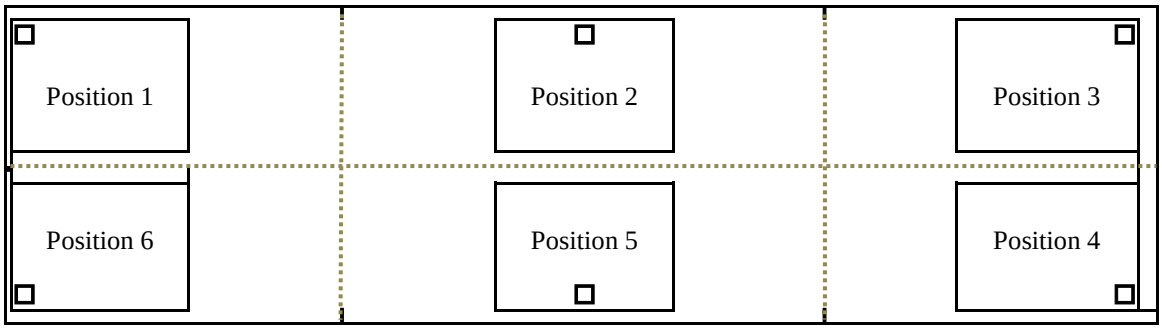
Source:
NIST Office of Weights and Measures (2016)

Purpose:
Eliminate inconsistencies in the shift test procedures for two-section livestock scales in the Scales Code of NIST Handbook 44.

Item Under Consideration:
Amend NIST Handbook 44 Scales Code as follows:

N.1.3.3.2. Prescribed Test Pattern and Test Loads for Livestock Scales with More Than Two Sections and Combination Vehicle/Livestock Scales. – A minimum test load of 5 000 kg (10 000 lb) or one-half of the rated section capacity, whichever is less, shall be placed, as nearly as possible, successively over each main load

support as shown in the diagram below. For livestock scales manufactured between January 1, 1989, and January 1, 2003, the required loading shall be no greater than one-half CLC. ~~**(Two-section livestock scales shall be tested consistent with N.1.3.7. All Other Scales Except Crane Scales, Hanging Scales, Hopper Scales, Wheel-Load Weighers, and Portable Axle-Load Weighers.)**~~



N.1.3.3.3. Prescribed Test Patterns and Test Loads for Two-Section Livestock Scales. – A shift test shall be conducted using the following prescribed test loads and test patterns **provided:, A single field standard weight used as the prescribed test load shall be applied centrally in the prescribed test pattern. When multiple field standard weights are used as the prescribed test load, the load shall be applied in a consistent pattern in the shift test positions throughout the test and applied in a manner that does not concentrate the load in a test pattern that is less than when that same load is a single field standard weight on the load-receiving element. tT**he shift test load **does shall** not exceed one-half the rated section capacity or one-half the rated concentrated load capacity whichever is applicable, using either:

(a) A one-half nominal capacity test load centered as nearly as possible, successively at the center of each quarter of the load-receiving element as shown in N.1.3.7. All Other Scales Except Crane Scales, Hanging Scales, Hopper Scales, Wheel-Load Weighers, and Portable Axle-Load Weighers Figure 1; or

(b) A one-quarter nominal capacity test load centered as nearly as possible, successively over each main load support as shown in N.1.3.7. All Other Scales Except Crane Scales, Hanging Scales, Hopper Scales, Wheel-Load Weighers, and Portable Axle-Load Weighers Figure 2.

(Added 2007) **(Amended 20XX)**

Background/Discussion:

The prescribed test patterns and test loads for conducting a shift test on two section livestock scales are specified in paragraph N.1.3.3.3.; yet, the last sentence (appearing in parenthesis) of paragraph N.1.3.3.2. specifies that two-section livestock scales are to be tested consistent with N.1.3.7. All Other Scales Except Crane Scales, Hanging Scales, Hopper Scales, Wheel-Load Weighers, and Portable Axle-Load Weighers. The test loads and test procedures specified in N.1.3.7. are not consistent with those specified in paragraph N.1.3.3.3. OWM believes that the test patterns and test loads specified in paragraph N.1.3.3.3. are correct and for this reason the last sentence appearing in N.1.3.3.2. should be deleted.

OWM notes that Paragraph N.1.3.3.3. was first added to HB 44 in 2008 (adopted by the NCWM in 2007) to address the test patterns and test loads that apply to shift tests conducted on two-section livestock scales. Previous to this paragraph being added, the test patterns and test loads that applied to section tests of two-section livestock scales were specified in paragraph N.1.3.8. All Other Scales Except Crane Scales, Hanging Scales, Hopper Scales, Wheel-Load Weighers, and Portable Axle-Load Weighers, which is now paragraph N.1.3.7. OWM also notes that the sentence proposed for deletion in paragraph N.1.3.3.2. already existed in the handbook prior to 2008 (e.g., in the 2007 version of HB 44, it appeared in paragraph N.1.3.4.2., Prescribed Test Pattern and Test Loads for Livestock Scales with More Than Two Sections and Combination Vehicle/Livestock Scales, which is now paragraph N.1.3.3.2.).

OWM believes it is likely that the sentence proposed for deletion in existing paragraph N.1.3.3.2. was purposely left remaining by the 2007 S&T Committee to capture that part of N.1.3.7. intended to eliminate instances where test weights are concentrated in a pattern that overload the load-bearing points, e.g., when multiple test weights are stacked resulting in the test load being concentrated in a small area of the platform. In support of this notion, OWM notes that in the 2007 S&T Committee Final Report, the Committee includes example illustrations showing acceptable and unacceptable applications of test weight to a livestock scale with a section capacity of 1 000 lb. The changes OWM is proposing to paragraph N.1.3.3.3. are to include that portion of N.1.3.7. into N.1.3.3.3. that OWM believes the 2007 S&T Committee wanted captured in the shift test procedures applicable to two-section livestock scales.

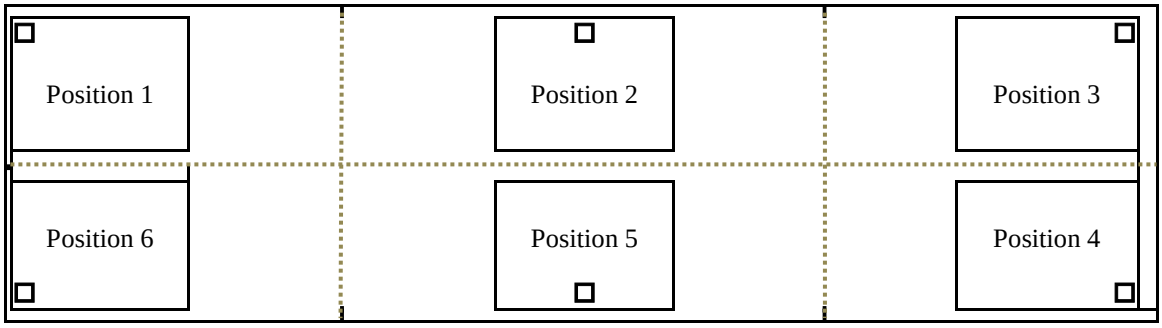
SWMA Action: New Item 4

Summary of comments considered by the regional committee (in writing or during the open hearings):

Mr. Carey Ainsworth (USDA) spoke in support of the item. Mr. Hal Prince (FL) asked if this addressed single 10,000 lb standards and if any such standards even existed. Mr. Rick Harshman (NIST) responded that Mr. Prince raised some valid points, but wasn't sure and it would be up to the S&T Committee.

Item as proposed by the regional committee: ***(If different than agenda item)***

N.1.3.3.2. Prescribed Test Pattern and Test Loads for Livestock Scales with More Than Two Sections and Combination Vehicle/Livestock Scales. – A minimum test load of 5 000 kg (10 000 lb) or one-half of the rated section capacity, whichever is less, shall be placed, as nearly as possible, successively over each main load support as shown in the diagram below. For livestock scales manufactured between January 1, 1989, and January 1, 2003, the required loading shall be no greater than one-half CLC. ~~**(Two-section livestock scales shall be tested consistent with N.1.3.7. All Other Scales Except Crane Scales, Hanging Scales, Hopper Scales, Wheel-Load Weighers, and Portable Axle-Load Weighers.)**~~



N.1.3.3.3. Prescribed Test Patterns and Test Loads for Two-Section Livestock Scales. – A shift test shall be conducted using the following prescribed test loads and test patterns **provided:**, **A single field standard weight used as the prescribed test load shall be applied centrally in the prescribed test pattern. When multiple field standard weights are used as the prescribed test load, the load shall be applied in a consistent pattern in the shift test positions throughout the test and applied in a manner that does not concentrate the load in a test pattern that is less than when that same load is a single field standard weight on the load-receiving element.** ~~t~~**T**he shift test load ~~**does**~~ **shall** not exceed one-half the rated section capacity or one-half the rated concentrated load capacity whichever is applicable, using either:

(a) A one-half nominal capacity test load centered as nearly as possible, successively at the center of each quarter of the load-receiving element as shown in N.1.3.7. All Other Scales Except Crane Scales, Hanging Scales, Hopper Scales, Wheel-Load Weighers, and Portable Axle-Load Weighers Figure 1; or

(b) A one-quarter nominal capacity test load centered as nearly as possible, successively over each main load support as shown in N.1.3.7. All Other Scales Except Crane Scales, Hanging Scales, Hopper Scales, Wheel-Load Weighers, and Portable Axle-Load Weighers Figure 2.

(Added 2007) **(Amended 20XX)**

Committee recommendation to the region:

☒ Voting Item on the NCWM Agenda ☐ Information Item on the NCWM Agenda ☐ Withdraw the Item from the NCWM Agenda (*In the case of new items, do not forward to NCWM)* ☐ Developing Item on the NCWM Agenda *(To be developed by source)*
Reasons for the committee recommendation:
The Committee heard comments in support of this item. The Committee believes the recommended changes will eliminate inconsistencies in the shift test procedures for two-section live stock scales. The Committee also learned that there are in fact single 10,000 lb standards in use and believed that the proposed language didn't require the use of such single standard, but only permitted its use.
COMPLETE SECTION BELOW FOLLOWING VOTING SESSION
Final updated or revised proposal from the region: *(If different than regional committee recommendation)*
No change from committee recommendation.
Regional recommendation to NCWM for item status: ☒ Voting Item on the NCWM Agenda ☐ Information Item on the NCWM Agenda ☐ Withdraw the Item from the NCWM Agenda (*In the case of new items, do not forward to NCWM)* ☐ Developing Item on the NCWM Agenda *(To be developed by source)* ☐ Unable to consider at this time *(Provide explanation in the "Additional Comments" section below)*
Regional Report to NCWM: Please provide your report in this section exactly how you want it to appear in the NCWM reports to represent your region's considerations, support or opposition, and recommendations. **This will replace any previous reports from your region on this item.**
The Committee heard comments in support of this item. The Committee believes the recommended changes will eliminate inconsistencies in the shift test procedures for two-section live stock scales. The Committee also learned that there are in fact single 10,000 lb standards in use and believed that the proposed language didn't require the use of such single standard, but only permitted its use.

Additional letters, presentations and data may have been part of the committee's consideration. Please refer to http://www.ncwm.net/meetings/interim/publication-15 to review these documents.

322 AUTOMATIC BULK WEIGHING SYSTEMS

New Item 31 A. Application, S Specifications, N. Notes, UR. User Requirements

Source:
Kansas (2016)

Purpose:
Modernize the ABWS code to more fully the reflect the types of systems in use and technology available while still maintaining the safeguards of the current code.

Item Under Consideration:
Amend NIST Handbook 44 Automatic Bulk Weighing Systems Code as follows:

A. Application

A.1. General. – This code applies to ~~**automatic bulk**~~ weighing systems, ~~**that is, weighing systems**~~ **capable**

of~~adapted to the automatic~~ automatically weighing **~~of a commodity in~~** successive drafts of **a bulk commodity without human intervention.~~predetermined amounts automatically recording the no-load and loaded weight values and accumulating the net weight of each draft.~~**
(Amended 1987)

S. Specifications

S.1. Design of Indicating and Recording Elements and Recorded Representations.

S.1.1. Zero Indication. – **~~Provisions~~ An Automatic Bulk Weighing System (ABWS)** shall **~~be made to~~**indicate and record a no-load reference value and, if the no-load reference value is a zero value indication, to indicate and record an out-of-balance condition on both sides of zero.

S.1.5. Recording Sequence. – **~~Provision~~ An ABWS** shall **~~be made so that~~ indicate** all weight values **~~are indicated~~** until **~~the completion of the~~** recording of the indicated value **is completed**.

S.1.6. Provision for Sealing Adjustable Components on Electronic Devices. – Provision shall be made for applying a security seal in a manner that requires the security seal to be broken before an adjustment can be made to any component affecting the performance of the device.

S.1.7 No Load Reference Values – An ABWS shall indicate and record weight values with no load in the load-receiving element. No load reference values must be recorded at a point in time after product flow from the load receiving element is stopped and before product flow into the load receiving element has started. Systems may be designed to stop operating if a no load reference value falls outside of user designated parameters. If this feature is designed into the system then the no load reference value indicated when the system is stopped must be recorded, an alarm must activate, weighing must be inhibited, and some type of human intervention must be required to restart the system after it is stopped.

S.1.8 Loaded Weight Values – An ABWS shall indicate and record loaded weight values for each weighment.

S.1.9 Net Weight Values – An ABWS shall calculate and record net weight for each weighment.

S.1.10 Net Weight Accumulation – An ABWS shall automatically accumulate and record the sum of all net weight values for each weighing process.

S.3. Interlocks and ~~Gate Control~~Product Flow Control.

S.3.1. ~~Gate Position~~Product Flow Control. – **~~Provision~~ An ABWS** shall **~~be made to~~** clearly indicate to the operator **product flow status ~~the position of the gates leading directly~~** to and from the **~~weigh hopper~~load receiving element. Many types of equipment can be used to control the flow of product into and out of a load receiving element automatically including but not limited to gates, conveyors, augers, robots, pipes, tubes, elevators, buckets, etc.**

S.3.2. Interlocks. – Each automatic bulk weighing system shall have operating interlocks to provide for the following:

(a) Product cannot be cycled and weighed if the weight recording element is disconnected or subjected to a power loss.

(b) The recording element **can only ~~cannot print~~ record** a weight if **~~either of the gates~~ equipment controlling product flow to or from the load-receiving element is in a condition**

that allows product to enter or leave the load receiving element. ~~**leading directly to or from the weigh hopper is open.**~~

S.3.3. Overfill ~~**Sensor**~~**And Interference Detection.**

(a) **The system must have a means to detect when** ~~**T**~~**t**he ~~**weigh hopper**~~**load-receiving element** ~~**shall be equipped with an**~~**is** overfill**ed. When an overfill condition exists** ~~**sensor which will cause the feed**~~**product flow to the load receiving element must be stopped,** ~~**gate to close,**~~an alarm must activate,~~**activate an alarm, and inhibit**~~ weighing **must be inhibited** until the overfill condition has been corrected**, and some type of human intervention must be required to restart the system. An alarm could be many things including a flashing light, siren, horn, flashing computer screen, etc. The intent of an alarm is to make the operator aware there is a problem which needs corrected.**
(Added 1993)

(b) ~~**If the system is equipped with a**~~**Downstream storage devices and other equipment, permanent or temporary,** ~~**lower garner or surge bin, that garner shall also**~~ **which have the potential to interfere with weighment when overfilled or not functioning properly must have a means to prevent interference. When interference exist the system must stop, an alarm must activate, product flow must stop, weighing must be inhibited until the interference has been corrected, and some type of human intervention is required to restart the system.**~~**be equipped with an overfill sensor which will cause the gate of the weigh hopper to remain open, activate an alarm, and inhibit weighing until the overfill condition has been corrected.**~~
[Nonretroactive as of January 1, 1998]
(Amended 1997)

N. Notes

N.1. Testing Procedures.

N.1.1. Test Weights. – The increasing load test shall be conducted using test weights equal to at least 10 % of the capacity of the system:

(a) on automatic ~~**grain**~~ bulk~~-~~ weighing systems installed after January 1, 1984 **used to weigh grain**; and

UR. User Requirements

UR.4. System Modification. – **Components of** ~~**T**~~**t**he weighing system, shall not be modified except when the modification has been approved by a competent engineering authority, preferably that of the engineering department of the manufacturer of the scale, and the official with statutory authority having jurisdiction over the scale.
(Amended 1991)

Background/Discussion:
The submitter provided the following points of discussion:

- There are many systems in use that don't meet the definition for a "scale" or an "Automatic Bulk Weighing System" or anything else in the handbook. These changes will make it easier for regulators/inspectors to determine if a system should be evaluated as an "ABWS".
- The wording "automatic bulk weighing systems" should not be used in the definition of the same.
- The no load and loaded weight recordings are important, but they are specifications and should not be included in the application code.

- The current code does not clearly define at what level of automation a system would be considered an ABWS versus a scale with some accessory equipment (hopper, tank, etc.). This is an attempt to more clearly distinguish which systems should be considered ABWS's.
- Human intervention could be many things. Some examples include but are not limited to pushing a reset button, turning power off then back on, typing a password, or entering a statement into a system log. The intent with including the term "human intervention" is to not include all systems which have a high degree of automation, only the ones that cycle repeatedly and can potentially operate without anyone present to observe weighing malfunctions.
- There are many types of load receiving elements that will work with an ABWS to include but not limited to tanks and hoppers so the previous language referring to hoppers was removed and replaced with the generic but accurate term "load receiving element".
- The old language implied separate sensors (e.g. bindicators) were required. Newer systems have already bypassed the use of separate sensors and utilize the weight indications to identify an overfilled condition, similar to how the indications are used to regulate product flow into the load receiving element for some devices. Concerns for this approach have been raised for situations when an indicator is not functioning properly. That is a legitimate concern, but my reply then is: What is the backup for an indicator not indicating properly on any other type of device? This is something we know happens with other devices and commonly may not be detected until a device inspection and test is completed. Thus one reason routine inspections and testing are required.
- Many types of equipment can be used to control the flow of product into and out of a load receiving element automatically including but not limited to gates, conveyors, augers, robots, pipes, tubes, elevators, and buckets. Examples would be a conveyer delivering product – in such a case the recording element should not record if the conveyer is still moving or in the case of a pneumatic transfer tube the recording element should not record if the blower forcing air through the tube is still operating. Therefore the old language referring to gates was removed and replace with more generic terminology which can be applied to any equipment used to control product flow not just gates.
- Many types of equipment can be used for downstream commodity storage including but not limited to hoppers, tanks, bins, flat storage, trucks, totes, rail cars and pits. The language referring to "lower garner", "surge bin", etc. has been removed and replaced with a more terms such as "downstream storage devices" to allow for all potentials types of product handling equipment.
- A downstream storage device itself may not interfere with the weighing process directly, but it also cannot create a situation in which an overfill condition or some other malfunction of the equipment interferes with the weighing process. An example would be a grain storage hopper located under a weigh hopper in a position which when grain is mounded up above the storage hopper the grain touches the bottom of the weigh hopper and interferes with the weighing process. For this example if the storage hopper can be lowered far enough below the weigh hopper so that the mounded grain when it reaches its' maximum potential height cannot touch the weigh hopper then it would not need the capability to detect an overfill condition. The same scenario would apply to a truck parked under the load receiving element, or a conveyer under the load receiving element. Wording was added to ensure interference does not occur and if it does that the system activates controls to prevent weighment errors.

The original code was written for very specific equipment for a very specialized use. This is a fairly drastic change from the original and introduces some new terminology that may present some confusion or uncertainty to those who were fairly familiar with the existing code. Some individuals feel the proposed changes may add some uncertainty as to what systems should or shouldn't be considered an ABWS.

SWMA Action: New Item 31
Summary of comments considered by the regional committee (in writing or during the open hearings):
Mr. Dick Suiter (Richard Suiter Consulting) stated that he had discussed this item with the submitter and felt it had merit, but he was concerned the proposal may have some unintended consequences. Mr. Tim Chesser (AR) noted that there were some language inconsistencies in both formatting and use elsewhere in other codes. He also asked why use the word "bulk commodity" instead of just "commodity."
Item as proposed by the regional committee: ***(If different than agenda item)***
A. Application

A.1. General. – This code applies to ~~**automatic bulk**~~ weighing systems, ~~**that is, weighing systems**~~ **capable of**~~**adapted to the automatic**~~ **automatically** weighing ~~**of a commodity in**~~ successive drafts of **a** ~~**bulk**~~ **commodity without operator** ~~**human**~~ **intervention.**~~**predetermined amounts automatically recording the no-load and loaded weight values and accumulating the net weight of each draft.**~~
(Amended 1987)

S. Specifications

S.1. Design of Indicating and Recording Elements and Recorded Representations.

S.1.1. Zero Indication. – ~~**Provisions**~~ **An automatic bulk weighing system** ~~**Automatic Bulk Weighing System (ABWS)**~~ shall ~~**be made to**~~indicate and record a no-load reference value and, if the no-load reference value is a zero value indication, to indicate and record an out-of-balance condition on both sides of zero.

S.1.5. Recording Sequence. – ~~**Provision**~~ **An automatic bulk weighing system** ~~**ABWS**~~ shall ~~**be made so that**~~ **indicate** all weight values ~~**are indicated**~~ until ~~**the completion of the**~~ recording of the indicated value **is completed**.

S.1.6. Provision for Sealing Adjustable Components on Electronic Devices. – Provision shall be made for applying a security seal in a manner that requires the security seal to be broken before an adjustment can be made to any component affecting the performance of the device.

S.1.7 No Load Reference Values – An automatic bulk weighing system ~~**ABWS**~~ **shall indicate and record weight values with no load in the load-receiving element. No load reference values must be recorded at a point in time after product flow from the load receiving element is stopped and before product flow into the load receiving element has started. Systems may be designed to stop operating if a no load reference value falls outside of user designated parameters. If this feature is designed into the system then the no load reference value indicated when the system is stopped must be recorded, an alarm must activate, weighing must be inhibited, and some type of operator** ~~**human**~~ **intervention must be required to restart the system after it is stopped.**

S.1.8 Loaded Weight Values – An automatic bulk weighing system ~~**ABWS**~~ **shall indicate and record loaded weight values for each weighment.**

S.1.9 Net Weight Values – An automatic bulk weighing system ~~**ABWS**~~ **shall calculate and record net weight for each weighment.**

S.1.10 Net Weight Accumulation – An automatic bulk weighing system ~~**ABWS**~~ **shall automatically accumulate and record the sum of all net weight values for each weighing process.**

S.3. Interlocks and ~~**Gate Control**~~**Product Flow Control.**

S.3.1. ~~**Gate Position**~~**Product Flow Control.** – ~~**Provision**~~ **An automatic bulk weighing system** ~~**ABWS**~~ shall ~~**be made to**~~ clearly indicate to the operator **product flow status** ~~**the position of the gates leading directly**~~ to and from the ~~**weigh hopper**~~**load receiving element. Many types of equipment can be used to control the flow of product into and out of a load receiving element automatically including but not limited to gates, conveyors, augers, robots, pipes, tubes, elevators, buckets, etc.**

S.3.2. Interlocks. – Each automatic bulk weighing system shall have operating interlocks to provide for the following:

(a) Product cannot be cycled and weighed if the weight recording element is disconnected or subjected to a power loss.

(b) The recording element **can only ~~cannot print~~ record** a weight if **~~either of the gates~~ equipment controlling product flow to or from the load-receiving element is in a condition that allows product to enter or leave the load receiving element. ~~leading directly to or from the weigh hopper is open.~~**

S.3.3. Overfill ~~Sensor~~And Interference Detection.

(a) **The system must have a means to detect when ~~T~~t**he **~~weigh hopper~~load-receiving element ~~shall be equipped with an~~is** overfill**ed. When an overfill condition exists ~~sensor which will cause the feed~~product flow to the load receiving element must be stopped, ~~gate to close,~~**an alarm must activate,**~~activate an alarm, and inhibit~~** weighing **must be inhibited** until the overfill condition has been corrected**, and some type of operator ~~human~~ intervention must be required to restart the system. An alarm could be many things including a flashing light, siren, horn, flashing computer screen, etc. The intent of an alarm is to make the operator aware there is a problem which needs corrected.**
(Added 1993)

(b) **~~If the system is equipped with a~~Downstream storage devices and other equipment, permanent or temporary, ~~lower garner or surge bin, that garner~~ ~~shall also~~ which have the potential to interfere with weighment when overfilled or not functioning properly must have a means to prevent interference. When interference exist the system must stop, an alarm must activate, product flow must stop, weighing must be inhibited until the interference has been corrected, and some type of operator ~~human~~ intervention is required to restart the system.~~~~be equipped with an overfill sensor which will cause the gate of the weigh hopper to remain open, activate an alarm, and inhibit weighing until the overfill condition has been corrected.~~**

[Nonretroactive as of January 1, 1998]
(Amended 1997)

N. Notes

N.1. Testing Procedures.

N.1.1. Test Weights. – The increasing load test shall be conducted using test weights equal to at least 10 % of the capacity of the system:

(a) on automatic **~~grain~~** bulk**~~-~~** weighing systems installed after January 1, 1984 **used to weigh grain**; and

UR. User Requirements

UR.4. System Modification. – **Components of ~~T~~t**he weighing system, shall not be modified except when the modification has been approved by a competent engineering authority, preferably that of the engineering department of the manufacturer of the scale, and the official with statutory authority having jurisdiction over the scale.
(Amended 1991)

Committee recommendation to the region:
☐ Voting Item on the NCWM Agenda
☐ Information Item on the NCWM Agenda
☐ Withdraw the Item from the NCWM Agenda (*In the case of new items, do not forward to NCWM)*
☒ Developing Item on the NCWM Agenda *(To be developed by source)*

Reasons for the committee recommendation: The Committee heard comments regarding potential unintended consequences as well as editorial changes the Committee considered necessary. Comments have been provided to the submitter by a member and the Committee looks for further development of the item.
COMPLETE SECTION BELOW FOLLOWING VOTING SESSION
Final updated or revised proposal from the region: ***(If different than regional committee recommendation)***
No change from committee recommendation.
Regional recommendation to NCWM for item status: ☐ Voting Item on the NCWM Agenda ☐ Information Item on the NCWM Agenda ☐ Withdraw the Item from the NCWM Agenda (*In the case of new items, do not forward to NCWM)* ☒ Developing Item on the NCWM Agenda *(To be developed by source)* ☐ Unable to consider at this time *(Provide explanation in the "Additional Comments" section below)*
Regional Report to NCWM: Please provide your report in this section exactly how you want it to appear in the NCWM reports to represent your region's considerations, support or opposition, and recommendations. **This will replace any previous reports from your region on this item.**
Reasons for the committee recommendation: The Committee heard comments regarding potential unintended consequences as well as editorial changes the Committee considered necessary. Comments have been provided to the submitter by a member and the Committee looks for further development of the item.

Additional letters, presentations and data may have been part of the committee's consideration. Please refer to http://www.ncwm.net/meetings/interim/publication-15 to review these documents.

322-1 D N.1. Testing Procedures. and T. Tolerances

Source:
Oregon (2015)

Purpose:
Modify the test method to reflect as-used dynamic conditions.

Item Under Consideration:
Amend NIST Handbook 44 Automatic Bulk Weighing Systems Code as follows:

N.1.4. Material Tests. – Procedure

1. **Start up the automatic bulk weighting system, including the surrounding equipment which is normally in use when instrument is itself in use.**
2. **Run the system for five weigh cycles (or more if necessary) to ensure normal working conditions.**
3. **Halt the automatic bulk weighting system and record the indication of total mass.**
4. **Run the weighing for not less than five cycles at maximum capacity, minimum capacity and one close to minimum totalized load.**

5. **Halt the automatic bulk weighing system and record the indication of total mass after each run.**

6. **Determine the material test error from the difference between the indicated totalized mass and the total mass of material as determined on the reference scale.**

Either pass a quantity of pre-weighed material through the Automatic Bulk Weighing system in a manner as similar as feasible to actual loading conditions, or weigh all material that has passed through the Automatic Bulk Weighing System. Means for weighing the material test load will depend on the capacity of the system and availability of a suitable reference scale for the test. To assure that the test load is accurately weighed and determined, the following precautions shall be observed:

(a) **The containers, whether railroad cars, trucks, or boxes, must not leak, and shall not be overloaded to the point that material will be lost.**

(b) **The actual empty or tare weight of the containers shall be determined at the time of the test. Stenciled tare weight of railway cars, trucks or boxes shall not be used. Gross and tare weights shall be determined on the same scale.**

(c) **When a pre-weighed test load is passed through the scale, the loading system shall be examined before and after the test to assure that the system is empty and that only the material of the test load has passed through the scale.**

(d) **Where practicable, a reference scale should be tested within 24 hours preceding the determination of the weight of the test load used for a Automatic Bulk Weighing System material test.**

A reference scale which is not "as found" within maintenance tolerance should have its accuracy re-verified after the Automatic Bulk Weighing System test with a suitable known weight load if the "as found" error of the Automatic Bulk Weighing System material test exceeds maintenance tolerance values.*

(e) **If any suitable known weight load other than a certified test weight load is used for re-verification of the reference scale accuracy, its weight shall be determined on the reference scale after the reference scale certification and before commencing the Automatic Bulk Weighing System material test.***

(f) **The test shall not be conducted if the weight of the test load has been affected by environmental conditions.**

***Note: Even if the reference scale is within maintenance tolerance it may require adjusting to be able to meet paragraph N.1.4.1. Accuracy of Material.**

N.1.4.1. Accuracy of Material. – The quantity of material used to conduct a material test shall be weighed on a reference scale to an accuracy within 1/3 of the smallest tolerance to be applied. Scales typically used for this purpose include Class III and III L scales or a scale without a class designation as described in Handbook 44, Section 2.20., Table T.1.1. Tolerances for Unmarked Scales.

N.1.4.2. Associated Equipment. – All associated equipment in local vicinity shall be in operation at time of test. This would include items such as conveyors; tote dumps, cleaning drums, rock separators, ect.

~~**N.1.4.**~~ **N.1.5. Zero-Balance or No-Load Reference Value Change Test.** – A test for change of zero-balance or no-load reference value shall be conducted on all scales after the removal of any test load. The change shall not be more than the minimum tolerance applicable.

~~N.1.5.~~ N.1.6. Discrimination Test. *– A discrimination test shall be conducted on all automatic indicating scales with the weighing device in equilibrium at zero-load and at maximum test load, and under controlled conditions in which environmental factors are reduced to the extent that they will not affect the results obtained.*

[Nonretroactive as of January 1, 1986]

~~N.1.5.1.~~ N.1.6.1. Digital Device. – On a digital device, this test is conducted from just below the lower edge of the zone of uncertainty for increasing-load tests, or from just above the upper edge of the zone of uncertainty for decreasing-load tests.

(Added 1987)

T.3. Basic Tolerance Values.

T.3.2. For Systems Used to Weigh Grain. – The basic maintenance tolerance shall be 0.1 % **and apply to both the** test load and **material test**.

T.3.3. For All Other Systems. – The basic maintenance tolerance shall be 0.2 % **and apply to both the** test load **and material test**.

(Amended 1986)

T.5. Repeatability.

T.5.1. Static Test Load – The results obtained by several weighings of the same load under reasonably static test conditions tests shall agree within the absolute value of the maintenance tolerance for that load, and shall be within applicable tolerances.

(Added 1986)

T.5.2. Material Test – variation in the values obtained during the conduct of material tests shall agree within the absolute value of the maintenance tolerance for that load, and shall be within applicable tolerances.

Background / Discussion:

Based on feedback from the previous year, the State of Oregon has submitted this modified proposal to be more consistent with OIML.

The purpose of this proposal to change the test and tolerances to reflect the way these devices are actually used. These are not “static” devices they are “dynamic”. Being dynamic they have many additional factors affecting their accuracy compared to static devices. Some of these additional factors are: timing of flow controls and conveyors, additional vibration from system while trying to capture weight, operation of software, characteristics of materials being weighed, environmental situations.

While evaluating Automatic Bulk Weighing Systems in the State of Oregon it was found that devices meeting static testing tolerances were in fact weighing with errors as high as 6%. Through investigation it was found that a high percentage of the Automatic Bulk Weighing Systems in the state were in fact weighing in error when operating in their normal dynamic mode. These same devices would of received approval using only static methods. Oregon reported in September 2015 that it continues to find issues with these devices that are not directly related to static calibration of the devices. Each new installation is initially static tested to establish a base line and then approved or disapproved based on the outcome of the material test.

The fundamentals of testing call for “testing as used” this proposal lays out a method to do exactly that “test as used”. Some facilities may find it difficult to accommodate the material test method. There may be substantial cost in restructuring facilities to allow for either the capture or introduction of test material. Furthermore, adopting this proposal would align with another dynamic device type; Belt Scales, NIST Handbook 44, Section 2.21.

2015 NCWM Interim Meeting
At the 2015 NCWM Interim Meeting, the SMA opposed this item and provided the following rationale for its position: This item should be addressed in the initial verification of the device and not affect the type evaluation testing procedures.

Mr. Doug Deiman (AK) stated that while the proposal provided by the State of Oregon is a serious issue that needs to be addressed, he could not support a material test as written and gave an example of a test of the fish scales commonly used in Alaska. Mr. Deiman illustrated that it would be necessary to procure thousands of pounds of fish to conduct each test and that the product would be largely destroyed in the process. He also noted that a test using substitute material would also be cumbersome and present a different set of problems. Mr. Deiman also pointed out that the material testing would largely be a waste of time, based on the data provided by the submitter which showed that gate timing was the problem on many of the test results. Mr. Deiman noted that gate timing is a process that is done outside the sealable parameters of the system and could easily be manipulated after the tests are performed. Mr. Deiman stated he could not give a recommendation to the Committee on a course of action but that he could not support the proposal as written.

Mr. Jeff McLaughlin (InterSystems, Inc.) provided comment in opposition to the proposal questioning how HB 44 tolerances can be applied to both static and material tests.

Mr. Richard Suiter (Richard Suiter Consulting) stated that he saw a lot of problems with the way the proposal was written. He voiced opposition to removing the static test from the ABWS Code and identified a number of concerns he had relating to the selection of a suitable reference scale as follows:

- the value of its minimum scale division (d);
- its degree of accuracy, and
- its location and distance from the ABWS that is to be tested.

Mrs. Tina Butcher (OWM) provided a summary of OWM's analysis of this item, which has been copied below and made available to the NCWM membership during the open hearings of the S&T Committee.

OWM Analysis S&T Item 324-1
A material test may have merit. The data provided by the State of Oregon during the 2014 Western Weights and Measures Association's Annual Meeting and included in their Annual Report seems to suggest that the results of a static test are not a true reflection of the accuracy of an ABWS when it is being operated in its normal automatic mode. For this reason, OWM encourages careful consideration be given when deciding the need for whether or not a material test should be part of the official examination of an ABWS. Although there are questions concerning the procedures used to collect the data, OWM believes that because of the magnitude of difference in the error when comparing results of static versus material tests, the concern being raised is worthy of additional investigation. OWM notes that a material test is part of Measurement Canada's Field Inspection Manual for ABWSs (referred to as "Bulk Weighing" or "Discontinuous Totalizing Devices") and of type evaluation criteria using OIML R 107 Discontinuous totalizing automatic weighting instruments (totalizing hopper weighers).

With regard to testing both statically (using physical standards) and dynamically (using reference material), OWM believes there may be value to both tests in that the results of each might be used to detect different problems within the system. For example, results of a static test might determine the accuracy of the scale and whether or not adjustment is necessary. If the static test proves the scale accurate, then inaccuracies detected during a material test might provide an indication of problems of another sort, e.g., improper venting, vibration, printing of unstable weight indications, etc. In considering the future possibility of HB 44 requiring both tests, the following are some unanswered questions raised by members of OWM's LMDP:

1. Should there be a different tolerance applied for each test, and if so, what should that tolerance be for each test?
2. What would be the proper use of adjustment required by a service technician when adjusting the scale to as close to zero error as practical?
3. Should the results of a static test be compared to the results of a material test and a repeatability tolerance applied? (OWM does not believe a repeatability tolerance should be applied to the results of different tests)

The following are some additional issues, concerns, comments, and questions identified by OWM as needing to be addressed, including additional follow-up work needed in consideration of this proposal:

1. How does one account for the loss of material caused by conveyance of the reference material, e.g., water loss, if weighing wet commodities such as fish, grain loss if using circulating augers to transfer, etc.? Guidelines for weighing and controlling the reference material will need to be developed.
2. Guidelines will also need to be established for determining the suitability and accuracy of the reference scale used to weigh the material used for the material test and the timing of the testing in relation to when material tests are conducted.
3. Can we get more comparison data for other commodities?
4. Should the material test be optional? This item isn't ready for vote – the issue needs more investigation.
5. How many material tests need to be conducted considering the weight/varieties of commodities weighed?

As a final note pertaining to proposed paragraph N.1.1.1. Accuracy of Material, OWM wishes to point out that it would not be appropriate to use material weighed to an accuracy within 0.1 percent as a standard in testing another scale that has an applicable tolerance of 0.05 percent (the current basic acceptance tolerance applicable to an ABWS used to weigh grain) or 0.1 percent (the current basic acceptance tolerance applicable to an ABWS used to weigh products other than grain). The Fundamental Considerations of HB 44 require the combined error and uncertainty of any standard used without correction to be less than one-third the applicable tolerance of the device being tested. In the case of a material test, the material that gets weighed on a suitable reference scale becomes the standard in testing when conducting the material tests. Thus, to be able to meet this requirement for use as a standard in testing an ABWS used to weigh grain, the maximum combined error and uncertainty of the material would need to be less than 0.033 percent of its actual weight if applying basic acceptance tolerance (i.e., a value smaller than the quotient resulting from dividing 0.1 percent by 3) unless corrections are made.

In discussing this item, several members of the Committee voiced disappointment that the submitter of the item was not present at the meeting to provide additional information concerning the data that had been collected or to answer questions regarding the proposal. The Committee initially considered withdrawing the item, but chose to assign it a Developing status in consideration of the large weighing errors reported, which were allegedly caused by weighing product using an ABWS in automatic operation soon after the scale portion of the ABWS that had been tested statically and approved. In assigning the Developing status, the Committee wanted to provide the submitter the opportunity to develop the proposal further and receive additional input form the regional weights and measures associations.

2015 NCWM Annual Meeting
At the 2015 NCWM Annual Meeting, Mr. Steve Harrington (OR) reported that Oregon's development of the item is ongoing. He asked that the Committee maintain its Developing status of the item to allow sufficient time for the State of Oregon to complete a more detailed proposal.

Mr. Russ Vires (Mettler-Toledo, LLC), speaking on behalf of the SMA reported that the SMA opposes the item. The SMA believes this item should be addressed in the initial verification of the device and not affect the type evaluation testing procedures.

A county official from the State of California commented that ABWS testing needs to start with a static test. A material test should be optional at the discretion of the official.

Mrs. Tina Butcher (OWM) commented that OWM acknowledges it may not be practical to perform a material test on all ABWSs due to the large capacities of some systems and/or the types of commodities weighed. This point should be considered when further developing any proposal to add a material test to the ABWS Code of HB 44, including when a test would be required; and when a test would be at the discretion of an official.

Mrs. Butcher noted that a material test is part of Measurement Canada's Field Inspection Manual for ABWSs and the international type evaluation criteria included in OIML R 107. MC usually conducts both static and material tests on ABWSs at facilities receiving inbound grain from the field. MC's S&T advisor reported that MC officials do NOT conduct a material test on *all* ABWSs. Two examples where a material test is *not* typically performed:

1) some larger capacity ABWSs (e.g., systems at export terminals used to weigh grain for ship loading); and

2) ABWSs used to weigh fish being received in bulk from commercial fishing vessels.

Mrs. Butcher also reiterated many of the more significant points OWM had made in its analysis of the item for the 2015 Interim Meeting as follows:

- A material test may have merit. Data provided by the State of Oregon at the 2014 WWMA meeting seems to suggest that the results of a static test are not a true reflection of the accuracy of an ABWS in normal operation.

- Careful consideration should be given when deciding the need for whether or not a material test should be part of the official examination of an ABWS. The magnitude of difference in the error being reported when comparing results of static versus material tests makes it is worthy of additional investigation.

- There may be value to testing both statically (using physical standards) and dynamically (using reference material).

- With regard to proposed paragraph N.1.1.1. Accuracy of Material, it would be inappropriate to use material weighed to an accuracy within 0.1 percent as a standard in testing another scale that has an applicable tolerance of 0.05 percent (the current basic acceptance tolerance applicable to an ABWS used to weigh grain) or 0.1 percent (the current basic acceptance tolerance applicable to an ABWS used to weigh products other than grain).

She also reiterated many of issues, concerns, comments, and questions identified by members of OWM's Legal Metrology Devices Program (LMDP) as needing to be addressed in its analysis of this item leading up the NCWM Interim meeting as follows:

- Should there be a different tolerance applied for the different tests (static & material), and if so, what should the tolerance be for each test?

- What would be the proper use of adjustment required by a service technician when adjusting the scale to as close to zero error as practical?

- Should the results of a static test be compared to the results of a material test and a repeatability tolerance applied? (OWM does not believe a repeatability tolerance should be applied to the results of different tests)

- Guidelines for weighing and controlling the reference material will need to be developed that provides instructions including: how to account for the loss of material caused by conveyance of the reference material (e.g., water loss, if weighing wet commodities such as fish, grain loss if using circulating augers to transfer, etc.), and will tests need to be performed using all types of materials (products) that are weighed by the system?

- Guidelines will also need to be established for determining the suitability and accuracy of the reference scale used to weigh the material used for the material test and the timing of the reference scale testing in relation to when material tests are conducted.

- Is it possible to collect additional data for the weighing of other commodities (e.g., grain, seed, coal) in this type of system?

In consideration of the comments received in support of this item and its ongoing development, the Committee agreed to maintain the Developing status of this item on its agenda.

Regional Association Comments:
At its 2014 Interim Meeting, CWMA received a comment from an industry representative suggesting retaining the stricken language and potentially using the new language as a supplemental test method. The CWMA reported to the NCWM that it was unable to consider the item at this time, yet noted that it supported the development of this item. At the 2015 CWMA Annual Meeting, the SMA opposed this item providing the rationale that the issue should be addressed in the initial verification of the device and not affect the type evaluation testing procedures. The CWMA agreed to recommend the item move forward as a Developing item based on the CWMA's S&T Committee's support for continued development.

Testimony was provided both for and against the proposal at the 2014 WWMA Annual Meeting. Several concerns were raised with the elimination of static testing in the original proposal. The item was updated based on these concerns to include both static and dynamic testing. In addition, the proposal will more closely align Handbook 44 with OIML recommendations. The WWMA forwarded the item to NCWM and recommended it as a Voting item as amended below:

N.1.4. Material Tests. – Material used for test must be the actual material weighed by system or similar in nature. Material tests should be conducted using actual scale loading conditions. These loading conditions shall include, three accumulation tests consisting of three loadings at maximum capacity for the material and a partial loading of between 30% and 50% (three and a partial loadings).

On subsequent verifications, at least two individual tests shall be conducted. The results of all tests shall be within tolerance limits.

Either pass a quantity of pre-weighed material through the Automatic Bulk Weighing system in a manner as similar as feasible to actual loading conditions, or weigh all material that has passed through the Automatic Bulk Weighing System. Means for weighing the material test load will depend on the capacity of the system and availability of a suitable scale for the test. To assure that the test load is accurately weighed and determined, the following precautions shall be observed:

(a) **The containers, whether railroad cars, trucks, or boxes, must not leak, and shall not be overloaded to the point that material will be lost.**

(b) **The actual empty or tare weight of the containers shall be determined at the time of the test. Stenciled tare weight of railway cars, trucks or boxes shall not be used. Gross and tare weights shall be determined on the same scale.**

(c) **When a pre-weighed test load is passed through the scale, the loading system shall be examined before and after the test to assure that the system is empty and that only the material of the test load has passed through the scale.**

(d) **Where practicable, a reference scale should be tested within 24 hours preceding the determination of the weight of the test load used for an Automatic Bulk Weighing System material test.**

A reference scale which is not "as found" within maintenance tolerance should have its accuracy re-verified after the Automatic Bulk Weighing System test with a suitable known weight load if the "as found" error of the Automatic Bulk Weighing System material test exceeds maintenance tolerance values.*

(e) **If any suitable known weight load other than a certified test weight load is used for re-verification of the reference scale accuracy, its weight shall be determined on the reference scale after the reference scale certification and before commencing the Automatic Bulk Weighing System material test.***

(f) **The test shall not be conducted if the weight of the test load has been affected by environmental conditions.**

*Note: Even if the reference scale is within maintenance tolerance it may require adjusting to be able to meet paragraph N.1.1.1. Accuracy of Material.

N.1.4.1. Accuracy of Material. – The quantity of material used to conduct a material test shall be weighed on a reference scale to an accuracy within 0.1 %. Scales typically used for this purpose include Class III and III L scales or a scale without a class designation as described in Handbook 44, Section 2.20., Table T.1.1. Tolerances for Unmarked Scales.

N.1.4.2. Associated Equipment. – All associated equipment in local vicinity shall be in operation at time of test. This would include items such as conveyors; tote dumps, cleaning drums, rock separators, etc.

~~**N.1.4.**~~ **N.1.5. Zero-Balance or No-Load Reference Value Change Test.** – A test for change of zero-balance or no-load reference value shall be conducted on all scales after the removal of any test load. The change shall not be more than the minimum tolerance applicable.

~~***N.1.5.***~~ ***N.1.6. Discrimination Test.*** *– A discrimination test shall be conducted on all automatic indicating scales with the weighing device in equilibrium at zero-load and at maximum test load, and under controlled conditions in which environmental factors are reduced to the extent that they will not affect the results obtained.*

[Nonretroactive as of January 1, 1986]

~~**N.1.5.1.**~~ **N.1.6.1. Digital Device.** – On a digital device, this test is conducted from just below the lower edge of the zone of uncertainty for increasing-load tests, or from just above the upper edge of the zone of uncertainty for decreasing-load tests.

(Added 1987)

T.3. Basic Tolerance Values.

T.3.2. For Systems Used to Weigh Grain. – The basic maintenance tolerance shall be 0.1 % ~~of~~ **and apply to both the** test load **and material test**.

T.3.3. For All Other Systems. – The basic maintenance tolerance shall be 0.2 % ~~of~~ **and apply to both the** test load **and material test.**

(Amended 1986)

T.5. Repeatability.

T.5.1. Static Test Load – The results obtained by several weighings of the same load under reasonably static test conditions tests shall agree within the absolute value of the maintenance tolerance for that load, and shall be within applicable tolerances.

(Added 1986)

T.5.2. Material Test – variation in the values obtained during the conduct of material tests shall agree within the absolute value of the maintenance tolerance for that load, and shall be within applicable tolerances.

At its 2014 Annual Meeting, SWMA recommended forwarding the language as drafted by the submitter after the Western Regional Meeting to the NCWM S&T so long as it is an optional test and recommended that the item be a Voting Item.

NEWMA reported, at its 2014 Interim Meeting, it believes the justification for the proposal has merit. NEWMA recommended the item be forwarded to the NCWM for vote. At its 2015 Annual Meeting, NEWMA's S&T Committee indicated more work needs to be completed on this item and recommended it remain in a "Developing" status. Consequently, NEWMA agreed to recommend the item move forward as a Developing item.

SWMA Action: Item 322-1
Summary of comments considered by the regional committee (in writing or during the open hearings):
No comments were received during the open hearings, but a written communication expressing concerns over the procedure was received and posted online.
Item as proposed by the regional committee: ***(If different than agenda item)***
No change.
Committee recommendation to the region: ☐ Voting Item on the NCWM Agenda ☐ Information Item on the NCWM Agenda ☐ Withdraw the Item from the NCWM Agenda (*In the case of new items, do not forward to NCWM)* ☒ Developing Item on the NCWM Agenda *(To be developed by source)*
Reasons for the committee recommendation:
The Committee has heard several concerns during past meetings and received a written communication before this meeting expressing concerns over the proposed procedures. The Committee looks for further development of the item by the submitter.
COMPLETE SECTION BELOW FOLLOWING VOTING SESSION
Final updated or revised proposal from the region: ***(If different than regional committee recommendation)***
No change.
Regional recommendation to NCWM for item status: ☐ Voting Item on the NCWM Agenda ☐ Information Item on the NCWM Agenda ☐ Withdraw the Item from the NCWM Agenda (*In the case of new items, do not forward to NCWM)* ☒ Developing Item on the NCWM Agenda *(To be developed by source)* ☐ Unable to consider at this time *(Provide explanation in the "Additional Comments" section below)*
Regional Report to NCWM: Please provide your report in this section exactly how you want it to appear in the NCWM reports to represent your region's considerations, support or opposition, and recommendations. **This will replace any previous reports from your region on this item.**
The Committee has heard several concerns during past meetings and received a written communication before this meeting expressing concerns over the proposed procedures. The Committee looks for further development of the item by the submitter.

Additional letters, presentations and data may have been part of the committee's consideration. Please refer to http://www.ncwm.net/meetings/interim/publication-15 to review these documents.

325 WEIGH-IN-MOTION SYSTEMS USED FOR VEHICLE ENFORCEMENT SCREENING

New Item 30 A. Application. and Sections Throughout the Code to Address Commercial and Law Enforcement Applications

Source:
Rinstrum, Inc and Right Weigh Innovations (2016)

Purpose:
To recognize a higher accuracy class and appropriate requirements in the Weighing-In-Motion Tentative Code to add commercial and law enforcement applications. In particular, scales meeting the higher accuracy classes would be permitted for use in commercial applications and for highway law enforcement.

Item Under Consideration:
Amend NIST Handbook 44, Weigh-In-Motion Systems Tentative Code as follows:

A.1. General. – This code applies to systems used to weigh vehicles~~,~~ while in motion~~.~~**.**

(a) For the purpose of screening and sorting the vehicles based on the vehicle weight to determine if a static weighment is necessary.
(b) For commercial legal for trade applications.
(c) For direct law enforcement applications.

A.2. Axle-Load Scales – The requirements for axle-load scales apply to such scales in official use for the enforcement of traffic and highway laws or for the collection of statistical information by government agencies and axle-load scales that meet the requirements of the Tentative Code for commercial use.

A.~~2~~ 3. The code does not apply to weighing systems intended **only** for the collection of statistical traffic data.

A.~~3~~ 4.Additional Code Requirements. – In addition to the requirements of this code, Weigh-In-Motion ~~Screening~~ Systems shall meet the requirements of Section 1.10. General Code.

S. Specifications

S.1. Design of Indicating and Recording Elements and of Recorded Representations.

S.1.1. Ready Indication. – The system shall provide a means of verifying that the system is operational and ready for use.

S.1.2. Value of System Division Units. – The value of a system division "d" expressed in a unit of weight shall be equal to:

(a) 1, 2, or 5; or

(b) a decimal multiple or submultiple of 1, 2, or 5.

Examples: divisions may be 10, 20, 50, 100; or 0.01, 0.02, 0.05; or 0.1, 0.2, 0.5, etc.

S.1.2.1. Units of Measure. – The system shall indicate weight values using only a single unit of measure.

S.1.3. Maximum Value of Division Size. – ~~The value of the system division "d" for a Class A, Weight-In-Motion System shall not be greater than 50 kg (100 lb).~~

(a) The value of the system division "d" for a Class A, Weigh-In-Motion System shall not be greater than 50 kg (100 lb).

(b) The value of the system division for "d" for a Class B or III L, Weigh-In-Motion System shall not be greater than 10kg (20lb).

S.1.4. Value of Other Units of Measure.

S.1.4.1. Speed. – Vehicle speeds shall be measured in miles per hour or kilometers per hour.

S.1.4.2. Axle-Spacing (Length). – **If applicable** ~~T~~**t**he center-to-center distance between any two successive axles shall be measured in:

(a) feet and inches;
(b) feet and decimal submultiples of a foot; or
(c) meters and decimal submultiples of a meter.

S.1.4.3. Vehicle Length. – If the system is capable of measuring the overall length of the vehicle, the length of the vehicle shall be measured in feet and/or inches, or meters.

S.1.5. Capacity Indication. – An indicating or recording element shall not display nor record any values greater than 105% of the specified capacity of the load receiving element.

S.1.6. Identification of a Fault. – Fault conditions shall be presented to the operator in a clear and unambiguous means. The following fault conditions shall be identified:

(a) Vehicle speed is below the minimum or above the maximum speed as specified.
(b) The maximum number of vehicle axles as specified has been exceeded.
(c) A change in vehicle speed greater than that specified has been detected.

S.1.7. Recorded Representations.

S.1.7.1. Values to be Recorded. – At a minimum, the following values shall be printed and/or stored electronically for each vehicle weighment:

(a) transaction identification number;
(b) lane identification (required if more than one lane at the site has the ability to weigh a vehicle in-motion);
(c) vehicle speed;
(d) number of axles;
(e) weight of each axle;
(f) **if applicable** identification and weight of axles groups;
(g) **if applicable** axle spacing;
(h) total vehicle weight;
(i) all fault conditions that occurred during the weighing of the vehicle;
(j) **if applicable** violations, as identified in paragraph S.2.1., that occurred during the weighing of the vehicle; and
(k) time & date.

S.1.8. Value of the Indicated and Recorded System Division. – The value of the system's division "(d)", as recorded, shall be the same as the division value indicated.

S.2. System Design Requirements.

S.2.1. Violation Parameters. – **If applicable,** ~~T~~**t**he instrument shall be capable of accepting user entered violation parameters for the following items:

(a) single axle weight limit;

(b) axle group weight limit;
(c) gross vehicle weight limit; and
(d) bridge formula maximum.

The instrument shall display and or record violation conditions when these parameters have been exceeded.

S.3. Design of Weighing Elements.

S.3.1. Multiple Load-Receiving Elements. –An instrument with a single indicating or recording element, or a combination indicating-recording element, that is coupled to two or more load-receiving elements with independent weighing systems, shall be provided with means to prohibit the activation of any load-receiving element (or elements) not in use, and shall be provided with automatic means to indicate clearly and definitely which load receiving element (or elements) is in use.

S.4. Design of Weighing Devices, Accuracy Class.

S.4.1. Designation of Accuracy. – ~~WIM Systems meeting the requirements of this code shall be designated as accuracy Class A.~~

(a) WIM Systems for screening and sorting, meeting the requirements of this code shall be designated as accuracy Class A.
(b) WIM Systems for commercial and law enforcement applications, meeting the requirements of this code shall be designated.

(1) Class III L for the dynamic gross vehicle weight calculations
(2) Class B for dynamic law enforcement applications

Note: This does not preclude ~~higher~~ **other** accuracy classes from being proposed and added to this Code in the future when it can be demonstrated that WIM systems grouped within those accuracy classes can achieve the ~~higher~~ level of accuracy specified for those devices.

S.5. Marking Requirements. – In addition to the marking requirements in G-S.1. Identification (except G.S.1.(e)), the system shall be marked with the following information:

(a) Accuracy Class;
(b) Value of the System Division "d";
(c) Operational Temperature Limits;
(d) Number of Instrumented Lanes (not required if only one lane is instrumented.);
(e) Minimum and Maximum Vehicle Speed;
(f) Maximum Number of Axles per Vehicle;
(g) Maximum Change in Vehicle Speed during Weighment; and
(h) Minimum and Maximum Load.

S.5.1. Location of Marking Information. – The marking information required in G-S.1. of the General Code and S.5. shall be visible after installation. The information shall be marked on the system or recalled from an information screen.

N. Notes

N.1. Test Procedures.

N.1.1. Selection of Test Vehicles. – All dynamic testing associated with the procedures described in each of the subparagraphs of N.1.5 shall be performed with a minimum of two test vehicles.

(a) The first test vehicle may be a two axle, six tire, single unit truck; that is, a vehicle with two axles with the rear axle having dual wheels. The vehicle shall have a ~~maximum~~ **minimum** Gross Vehicle Weight of 10,000 lbs.
(b) The second test vehicle shall be a ~~five axle,~~ single trailer truck with a maximum Gross Vehicle Weight of
80,000 lbs.

Note: Consideration should be made for testing the systems using vehicles which are typical to the systems daily operation.

N.1.1.1. Weighing of Test Vehicles. – All test vehicles shall be weighed on a reference scale before being used to conduct the dynamic tests.

N.1.1.2. Determining Reference Weights for Axle, Axle Groups and Gross Vehicle Weight. – The reference weights shall be the average weight value of a minimum of three static weighments of all single axle, axle groups and gross vehicle weight.

Note: The axles within an axle group **weighed only as an axle group** are not considered single axles.

N.1.2. Test Loads.

N.1.2.1. Static Test Loads. – All static test loads shall use certified test weights

N.1.2.2. Dynamic Test Loads. – Test vehicles used for dynamic testing shall be loaded to 85 to 95% of their legal maximum Gross Vehicle Weight **or as typical in normal use.** The "load" shall be non-shifting and shall be positioned to present as close as possible, an equal side-to-side load.

~~**N.1.3. Reference Scale.** – Each reference vehicle shall be weighed statically on a multiple platform vehicle scale comprised of three individual weighing/load-receiving elements, each an independent scale. The three individual weighing/load receiving elements shall be of such dimension and spacing to facilitate 1) the single-draft weighing of all reference test vehicles, and 2) the simultaneous weighing of each single axle and axle group of the reference test vehicles on different individual elements of the scale; gross vehicle weight determined by summing the values of the different reference axle and reference axle groups of a test vehicle. The scale shall be tested immediately prior to using it to establish reference test loads and in no case more than 24 hours prior. To qualify for use as a suitable reference scale, it must meet NIST Handbook 44, Class III L maintenance tolerances.~~

N.1.3. Reference Scale. – Each reference vehicle shall be weighed statically on a certified scale to determine the Gross Vehicle Weight. To qualify for use as a suitable reference scale, it must meet NIST Handbook 44, Class III L maintenance tolerances. The scale shall be tested immediately prior to using it to establish reference test loads and in no case more than 24 hours prior.

(a) For law enforcement applications the reference vehicle shall be weighed on a certified multiple platform vehicle scale comprised of three individual weighing/load-receiving elements, each an independent scale. The three individual weighing/load receiving elements shall be of such dimension and spacing to facilitate 1) the single-draft weighing of all reference test vehicles, and 2) the simultaneous weighing of each single axle and axle group of the reference test vehicles on different individual elements of the scale; gross vehicle weight determined by summing the values of the different reference axle and reference axle groups of a test vehicle.

Note: If the distance to an off-site reference scale will significantly impact the accuracy of the reference weights then the scale under test may be used as the reference scale.

(b) For commercial applications for the gross vehicle weight calculations only, the reference vehicle shall be weighed statically on either the same scale, a certified multiple platform vehicle scale or a single platform vehicle scale with sufficient length to accommodate single draft weighing of the reference vehicle

N.1.3.1. Location of a Reference Scale. – The location of the reference scale must be considered as vehicle weights
will change due to fuel consumption.

N.1.4. Test Speeds. – All dynamic tests shall be conducted within 20% **above the rated minimum and 20%** below **the rated maximum speed limits.**

N.1.5. Test Procedures. For law enforcement scales.

N.1.5.1. Static Test Procedures. - For Type Approval Evaluation and initial verification the axle-load scale designed for commercial use shall be tested statically to Handbook 44 Class III Tolerances. For subsequent verification the scale will be tested to Handbook 44 Class III L maintenance tolerances.

N.1.5.~~1~~2. Dynamic Load Test. – The dynamic test shall be conducted using the test vehicles defined in N.1.1. The test shall consist of a minimum of 20 runs for each test vehicle at the speed as stated in N.1.4.

At the conclusion of the dynamic test there will be a minimum of 20 weight readings for each single axle, axle group and gross vehicle weight of the test vehicle. The tolerance for each weight reading shall be based on the percentage values specified in Table T.2.2.

N.1.5.~~2~~3. Vehicle Position Test. – During the conduct of the dynamic testing ensure that the vehicle stays within the defined roadway along the width of the sensor. The test shall be conducted with 10 runs with the vehicle centered along the width of the sensor, 5 runs with the vehicle on the right side along the width of the sensor, and 5 runs with the vehicle on the left side along the width of the sensor. Only gross vehicle weight is used for this test and the tolerance for each weighment shall be based on the tolerance value specified in T.2.3.

N.1.5.~~3~~4. Axle Spacing Test. – The axle spacing test is a review of the displayed and/or recorded axle spacing distance of the test vehicles. The tolerance value for each distance shall be based on the tolerance value specified in T.2.4.

N.1.6. Test Procedure for Commercial Gross Vehicle Weight Calculation Scales.

N.1.6.1. As-Used Test Procedures. – A weighing system shall be tested in a manner that represents the normal method of operation.

N.1.6.2. Static Test Procedures. - For Type Approval Evaluation and initial verification the axle-load scale designed for commercial use shall be tested statically to Handbook 44 Class III Tolerances. For subsequent verification the scale will be tested to Handbook 44 Class III L maintenance tolerances.

N.1.6.3. Dynamic Test. – The dynamic test shall be conducted using the test vehicles defined in N.1.1. The test shall consist of a minimum of 5 runs for each test vehicle at the speed as stated in N.1.4.

At the conclusion of the dynamic test there will be a minimum of 5 weight readings for the gross vehicle weight of the test vehicle. The tolerance for each weight reading shall be based on Handbook 44 Class III L maintenance tolerances.

T. Tolerances

T.1. Principles.

T.1.1. Design. – The tolerance for a weigh-in-motion system is a performance requirement independent of the design principle used.

T.2. Tolerance Values for Accuracy Class A.

T.2.1. To Tests Involving Digital Indications or Representations – To the tolerances that would otherwise be applied in paragraphs T.2.2 and T.2.3, there shall be added an amount equal to one-half the value of the scale division to account for the uncertainty of digital rounding.

T.2.2. Tolerance Values for Dynamic Load Tests for Screening and Sorting devices. – The tolerance values applicable during dynamic load testing are as specified in Table T.2.2

Table T.2.2. – Tolerance for Accuracy Class A	
Load Description*	**Tolerance as a Percentage of Applied Test Load**
Axle Load	±20%
Axle Group Load	±15%
Gross Vehicle Weight	±10%
* No more than 5% of the weighments in each of the load description subgroups shown in this table shall exceed the applicable tolerance.	

T.2.3. Tolerance Value for Vehicle Position Test. – The tolerance value applied to each gross vehicle weighment is ±10% of the applied test load.

T.2.4. Tolerance Value for Axle Spacing. – The tolerance value applied to each axle spacing measurement shall be ± 0.15 meter (0.5 feet).

T.3. Tolerance Values for Dynamic Weighing Systems Used Commercially and for Direct Law Enforcement. -The tolerance values applicable during dynamic load testing are as specified in Table T.2.2

Table T.3. – Tolerance for Commercial and Law Enforcement Dynamic Scales.	
Load Description	**Tolerance as a Percentage of Applied Test Load**
Axle Load	**±0.5%**
Axle Group Load	**±1%**
Gross Vehicle Weight	**Class III L Maintenance Tolerance**

T.~~3~~.4. Influence Factors. – The following factors are applicable to tests conducted under controlled conditions only.

T.~~3~~4.1. Temperature. – Systems shall satisfy the tolerance requirements under all operating temperature unless a limited operating temperature range is specified by the manufacturer.

T.4~~5~~. Radio Frequency Interference (RFI) and Other Electromagnetic Interference Susceptibility. – The difference between the weight indication due to the disturbance and the weight indication without the disturbance shall not exceed the tolerance value as stated in Table T.2.2. **or Table T.3 as applicable.**

UR. USER REQUIREMENTS

UR.1. Selection Requirements. – Equipment shall be suitable for the service in which it is used with respect to elements of its design, including but not limited to, its capacity, number of scale divisions, value of the scale division or verification scale division and minimum capacity.

UR.1.1. General

The typical class or type of device for particular weighing applications is shown in Table 1. Typical Class or Type of Device for Weighing Applications.

Table 1.
Typical Class or type of Device for Weighing Applications

Class	Weighing Application
A	Screening and sorting of vehicles based on axle, axle group and gross vehicle weight.
B	**Dynamic law enforcement axle, axle group and gross vehicle weight.**
III L	**Commercial and direct law enforcement**
Note: A WIM system with a higher accuracy class than that specified as "typical" may be used.	

UR.2. User Location Conditions and Maintenance. – The system shall be installed and maintained as defined in the manufacturer's recommendation.

UR.2.1. System Modification. – The dimensions (e.g., length, width, thickness, etc.) of the load receiving element of a system shall not be changed beyond the manufacturer's specifications, nor shall the capacity of a scale be increased beyond its design capacity by replacing or modifying the original primary indicating or recording element with one of a higher capacity, except when the modification has been approved by a competent engineering authority, preferably that of the engineering department of the manufacturer of the system, and by the weights and measures authority having jurisdiction over the system.

UR.2.2. Foundation, Supports, and Clearance. – The foundation and supports shall be such as to provide strength, rigidity, and permanence of all components.
On load-receiving elements which use moving parts for determining the load value, clearance shall be provided around all live parts to the extent that no contacts may result when the load-receiving element is empty, nor throughout the weighing range of the system.

UR.2.3. Access to Weighing Elements. – If necessary, adequate provision shall be made for inspection and maintenance of the weighing elements.

UR.2.4. Axle-Load Scales Approaches. – At each end of an axle-load scale there shall be a straight, paved, and level approach in the same plane as the platform. The approaches shall be the same width as the platform and of sufficient length to insure the level positioning of vehicles on the approaches throughout the weighing process.

UR.3. Maximum Load. – A system shall not be used to weigh a load of more than the marked maximum load of the system.

Background/Discussion:
The proposed requirements are based in part on requirements in OIML R 134, **"Automatic instruments for weighing road vehicles in motion and measuring axle loads."** Test data and experience at multiple test sites demonstrate this system can meet the performance requirements that are proposed.

SWMA Action: New Item 30
Summary of comments considered by the regional committee (in writing or during the open hearings):
The submitter of the item provided a presentation during the open hearings and numerous questions and concerns were raised following the presentation. State representatives from Florida and Arkansas expressed concerns over the speed (both maximum speed and how verified); use of the term "law enforcement" in the specific code; and over the laps (number and type) required. Mr. Dick Suiter (Richard Suiter Consulting) stated that he has worked with the submitter and the Western Region had some really good suggestions and moved the item forward as Developmental. Further the Central and Northeast recommended moving forward as a Voting Item and he would recommend the Southern Region do the same. Mr. Rick Harshman (NIST) asked questions about the reference vehicle repeatability. Further he recommended seeing support of the Weigh In Motion Workgroup, to which he is a member. Mr. Steve Langford (Cardinal Scale Manufacturing Company) stated he is a member of the Weigh In Motion Workgroup and supports the development of this item. Mr. Hal Prince (FL) asked why this wasn't discussed within the Workgroup previously since they just passed a tentative code this past July, which was only for screening purposes. He further expressed concerns for the use in states that have review boards who decide the outcome for cases challenging the assessment of overweight penalties. Mr. Prince further stated that if this was of a lower accuracy class than a static scale that would most certainly lead to overturning cases when compared to static scale measurements. In response, Mr. Langford cited a case where the violation was overturned and prompted the need for something beyond a screening technique. Mr. Suiter also added that he believed the tolerances were actually tighter.
Item as proposed by the regional committee: ***(If different than agenda item)***
No change.
Committee recommendation to the region: ☐ Voting Item on the NCWM Agenda ☐ Information Item on the NCWM Agenda ☐ Withdraw the Item from the NCWM Agenda (*In the case of new items, do not forward to NCWM)* ☒ Developing Item on the NCWM Agenda *(To be developed by source)*
Reasons for the committee recommendation:
The Committee feels the item has merit, but needs further development through the Weigh In Motion Workgroup.
COMPLETE SECTION BELOW FOLLOWING VOTING SESSION
Final updated or revised proposal from the region: ***(If different than regional committee recommendation)***
No change.

Regional recommendation to NCWM for item status: ☐ Voting Item on the NCWM Agenda ☐ Information Item on the NCWM Agenda ☐ Withdraw the Item from the NCWM Agenda (*In the case of new items, do not forward to NCWM)* ☒ Developing Item on the NCWM Agenda *(To be developed by source)* ☐ Unable to consider at this time *(Provide explanation in the "Additional Comments" section below)*
Regional Report to NCWM: Please provide your report in this section exactly how you want it to appear in the NCWM reports to represent your region's considerations, support or opposition, and recommendations. **This will replace any previous reports from your region on this item.**
The Committee feels the item has merit, but needs further development through the Weigh In Motion Workgroup.

Additional letters, presentations and data may have been part of the committee's consideration. Please refer to http://www.ncwm.net/meetings/interim/publication-15 to review these documents.

New Item 5 **This Item was withdrawn by Submitter**

New Item 6 **This Item was withdrawn by Submitter**

330 LIQUID MEASURING DEVICES

New Item 34 S.1.6.3. Return to Zero (See Related New Items 35 and 36)

Source:
Maryland (2016)

Purpose:
Prohibit operation of the reset mechanism during delivery.

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

S.1.6.3. Return to Zero.

(a) The primary indicating elements, and primary recording elements if the device is equipped to record, shall be readily returnable to a definite zero indication. However, a key-lock operated or other self-operated device may be equipped with cumulative indicating or recording elements, provided that it is also equipped with a zero-return indicating element.

(b) It shall not be possible to return primary indicating elements, or primary recording elements beyond the correct zero position.

(c) A reset mechanism for the indicating element shall not be operable during a delivery.

(Amended 1972 and 20XX**)**

Background/Discussion:
While many devices include a provision to prevent the reset operation from occurring during a delivery, this language is not directly specified in all measuring codes. Consequently, the proposals include suggested language to add this provision to the LMD, VTM, and LPG & NH3 codes.

SWMA Action: New Item 34
Summary of comments considered by the regional committee (in writing or during the open hearings):
This item was grouped in a batch consisting of New items #34-#36 and all items were heard together. Mr. Michael Keilty (Endress Hauser Flowtec) asked if this was already covered. The submitter responded that they thought it was too initially, but turns out it was not. He added that these three items were to harmonize the codes as well.
Item as proposed by the regional committee: ***(If different than agenda item)***
No change.
Committee recommendation to the region: ☒ Voting Item on the NCWM Agenda ☐ Information Item on the NCWM Agenda ☐ Withdraw the Item from the NCWM Agenda (*In the case of new items, do not forward to NCWM)* ☐ Developing Item on the NCWM Agenda *(To be developed by source)*
Reasons for the committee recommendation:
This item was grouped in a batch consisting of New items #34-#36 and all items were heard together. The Committee feels the items have merit and should be moved forward as a voting item.
COMPLETE SECTION BELOW FOLLOWING VOTING SESSION
Final updated or revised proposal from the region: ***(If different than regional committee recommendation)***
No change.
Regional recommendation to NCWM for item status: ☒ Voting Item on the NCWM Agenda ☐ Information Item on the NCWM Agenda ☐ Withdraw the Item from the NCWM Agenda (*In the case of new items, do not forward to NCWM)* ☐ Developing Item on the NCWM Agenda *(To be developed by source)* ☐ Unable to consider at this time *(Provide explanation in the "Additional Comments" section below)*
Regional Report to NCWM: Please provide your report in this section exactly how you want it to appear in the NCWM reports to represent your region's considerations, support or opposition, and recommendations. **This will replace any previous reports from your region on this item.**
This item was grouped in a batch consisting of New items #34-#36 and all items were heard together. The Committee feels the items have merit and should be moved forward as a voting item.

Additional letters, presentations and data may have been part of the committee's consideration. Please refer to http://www.ncwm.net/meetings/interim/publication-15 to review these documents.

New Item 29 S.X.X Card Operated Retail Motor Fuel Devices

Source:
North Carolina (2016)

Purpose:
To clarify justification of testing 3 minute time out for credit card operated RMFD.

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

> **S.X.X Card Operated Retail Motor Fuel Devices. – Within three minutes after the card has been accepted and the device has been authorized, if the device is not activated or there is no initial product dispensed, the device must de-authorize. Re-authorization of the device must be performed before any product can be dispensed. If the time limit to de-authorize the device is programmable, it shall not accept an entry greater than three minutes.**

Background/Discussion:
This paragraph is represents how the feature is tested in an NTEP evaluation in accordance with the NCWM Publication 14 checklist. However, it is not clearly supported by Handbook 44. General Code, paragraph G-S.2. Facilitation of Fraud is vague on this issue. There is great concern regarding the use of credit cards and the potential for accidental or intentional fraud.

SWMA Action: New Item 29
Summary of comments considered by the regional committee (in writing or during the open hearings):
No comments were received on this item.
Item as proposed by the regional committee: ***(If different than agenda item)***
No change.
Committee recommendation to the region: ☒ Voting Item on the NCWM Agenda ☐ Information Item on the NCWM Agenda ☐ Withdraw the Item from the NCWM Agenda (*In the case of new items, do not forward to NCWM)* ☐ Developing Item on the NCWM Agenda *(To be developed by source)*
Reasons for the committee recommendation:
The Committee recommends moving this item forward as a voting item.
COMPLETE SECTION BELOW FOLLOWING VOTING SESSION
Final updated or revised proposal from the region: ***(If different than regional committee recommendation)***
No change.
Regional recommendation to NCWM for item status: ☒ Voting Item on the NCWM Agenda ☐ Information Item on the NCWM Agenda ☐ Withdraw the Item from the NCWM Agenda (*In the case of new items, do not forward to NCWM)* ☐ Developing Item on the NCWM Agenda *(To be developed by source)* ☐ Unable to consider at this time *(Provide explanation in the "Additional Comments" section below)*
Regional Report to NCWM: Please provide your report in this section exactly how you want it to appear in the NCWM reports to represent your region's considerations, support or opposition, and recommendations. **This will replace any previous reports from your region on this item.**
The Committee recommends moving this item forward as a voting item.

Additional letters, presentations and data may have been part of the committee's consideration. Please refer to http://www.ncwm.net/meetings/interim/publication-15 to review these documents.

330-1 D N.4.2.5. Determination of Error on Wholesale Devices with Multiple Flow Rates and Calibration Factors

Source:
Minnesota Weights and Measures Division (2014)

Purpose:
To update Handbook 44 to reflect the technological changes in registers for liquid measuring devices and to alert Weights & Measures officials to the fact that error in start-up and shut-down delivery quantities can introduce linear errors in the calibration at normal flow rates; these errors increase the further the delivered quantity deviates from the prover size used at calibration.

Item Under Consideration:
AmendST Handbook 44 Liquid Measuring Devices Code as follows:

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.

Background / Discussion:
Wholesale metering systems are used to deliver product at many different flow rates. Many of these systems are equipped with features that allow different calibration factors to be programmed at those flow rates. Companies commonly set accuracy goals of +/- 0.05% at normal and "fallback" delivery rates; however, they are often reluctant to spend time entering different calibration factors for the initial ("start-up") and ending ("shut-down") portions of the delivery. Spending time calibrating the metering system at normal and fallback delivery rates to such a high degree of accuracy is wasted if the error introduced into the measurement by the start-up and shut-down quantities is unknown. An additional concern is that an unscrupulous operator could use the error introduced by the start-up and shut-down portions of the delivery (if known) to adjust calibration at the normal delivery rate such that the overall error of a typical delivery is predominantly in the user's favor. Officials should be aware that when delivered quantities are greater than the prover used at calibration, start-up and shutdown errors have a counter-intuitive effect. Underregistration errors (which are normally in the consumers' favor) in the start-up and shut-down portions of the delivery may actually create shortages in the total delivery if calibration of the normal rate is adjusted to compensate for that underregistration. While these errors should be well within tolerance if the start-up and shut-down errors

are in tolerance, an official who is trying to determine predominance of error should be aware of this effect and know how to determine the expected error in a typical delivery. Operators need to understand the importance of knowing and accounting for the effects of start-up and shut-down errors. Officials need to be aware of the potential for misusing that knowledge. Terminals and refineries want to maximize the accuracy of their liquid measuring devices by optimizing the calibration factors at typical delivery rates.

This proposal is not intended to have any effect on locations which do not use electronic calibration factors to optimize accuracy at every delivery rate. Even at locations which do use multiple calibration factors, no action is required unless the official notices that the error for the start-up and shut-down rates is predominantly in one direction. If the start-up and shut-down errors are predominantly in one direction, the official then needs to determine the size of a typical transaction and the likely predominance of the error. Device owners can easily ensure that they have no problems with this requirement by making sure that their devices are in tolerance at slow flow start-up and shut-down rates and that errors are not predominantly in one direction.

See Appendix D, *How Slow Flow Accuracy Affects LMDs* for additional background information related to this proposal.

See the 2014 S&T Committee's Annual Report to review previous language and positions to add paragraphs N.4.2.5. Initial Verification and UR. 2.5.1. Initial Verification Proving Reports to NIST Handbook 44 Liquid Measuring Devices Code.

2015 NCWM Interim Meeting:
At the 2015 NCWM Interim Meeting the Committee grouped together Items 330-4 and 331-2 and comments were taken simultaneously as the Committee considered them companion. Ms. Quinn, speaking as Chair of the Multipoint-Calibration Work Group, stated that the WG received comments indicating there are concerns regarding the amount of time it would take to test multipoint-calibration devices if this item were adopted. She recommended the item remain Developmental and stated that the WG may wish to consider the Canadian model in addressing devices equipped with multipoint calibration.

Mrs. Tina Butcher (OWM) acknowledged that to verify the performance of a meter with multi-point calibration completely, separate tests must be performed with each product that will be metered, and at all flow rates and every calibration factor that has been programmed into the system for those products. This makes obvious the need to perform many tests on a single meter in order to take into account the different factors, and combinations thereof, affecting performance. She reported that OWM questions however, whether it is reasonable to expect that all regulatory jurisdictions be equipped with the resources necessary to perform the extensive amount of testing required by this proposal. OWM believes that some jurisdictions are likely to consider this practice onerous, and consequently, may not be willing or capable of performing the amount of testing prescribed. OWM also questions whether device owners would be receptive to the amount of time a device would need to be taken out of service in order to complete the testing. Mrs. Butcher also summarized the following list of issues that OWM had identified as needing additional work in its analysis of this item to further develop the proposal:

- Why limit this concept of testing multi-point calibration devices to LMDs and to only those LMDs being used in a wholesale application? Other types of equipment, both wholesale and retail, including scales, vehicle tank meters, etc., have multi-point calibration. Perhaps there should be a General Code requirement that addresses this issue for all types of devices.
- Did the multi-calibration group consider statistical sampling to reduce the number of tests required when developing this proposal? Might some form of statistical sampling plan be developed that provides an indication of the level (or amount) of testing required in a given population of devices?
- Might such detailed procedures be better suited for inclusion in a NIST EPO?
- It is not clear what is meant by "all products' in the proposal. Is this to mean every grade of product? If the intent is to require every grade of every product, this would conflict with current NTEP evaluation policy.
- If it is the intent of the multi-calibration work group to classify the testing to be performed on a device with multi-point calibration as "Normal" tests opposed to "Special" tests, which is OWM's understanding, then positioning this new paragraph beneath N.4.2. Special Tests and assigning it the designation "N.4.2.5." would be inappropriate.

- The title of the proposed paragraph, "Initial Verification," conflicts with the following words contained in the first sentence of the paragraph: "or after being repaired or replaced."

Mr. Oppermann provided the Committee a written analysis of these items, which he summarized as follows:

> He stated that the test procedures proposed in Agenda Items 330-4 and 331-2 are directed to service companies placing meters into service and that HB 44 is the wrong place for instructions to service companies regarding how devices are to be placed into service. The "Notes" section of these two device codes (LMD and VTM) already permits officials to conduct any additional tests that they deem necessary to determine the performance characteristics of the meters being tested. Each NIST EPO outline describes the minimum examination for official action. The EPOs provide officials the necessary latitude to conduct additional tests or to repeat any or all tests as part of the examination process. He also stated that the term "initial verification" is used incorrectly in the proposal to apply to tests performed by service company representatives when placing meters into service. Initial verification applies to the first inspection and test conducted by weights and measures officials on a new weighing or measuring device.

Ms. Quinn commented the term "initial verification" is meant for devices tested for the first time.

In consideration of the comments provided during the open hearings and the recommendation provided by the Chair of the WG that the item remain in a "Developing" status, the Committee agreed to assign this item a "Developing" status.

2015 NCWM Annual Meeting:
At the 2015 NCWM Annual Meeting the Committee agreed to group together Agenda Items 330-4 and 331-2 and take comments simultaneously on these two items. During the open hearings, there was a recommendation made by Ms. Julie Quinn (MN), submitter of the two items, to replace the Item Under Consideration in both Agenda Items with the following:

> ***N.4.5 Verification of Linearization Factors. All enabled linearization factors shall be verified when a device:***
>
> ***(a) is initially being put into commercial use;***
>
> ***(b) has been placed into service and is officially being tested for the first time;***
>
> ***(c) is being returned to commercial service following official rejection for failure to conform to performance requirements and is being officially tested for the first time after corrective service;***
>
> ***(d) is being officially tested for the first time after major reconditioning or overhaul; or***
>
> ***(e) at the discretion of the official with statutory authority.***
>
> ***The verification of enabled linearization factors may be done through physical testing or empirical analysis.***
>
> ***UR.4. Maintenance Requirements***
>
> ***UR.4.1. Use of Adjustments Whenever devices are adjusted, all enabled linearization factors shall be verified through physical testing or empirical analysis to determine that the errors are in tolerance and any adjustments which are made, shall be made so as to bring performance errors as close as practicable to zero value.***

In providing justification for the recommendation, Ms. Quinn noted that she had conducted a meeting on Sunday, July 19, 2015 with a group that included several meter manufacturers to consider the proposal. It was during this meeting that the group developed proposed paragraphs N.4.5. and UR.4 and decided to recommend they replace the two paragraphs currently proposed.

An industry representative, who is also a member of the group that helped develop the proposal voiced support of the changes proposed by Ms. Quinn.

Mr. Ross Andersen (NY retired), in considering the new proposal recommended by Ms. Quinn, commented that only part (e) of proposed new paragraph N.4.5. Verification of Linearization Factors is needed. Officials must decide which factors are to be tested or what testing is needed.

Mrs. Tina Butcher (OWM) acknowledged the progress made by the group working on the multi-point calibration issue. She indicted additional work is needed with respect to abbreviating the testing that's needed to verify the performance of a meter with multi-point calibration. She also indicated that detailed procedures might be better suited in a NIST EPO, rather than HB 44. In a written analysis of the item provided to the Committee, OWM reiterated the following points presented at the 2015 NCWM Interim Meeting:

- OWM acknowledges that to verify the performance of a meter with multi-point calibration completely, separate tests must be performed with each product that will be metered, and at all flow rates and every calibration factor that has been programmed into the system for those products. This makes obvious the need to perform many tests on a single meter in order to take into account the different factors, and combinations thereof, affecting performance.

- OWM questions however, whether it is reasonable to expect that all regulatory jurisdictions be equipped with the resources necessary to perform the extensive amount of testing required by this proposal. OWM believes that some jurisdictions are likely to consider this practice onerous, and consequently, may not be willing or capable of performing the amount of testing prescribed. OWM also questions whether device owners would be receptive to the amount of time a device would need to be taken out of service in order to complete the testing.

- In considering this item, OWM identified a number of issues that indicate additional work would be needed to further develop this proposal. The following issues were identified:
  - Why limit this concept of testing multi-point calibration devices to LMDs and to only those LMDs being used in a wholesale application? Other types of equipment, both wholesale and retail, including scales, vehicle tank meters, etc., have multi-point calibration. Perhaps there should be a General Code requirement that addresses this issue for all types of devices.
  - Did the multi-calibration group consider statistical sampling to reduce the number of tests required when developing this proposal? Might some form of statistical sampling plan be developed that provides an indication of the level (or amount) of testing required in a given population of devices?
  - Might such detailed procedures be better suited for inclusion in a NIST EPO?
  - It is not clear what is meant by "all products' in the proposal. Is this to mean every grade of product? If the intent is to require every grade of every product, this would conflict with current NTEP evaluation policy.
  - If it is the intent of the multi-calibration work group to classify the testing to be performed on a device with multi-point calibration as "Normal" tests opposed to "Special" tests, which is OWM's understanding, then positioning this new paragraph beneath N.4.2. Special Tests and assigning it the designation "N.4.2.5." would be inappropriate.
  - The title of the proposed paragraph, "Initial Verification," conflicts with the following words contained in the first sentence of the paragraph: "or after being repaired or replaced."
  - What is meant by "repaired" in the first sentence? Did the multi-calibration group consider the definition of "repaired device" in NIST Handbook 44 or the examples of a "repaired device" that were developed by the NCWM Remanufactured Device Task Force in 2000 when using this term?
  - How much testing would be required on a return (callback or reexamination) inspection if a device exceeded tolerance on only one of the initial tests (i.e., one product, flow rate, and calibration factor) when all other initial tests of the same meter (using same or different products at different flow rates and calibration factors) proved accurate? No guidance has been provided on how much testing would be needed on a callback or reinspection visit (i.e., following repair).
  - Should the word "and" replace the word "or" in the first sentence? OWM believes the testing described is intended to apply to equipment put into commercial service the first time, equipment

that has been adjusted, and to equipment installed to replace another piece of equipment. If that's the case, the word "and" should be used.

The Committee agreed to replace the Item Under Consideration with the following as proposed and recommended by Ms. Quinn during the open hearings. The Committee looks forward to future refinements of this item by the submitter:

N.4.5 Verification of Linearization Factors. All enabled linearization factors shall be verified when a device:

- ***(f) is initially being put into commercial use;***
- ***(g) has been placed into service and is officially being tested for the first time;***
- ***(h) is being returned to commercial service following official rejection for failure to conform to performance requirements and is being officially tested for the first time after corrective service;***
- ***(i) is being officially tested for the first time after major reconditioning or overhaul; or***
- ***(j) at the discretion of the official with statutory authority.***

The verification of enabled linearization factors may be done through physical testing or empirical analysis.

UR.4. Maintenance Requirements

UR.4.1. Use of Adjustments Whenever devices are adjusted, all enabled linearization factors shall be verified through physical testing or empirical analysis to determine that the errors are in tolerance and any adjustments which are made, shall be made so as to bring performance errors as close as practicable to zero value.

Regional Association Meetings:
CWMA received a presentation, at its 2014 Interim Meeting, to clarify the purpose of this item. A regulatory official voiced support for this item. CWMA agreed that the item was sufficiently developed and recommended that it be a Voting item as amended below:

N.4.2.5.~~Determination of Error on Whole Sale Devices with Multiple Flow Rates and Calibration Factors~~ *Initial Verification*

~~On whole sale devices which are configured with multiple flow rates where each flow rate has its own calibration factor, and which are programmed to deliver a set quantity at a slow flow rate on start up and/or shut down, the effect of start up and shut down rates on the accuracy the typical delivery shall be considered if the typical delivery is greater or less than the test measure used at the time of evaluation. The weights and measures jurisdiction shall determine the size of the typical delivery based upon available evidence.~~ *A wholesale liquid measuring device shall be tested at all flow rates and with all products for which a* ***~~calibration~~ linearization*** *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~~ linearization*** *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

During the 2015 CWMA Annual Meeting open hearings, Ms. Julie Quinn (MN), submitter of the item, reported that a work group is still developing the item. Consequently, the CWMA agreed to recommend the item move forward as a Developing item noting support for its continued development.

Testimony was presented at the 2014 WWMA Annual Meeting by a member of the Multi-Point Calibration Group, stating that the item is fully developed and ready to be a Voting item. No opposition was heard during open hearing and the WWMA agreed that the item was sufficiently developed and recommended that it be a Voting item as amended below:

N.4.1.3.~~N.4.2.5.~~ Initial Verification

(a) A wholesale liquid measuring device shall be tested at all flow rates and with all products for which a calibration linearization factor has been electronically programmed prior to placing it into commercial service for the first time or after being repaired or replaced.

(b) A wholesale liquid measuring device not equipped with means to electronically program its flow rates and calibration linearization 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.2.6.~~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

At the 2014 SWMA Annual Meeting, SWMA's S&T Committee recommended the item be withdrawn based on concerns that if adopted, it would result in extensive additional work required by inspectors; increased downtime for businesses; questionable gain when compared to existing tolerances; and result in the approval of devices for each product type. The Committee doesn't believe the Handbooks are the proper place for examples. Based on the Committee's recommendation, SWMA did not forward this item to NCWM; recommending instead, that it be withdrawn.

NEWMA did not receive comments on this item at its 2014 Interim Meeting and recommended that the item be Withdrawn**.** At its 2015 Annual Meeting NEWMA did not receive comments but changes its earlier position on this item recommending it be developing pending further information.

SWMA Action: Item 330-1
Summary of comments considered by the regional committee (in writing or during the open hearings):
This item was batched and heard together with Item 331-1. Mr. Hal Prince (FL) stated that he would like to see this item completed, but doesn't see that it will affect the tolerances so it may not be best suited in Handbook 44 rather may be something better suited in an EPO. Mr. Allen Katalinic (NC) stated that this item had been reworked by the software sector, but that language was not forwarded.
Item as proposed by the regional committee: ***(If different than agenda item)***
No change.
Committee recommendation to the region: ☐ Voting Item on the NCWM Agenda ☐ Information Item on the NCWM Agenda ☐ Withdraw the Item from the NCWM Agenda (*In the case of new items, do not forward to NCWM)* ☒ Developing Item on the NCWM Agenda *(To be developed by source)*
Reasons for the committee recommendation:
This item was batched and heard together with Item 331-1. The Committee feels this item needs further development.
COMPLETE SECTION BELOW FOLLOWING VOTING SESSION
Final updated or revised proposal from the region: ***(If different than regional committee recommendation)***
No change.
Regional recommendation to NCWM for item status: ☐ Voting Item on the NCWM Agenda ☐ Information Item on the NCWM Agenda ☐ Withdraw the Item from the NCWM Agenda (*In the case of new items, do not forward to NCWM)* ☒ Developing Item on the NCWM Agenda *(To be developed by source)* ☐ Unable to consider at this time *(Provide explanation in the "Additional Comments" section below)*
Regional Report to NCWM: Please provide your report in this section exactly how you want it to appear in the NCWM reports to represent your region's considerations, support or opposition, and recommendations. **This will replace any previous reports from your region on this item.**
This item was batched and heard together with Item 331-1. The Committee feels this item needs further development.

Additional letters, presentations and data may have been part of the committee's consideration. Please refer to http://www.ncwm.net/meetings/interim/publication-15 to review these documents.

New Item 33 Recognized the Use of Digital Density Meters

Source:
Missouri (2016)

Purpose:
Allow the use of digital density meters for inspections of meter for viscous fluids such as motor oils, diesel exhaust fluid (DEF) and antifreeze.

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

Develop provisions in various LMD Codes of Handbook 44 that would recognize the use of digital density meters in lieu of volumetric provers, or the use of flasks and thermometers in the case of gravimetric testing) when testing meters used to dispense certain viscous fluids such as motor oil, DEF, antifreeze, syrups, etc..

"Digital density meters may be a solution for testing motor oil, DEF and anti-freeze meters."

Background/Discussion:
Current test procedures are slow and awkward due to the need of using borosilicate glassware for package checking. Digital density meters are fast, use small samples size (2 ml) and have built in thermometers.

When conducting volumetric testing of meters used for dispensing viscous fluids such as motor oil, DEF, antifreeze, syrups, etc., air becomes entrapped in the fluid and clings to the sides of the prover which adversely affect the results of the test. In order to conduct gravimetric tests, it is necessary to determine the density of the product. Digital density meters are fast and accurate in comparison with recognized gravimetric testing procedures using flasks and thermometers. There is no need to "wet down" volumetric flasks before each measurement. Most non-food products may be recovered without contamination. Only a small sample size (2 ml) of the product is needed for testing. Using digital density meters equipped with built-in API density tables will not require the cooling samples to 60 F. There is no need for a partial immersion thermometer or volumetric flasks.

Well established ASTM and other international standard test methods are available with precision statements.

SWMA Action: New Item 33
Summary of comments considered by the regional committee (in writing or during the open hearings):
Mr. Hal Prince (FL) stated that Florida supports this item and believes adding digital density meters to the code will make testing much easier.
Item as proposed by the regional committee: ***(If different than agenda item)***
No change.
Committee recommendation to the region: ☒ Voting Item on the NCWM Agenda ☐ Information Item on the NCWM Agenda ☐ Withdraw the Item from the NCWM Agenda (*In the case of new items, do not forward to NCWM)* ☐ Developing Item on the NCWM Agenda *(To be developed by source)*
Reasons for the committee recommendation:
The Committee heard comments in support of this item and recommends moving this item forward as a voting item.
COMPLETE SECTION BELOW FOLLOWING VOTING SESSION
Final updated or revised proposal from the region: ***(If different than regional committee recommendation)***
No change.
Regional recommendation to NCWM for item status: ☒ Voting Item on the NCWM Agenda ☐ Information Item on the NCWM Agenda ☐ Withdraw the Item from the NCWM Agenda (*In the case of new items, do not forward to NCWM)* ☐ Developing Item on the NCWM Agenda *(To be developed by source)* ☐ Unable to consider at this time *(Provide explanation in the "Additional Comments" section below)*
Regional Report to NCWM: Please provide your report in this section exactly how you want it to appear in the NCWM reports to represent your region's considerations, support or opposition, and recommendations. **This will replace any previous reports from your region on this item.**
The Committee heard comments in support of this item and recommends moving this item forward as a voting item.

Additional letters, presentations and data may have been part of the committee's consideration. Please refer to http://www.ncwm.net/meetings/interim/publication-15 to review these documents.

331 VEHICLE-TANK METERS

New Item 35 S.1.1.5. Return to Zero, S.1.1.6. Initial Zero Indication – Electronic Devices (See Related New Items 34 and 36)

Source:
Maryland (2016)

Purpose:
Ensure that a VTM register starts on zero upon initial authorization by following the manufacturer's instructions.

Item Under Consideration:
Amend NIST Handbook 44 Vehicle Tank Meter Code as follows:

> **S.1.1.5. Return to Zero. –** Primary indicating elements shall be readily returnable to a definite zero indication. Means shall be provided to prevent the return of primary indicating elements, and of primary recording elements if these are returnable to zero, beyond their correct zero position. **A reset mechanism for the indicating element shall not be operable during a delivery.**
>
> ***S.1.1.6. Initial Zero Indication – Electronic Devices. A device shall display a definite zero indication upon initial activation of the delivery mode. The measurement, indication of delivered quantity, and (for computing devices) the indication of total sales price shall be inhibited until the fueling position reaches conditions necessary to ensure that the delivery starts at zero. Pressurization of any discharge hose shall not result in the register advancing beyond the initial zero indication.***

Background/Discussion:
The language that is currently in the Handbook 44 VTM and LPG & NH_3 codes allows for the operator to reset a register to zero if it advances beyond zero when initially activated. This would mean that it is the responsibility of the operator to ensure the device is reset to zero prior to every operation, and could easily lead to facilitation of fraud. Technology is currently available that would eliminate this issue, as evidenced by similar language in the LMD Code, Mass Flow Meter Code and the Hydrogen Gas-Measuring Devices Tentative Code. Having the capability to always start on zero would also eliminate the need to print additional receipts in order to reset the device to zero.

Commercial measuring devices such as retail motor-fuel dispensers, vehicle-tank meters, and LPG liquid-measuring systems are required to be "wet-hose type" devices. This means that the system's discharge hose is intended to be full of liquid at all times during its operation. This, coupled with requirements that prevent the drainage of the discharge hose (anti-drain requirements), help ensure that the hose is not drained between deliveries and that the current customer is not paying for the amount of product required to fill the discharge hose.

Between deliveries, the pressure in a discharge hose can sometimes vary with changing conditions. For example, when temperatures increase, the product in the hose may expand and conversely, when temperatures decrease the product may contract. As a result of these often slight changes, when a system is initially activated in preparation for delivery, the discharge hose may go through an initial "pressurization" process in which the discharge hose is filled with liquid. The re-pressurization can sometimes result in an advancement of the indications prior to the

delivery of any product, an event often referred to as "computer jump." In this situation, the customer has received no product, but the quantity and total sale indications may indicate that product has been delivered.

Current language in several of the NIST Handbook 44 measuring codes includes requirements for the device user/operator to return indicating and recording elements to zero immediately before a delivery begins. This helps to ensure that deliveries start with a zero indication. This also requires that, if the system advances or "computer jump" occurs during the initial activation of the system that the operator reset the indications to zero.

Initially, most of the measuring codes did not include any specifications requiring that a system be designed with provisions to help ensure a zero start without necessitating intervention by the operator. While the user requirements referenced above can help, experience is showing that a user requirement by itself is not always effective in ensuring that transactions consistently start on zero. In 2005, the NCWM recognized that, with increased unit prices, the computer jump that sometimes occurs with retail motor-fuel dispensers was resulting in the advancement of the total sale indications prior to the delivery of any fuel.

Systems that routinely experience computer jump facilitate transactions that do not start on zero prior to the delivery of product and, thus, facilitate fraud. If a driver has already inserted a ticket in a VTM or LPG VTM, it is questionable (and probably unlikely) that the operator will reset the indications to zero after the hose has pressurized (and the indications have advanced) and put another ticket into the device. A better solution would be the addition of a requirement similar to that in LMD Code paragraph S.1.6.1. Indication of Delivery which includes the following nonretroactive provision to include automatic means to help ensure the transaction starts on zero:

> 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]

Although most systems include a provision to prevent the reset operation from occurring during a delivery, this is not specified in all codes. Consequently, the proposals include suggested language to add this provision to the LMD, VTM, and LPG & NH_3 codes.

Note that consideration may also need to be given to limiting the quantity that can be suppressed as is currently referenced in LMD code paragraph S.1.6.1.

SWMA Action: New Item 35

Summary of comments considered by the regional committee (in writing or during the open hearings):

This item was grouped in a batch consisting of New items #34-#36 and all items were heard together. Mr. Michael Keilty (Endress Hauser Flowtec) asked if this was already covered. The submitter responded that they thought it was too initially, but turns out it was not. He added that these three items were to harmonize the codes as well.

Item as proposed by the regional committee: ***(If different than agenda item)***

S.1.1.5. Return to Zero. – Primary indicating elements shall be readily returnable to a definite zero indication. Means shall be provided to prevent the return of primary indicating elements, and of primary recording elements if these are returnable to zero, beyond their correct zero position. **A reset mechanism for the indicating element shall not be operable during a delivery.**

S.1.1.6. Initial Zero Indication – Electronic Devices. A device shall display a definite zero indication upon initial activation of the delivery mode. The measurement, indication of delivered quantity, and (for computing devices) the indication of total sales price shall be inhibited until the fueling position reaches conditions necessary to ensure that the delivery starts at zero. Pressurization of any discharge hose shall not result in the register advancing beyond the initial zero indication.

[Nonretroactive as of January 1, 20XX]

Committee recommendation to the region:

- ☒ Voting Item on the NCWM Agenda
- ☐ Information Item on the NCWM Agenda
- ☐ Withdraw the Item from the NCWM Agenda (*In the case of new items, do not forward to NCWM)*

☐ Developing Item on the NCWM Agenda *(To be developed by source)*
Reasons for the committee recommendation:
This item was grouped in a batch consisting of New items #34-#36 and all items were heard together. The Committee feels the items have merit and should be moved forward as a voting item. The Change will harmonize the non-retroactive requirement with New Item #35.
COMPLETE SECTION BELOW FOLLOWING VOTING SESSION
Final updated or revised proposal from the region: *(If different than regional committee recommendation)*
No change from committee recommendation.
Regional recommendation to NCWM for item status: ☒ Voting Item on the NCWM Agenda ☐ Information Item on the NCWM Agenda ☐ Withdraw the Item from the NCWM Agenda (*In the case of new items, do not forward to NCWM)* ☐ Developing Item on the NCWM Agenda *(To be developed by source)* ☐ Unable to consider at this time *(Provide explanation in the "Additional Comments" section below)*
Regional Report to NCWM: Please provide your report in this section exactly how you want it to appear in the NCWM reports to represent your region's considerations, support or opposition, and recommendations. **This will replace any previous reports from your region on this item.**
This item was grouped in a batch consisting of New items #34-#36 and all items were heard together. The Committee feels the items have merit and should be moved forward as a voting item. The Change will harmonize the non-retroactive requirement with New Item #35.

Additional letters, presentations and data may have been part of the committee's consideration. Please refer to http://www.ncwm.net/meetings/interim/publication-15 to review these documents.

New Item 19 Table S.2.2. Categories of Sealing and Methods of Sealing (See Related New Items 20, 21, 22, 23, 24 and 25)

Source:
Gilbarco, Inc. (2016)

Purpose:
Allow a Category 3 event logger to have an electronic means to transfer the event logger information..

Item Under Consideration:
Amend NIST Handbook 44 Vehicle Tank Meter Code as follows:

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

[Nonretroactive as of January 1, 1995]

(Table Added 2006) **(Amended 20XX)**

Background/Discussion:
This amendment and similar proposals to amen other codes in Section 3 of Handbook 44 would provide the same requirements for Category 3 event loggers as was adopted for the 3.30 Liquid Measuring Devices Code at the 2015 NCWM Annual Meeting. Event logger information in an electronic format is easier to sort and search the traditional paper format.

SWMA Action: New Item 19
Summary of comments considered by the regional committee (in writing or during the open hearings):
This item was grouped in a batch consisting of New items #19-#25 and all items were heard together. Mr. Gordon Johnson (Gilbarco), the submitter, of this item noted that this was identical to the item passed in the LMD Code this past July and this series of items was to harmonize the codes.
Item as proposed by the regional committee: ***(If different than agenda item)***
No Change.
Committee recommendation to the region: ☒ Voting Item on the NCWM Agenda ☐ Information Item on the NCWM Agenda ☐ Withdraw the Item from the NCWM Agenda (*In the case of new items, do not forward to NCWM)*

☐ Developing Item on the NCWM Agenda *(To be developed by source)*
Reasons for the committee recommendation:
This item was grouped in a batch consisting of New items #19-#25 and all items were heard together. The Committee agrees with adding this language and harmonizing it with the LMD Code.
COMPLETE SECTION BELOW FOLLOWING VOTING SESSION
Final updated or revised proposal from the region: ***(If different than regional committee recommendation)***
No change.
Regional recommendation to NCWM for item status: ☒ Voting Item on the NCWM Agenda ☐ Information Item on the NCWM Agenda ☐ Withdraw the Item from the NCWM Agenda (*In the case of new items, do not forward to NCWM)* ☐ Developing Item on the NCWM Agenda *(To be developed by source)* ☐ Unable to consider at this time *(Provide explanation in the "Additional Comments" section below)*
Regional Report to NCWM: Please provide your report in this section exactly how you want it to appear in the NCWM reports to represent your region's considerations, support or opposition, and recommendations. **This will replace any previous reports from your region on this item.**
This item was grouped in a batch consisting of New items #19-#25 and all items were heard together. The Committee agrees with adding this language and harmonizing it with the LMD Code.

Additional letters, presentations and data may have been part of the committee's consideration. Please refer to http://www.ncwm.net/meetings/interim/publication-15 to review these documents.

New Item 37 S.3.7. Manifold Hose Flush System

This item was not submitted to your region.

331-1 D N.4.2.1. Determination of Error on Vehicle-Tank Meters with Multiple Flow Rates and Calibration Factors

Source:
Minnesota Weights and Measures Division (2014)

Purpose:
To update NIST Handbook 44 to reflect the technological changes in registers for vehicle-tank meters and to alert Weights & Measures officials to the fact that error in start-up and shut-down delivery quantities can introduce linear errors in the calibration at normal flow rates which increase the further the delivered quantity deviates from the prover size used at calibration.

Item Under Consideration:
Amend NIST Handbook 44 Vehicle Tank Meter Code as follows:

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.

Background / Discussion:
Many terminals and refineries want to maximize the accuracy of their liquid-measuring devices by optimizing the calibration factors at typical delivery speeds and some bulk delivery companies are beginning to utilize the capabilities of electronic registers with multiple calibration factors to optimize their accuracy at flow rates that are customarily used. Just like registers on wholesale liquid measuring devices, these meters can be configured for a standard initial "start-up" and ending "shut-down" quantity delivered at a slower speed than is used for the remainder of the delivery. Service agents are expected to calibrate devices as close to zero as possible, but spending time calibrating normal delivery rates to a high degree of accuracy is wasted if the error introduced into the measurement by the start-up and shut-down quantities is unknown. On the other hand, an unscrupulous operator could also use the known error introduced by the start-up and shut-down errors to calibrate the normal delivery rates so that all the errors on typical deliveries work predominantly in the user's favor. Officials should be aware that when delivered quantities are greater than the prover used at calibration, start-up and shut-down errors have a counter-intuitive effect. Underregistration, which normally operates in the consumers' favor, may actually create shortages in the total delivery if calibration of the normal rate was adjusted to compensate for that underregistration. While these errors should be well within tolerance if the start-up and shut-down error are in tolerance, an official who is trying to determine predominance of error should be aware of this effect and know how to calculate the expected error in a typical delivery. Operators need to understand the importance of knowing and accounting for the effects of start-up and shut-down errors. Officials need to be aware of the potential for misusing that knowledge.

This proposal has no effect on locations which do not use electronic calibration factors to optimize accuracy at every delivery rate. Even at locations which do, no action is required unless the official notices that the error for the start-up and shut-down rates is predominantly in one direction. If the start-up and shut-down errors are predominantly in one direction, the official then needs to determine the size of a typical transaction and the likely predominance of the error. Device owners can easily ensure that they have no problems with this requirement by making sure that their devices are in tolerance at the slower start-up and shut-down flow rates and errors are not predominantly one way or the other.

See Appendix E, *How Slow Flow Errors Affect VTMs.*

See the 2014 S&T Committee's Annual Report to review previous language and positions to add paragraphs N.4.5. Initial Verification and UR. 2.5.1. Initial Verification Proving Reports to NIST Handbook 44 Vehicle-Tank Meters Code.

2015 NCWM Interim Meeting
At the 2015 NCWM Interim Meeting, the Committee grouped together Items 330-4 and 331-2 and comments were taken simultaneously as the Committee considered these items companion. For a summary of the comments provided during the open hearings, refer to Agenda Item 330-4. In consideration of the comments received, the Committee agreed to assign a "Developing" status to both of these items.

2015 NCWM Annual Meeting
At the 2015 NCWM Annual Meeting the Committee agreed to group together Agenda Items 330-4 and 331-2 and take comments simultaneously on these two items. For a summary of the comments received during the open hearings on these two agenda items, refer to Agenda Item 330-4. With respect to both of these items, the Committee agreed to replace the Item Under Consideration with the following at the recommendation of the submitter of the items:

N.4.5 Verification of Linearization Factors. All enabled linearization factors shall be verified when a device:

- ***(k) is initially being put into commercial use;***
- ***(l) has been placed into service and is officially being tested for the first time;***
- ***(m) is being returned to commercial service following official rejection for failure to conform to performance requirements and is being officially tested for the first time after corrective service;***
- ***(n) is being officially tested for the first time after major reconditioning or overhaul; or***
- ***(o) at the discretion of the official with statutory authority.***

The verification of enabled linearization factors may be done through physical testing or empirical analysis.

UR.4. Maintenance Requirements

UR.4.1. Use of Adjustments Whenever devices are adjusted, all enabled linearization factors shall be verified through physical testing or empirical analysis to determine that the errors are in tolerance and any adjustments which are made, shall be made so as to bring performance errors as close as practicable to zero value.

Regional Association Comments:
CWMA received a presentation, at its 2014 Interim Meeting, to clarify the purpose of this item. A regulatory official voiced support for this item. CWMA agreed that the item was sufficiently developed and recommended it be a Voting item as amended below:

N.4.6. ~~Determination of Error on Vehicle Tank Meters with Multiple Flow Rates and Calibration Factors~~ ***Initial Verification***

~~On vehicle tank meters which are configured with multiple flow rates where each flow rate has its own calibration factor, and which are programmed to deliver a set quantity at a slow flow rate on start up and/or shut down, the effect of start up and shut down rates on the accuracy of the typical delivery shall be considered if the typical delivery is greater or less than the test measure used at the time of evaluation. The weights and measures jurisdiction shall determine the size of the typical delivery based upon available evidence. .~~ ***A vehicle tank meter shall be tested at all flow rates and with all products for which a ~~calibration~~ linearization 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~~ linearization 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.

At its 2015 Annual Meeting, CWMA received comments from the submitter of the item indicating a work group was still developing the item. Consequently, CWMA agreed to change its earlier recommendation that the item move forward as a voting item to the recommendation of moving the item forward as a Developing.

Testimony was presented at the 2014 WWMA Annual Meeting by a member of the Multi-Point Calibration Group, stating that the item is fully developed and ready to be a Voting item. No opposition was heard during open hearing and the WWMA agreed that the item was sufficiently developed and recommended that it be a Voting item as amended below:

N.4.6. Initial Verification

(a) A vehicle tank meter shall be tested at all flow rates and with all products for which a calibration linearization factor has been electronically programmed prior to placing it into commercial service for the first time or after being repaired or replaced.

(b) A vehicle tank meter not equipped with means to electronically program its flow rates and calibration linearization 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.

At the 2014 SWMA Annual Meeting, the SWMA's S&T Committee recommended the item be withdrawn based on concerns that if adopted, it would result in extensive additional work required by inspectors; increased downtime for businesses; questionable gain when compared to existing tolerances; and result in the approval of devices for each product type. The Committee doesn't believe the Handbooks are the proper place for examples. Based on the Committee's recommendation, SWMA did not forward this item to NCWM; recommending instead, that it be withdrawn.

NEWMA did not receive comments on this item at its 2014 Interim Meeting and recommended that the item be Withdrawn**.** At its 2015 Annual Meeting NEWMA did not receive comments but changed its earlier position on this item recommending it be developing pending further information.

SWMA Action: Item 331-1

Summary of comments considered by the regional committee (in writing or during the open hearings):
This item was batched and heard together with Item 330-1. Mr. Hal Prince (FL) stated that he would like to see this item completed, but doesn't see that it will affect the tolerances so it may not be best suited in Handbook 44 rather may be something better suited in an EPO. Mr. Allen Katalinic (NC) stated that this item had been reworked by the software sector, but that language was not forwarded.
Item as proposed by the regional committee: ***(If different than agenda item)***
No change.
Committee recommendation to the region: ☐ Voting Item on the NCWM Agenda ☐ Information Item on the NCWM Agenda ☐ Withdraw the Item from the NCWM Agenda (*In the case of new items, do not forward to NCWM)* ☒ Developing Item on the NCWM Agenda *(To be developed by source)*
Reasons for the committee recommendation:
This item was batched and heard together with Item 330-1. The Committee feels this item needs further development.
COMPLETE SECTION BELOW FOLLOWING VOTING SESSION
Final updated or revised proposal from the region: ***(If different than regional committee recommendation)***
No change.
Regional recommendation to NCWM for item status: ☐ Voting Item on the NCWM Agenda ☐ Information Item on the NCWM Agenda ☐ Withdraw the Item from the NCWM Agenda (*In the case of new items, do not forward to NCWM)* ☒ Developing Item on the NCWM Agenda *(To be developed by source)* ☐ Unable to consider at this time *(Provide explanation in the "Additional Comments" section below)*
Regional Report to NCWM: Please provide your report in this section exactly how you want it to appear in the NCWM reports to represent your region's considerations, support or opposition, and recommendations. **This will replace any previous reports from your region on this item.**
This item was batched and heard together with Item 330-1. The Committee feels this item needs further development.

Additional letters, presentations and data may have been part of the committee's consideration. Please refer to http://www.ncwm.net/meetings/interim/publication-15 to review these documents.

332 LPG AND ANHYDROUS AMMONIA LIQUID-MEASURING DEVICES

New Item 36 S.1.4.2. Return to Zero, S.1.4.3. Initial Zero Indication – Electronic Devices. (See Related New Items 34 and 35)

Source:
Maryland (2016)

Purpose:
Ensure that a register starts on zero upon initial authorization by following the manufacturer's instructions.

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

S.1.4.2. Return to Zero.

(a) Primary indicating elements shall be readily returnable to a definite zero indication.

(b) Primary recording elements on a stationary retail device shall be readily returnable to a definite zero indication if the device is equipped to record.

(c) Means shall be provided to prevent the return of primary indicating elements and of primary recording elements if these are returnable to zero, beyond their correct zero position.

(d) A reset mechanism for the indicating element shall not be operable during a delivery.

(Amended 1990 **and 20XX**)

Add a new paragraph S.1.4.3. Initial Zero Indication as follows:

S.1.4.3. Initial Zero Indication – Electronic Devices. A device shall display a definite zero indication upon initial activation of the delivery mode. The measurement, indication of delivered quantity, and (for computing devices) the indication of total sales price shall be inhibited until the fueling position reaches conditions necessary to ensure that the delivery starts at zero. Pressurization of any discharge hose shall not result in the register advancing beyond the initial zero indication.

[Nonretroactive as of January 1, 20XX]

Background/Discussion:
The language that is currently in the Handbook 44 VTM and LPG & NH_3 codes allows for the operator to reset a register to zero if it advances beyond zero when initially activated. This would mean that it is the responsibility of the operator to ensure the device is reset to zero prior to every operation, and could easily lead to facilitation of fraud. Technology is currently available that would eliminate this issue, as evidenced by similar language in the LMD Code, Mass Flow Meter Code and the Hydrogen Gas-Measuring Devices Tentative Code. Having the capability to always start on zero would also eliminate the need to print additional receipts in order to reset the device to zero.

Commercial measuring devices such as retail motor-fuel dispensers, vehicle-tank meters, and LPG liquid-measuring systems are required to be "wet-hose type" devices. This means that the system's discharge hose is intended to be full of liquid at all times during its operation. This, coupled with requirements that prevent the drainage of the discharge hose (anti-drain requirements), help ensure that the hose is not drained between deliveries and that the current customer is not paying for the amount of product required to fill the discharge hose.

Between deliveries, the pressure in a discharge hose can sometimes vary with changing conditions. For example, when temperatures increase, the product in the hose may expand and conversely, when temperatures decrease the product may contract. As a result of these often slight changes, when a system is initially activated in preparation for delivery, the discharge hose may go through an initial "pressurization" process in which the discharge hose is filled with liquid. The re-pressurization can sometimes result in an advancement of the indications prior to the delivery of any product, an event often referred to as "computer jump." In this situation, the customer has received no product, but the quantity and total sale indications may indicate that product has been delivered.

Current language in several of the NIST Handbook 44 measuring codes includes requirements for the device user/operator to return indicating and recording elements to zero immediately before a delivery begins. This helps to ensure that deliveries start with a zero indication. This also requires that, if the system advances or "computer jump" occurs during the initial activation of the system that the operator reset the indications to zero.

Initially, most of the measuring codes did not include any specifications requiring that a system be designed with provisions to help ensure a zero start without necessitating intervention by the operator. While the user requirements referenced above can help, experience is showing that a user requirement by itself is not always

effective in ensuring that transactions consistently start on zero. In 2005, the NCWM recognized that, with increased unit prices, the computer jump that sometimes occurs with retail motor-fuel dispensers was resulting in the advancement of the total sale indications prior to the delivery of any fuel.

Systems that routinely experience computer jump facilitate transactions that do not start on zero prior to the delivery of product and, thus, facilitate fraud. If a driver has already inserted a ticket in a VTM or LPG VTM, it is questionable (and probably unlikely) that the operator will reset the indications to zero after the hose has pressurized (and the indications have advanced) and put another ticket into the device. A better solution would be the addition of a requirement similar to that in LMD Code paragraph S.1.6.1. Indication of Delivery which includes the following nonretroactive provision to include automatic means to help ensure the transaction starts on zero:

> 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]

Although most systems include a provision to prevent the reset operation from occurring during a delivery, this is not specified in all codes. Consequently, the proposals include suggested language to add this provision to the LMD, VTM, and LPG & NH_3 codes.

Note that consideration may also need to be given to limiting the quantity that can be suppressed as is currently referenced in LMD code paragraph S.1.6.1.

SWMA Action: New Item 36
Summary of comments considered by the regional committee (in writing or during the open hearings):
This item was grouped in a batch consisting of New items #34-#36 and all items were heard together. Mr. Michael Keilty (Endress Hauser Flowtec) asked if this was already covered. The submitter responded that they thought it was too initially, but turns out it was not. He added that these three items were to harmonize the codes as well.
Item as proposed by the regional committee: ***(If different than agenda item)***
No change.
Committee recommendation to the region: ☒ Voting Item on the NCWM Agenda ☐ Information Item on the NCWM Agenda ☐ Withdraw the Item from the NCWM Agenda (*In the case of new items, do not forward to NCWM)* ☐ Developing Item on the NCWM Agenda *(To be developed by source)*
Reasons for the committee recommendation:
This item was grouped in a batch consisting of New items #34-#36 and all items were heard together. The Committee feels the items have merit and should be moved forward as a voting item.
COMPLETE SECTION BELOW FOLLOWING VOTING SESSION
Final updated or revised proposal from the region: ***(If different than regional committee recommendation)***
No change.
Regional recommendation to NCWM for item status: ☒ Voting Item on the NCWM Agenda ☐ Information Item on the NCWM Agenda ☐ Withdraw the Item from the NCWM Agenda (*In the case of new items, do not forward to NCWM)* ☐ Developing Item on the NCWM Agenda *(To be developed by source)* ☐ Unable to consider at this time *(Provide explanation in the "Additional Comments" section below)*
Regional Report to NCWM: Please provide your report in this section exactly how you want it to appear in the NCWM reports to represent your region's considerations, support or opposition, and recommendations. **This will replace any previous reports from your region on this item.**

This item was grouped in a batch consisting of New items #34-#36 and all items were heard together. The Committee feels the items have merit and should be moved forward as a voting item.

Additional letters, presentations and data may have been part of the committee's consideration. Please refer to http://www.ncwm.net/meetings/interim/publication-15 to review these documents.

332-1 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-Petroleum 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 dispensers hose. There are currently 5 active and 2 inactive NTEP Certificates of Conformance for LPG retail motor-fuel dispensers listed in the NCWM Database.

See the 2014 S&T Committee's Annual Report for additional background information and to review previous language and positions to amend HB 44 Liquefied Petroleum Gas and Anhydrous Liquid-Measuring Devices Code.

2015 NCWM Interim Meeting
At the 2015 NCWM Interim Meeting, the Committee heard comments in support of changing the status of this item from Developing to Informational. Ms. Kristin Macey (CA) reported that the expert assigned by CA Division of Measurement Standards (DMS) to further develop this item is no longer employed with the State and there is no one else within CA DMS that has the level of expertise required to complete this assignment. She suggested OWM complete any final changes that might be needed.

Mr. Dmitri Karimov (Liquid Controls, LLC) voiced concern regarding proposed paragraph S.1.4.3. Provisions for Power Loss. He noted that this paragraph, if adopted, would apply to both stationary and vehicle mounted meters. Vehicle mounted meters receive power from a vehicle's battery. He indicated that he believes the power loss provision paragraph needs more consideration and also noted there is no such requirement in the Vehicle-Tank Meter Code of HB 44.

Mrs. Tina Butcher (NIST OWM) commented that OWM believes this proposal includes much-needed changes that will help to align requirements for LPG retail motor-fuel systems with those for retail motor-fuel systems covered under other NIST Handbook 44 measuring codes. She noted that the CA Division of Measurement Standards and the WWMA have done excellent work in developing this item and, with some additional changes; OWM believes the item is ready for NCWM consideration as a Voting item.

OWM recommended that the Item Under Consideration as shown in NCWM Publication 15 be replaced with the revised version presented by the WWMA, with the following additional changes from OWM. A revised version of the proposal (including the OWM proposed changes to the WWMA version) appears at the end of this summary.

[Technical Advisor's Note: As requested by the S&T Committee, following the 2015 Interim Meeting, NIST Technical Advisors consulted with Mr. Karimov, representing the MMA, to discuss MMA's concerns over proposed power loss requirements. During that discussion, OWM acknowledged that confusion exists about the application of requirements to retail fueling systems that are not enclosed in a "cabinet" or "dispenser" housing yet include the same major components as conventional "dispensers" and are used in the same application and noted that the current proposal is intended to clarify these requirements. OWM also noted that references to retail fueling systems are not consistent throughout this and other measuring device codes and the inconsistent use of terminology in Handbook 44 may also be contributing to this confusion. OWM has begun reviewing existing terminology and may propose additional changes (as part of this item or as an additional, new item) to ensure consistency in references in this and other measuring codes to terms such as the following: "retail motor-fuel dispenser," "retail motor-fuel device," "retail motor-fuel system," "retail motor-fuel dispensing system," and "retail vehicle fuel device." OWM has since identified a few additional changes that it will propose and submit to the Committee to include with this item prior to the NCWM Annual Meeting.]

S.1.3.6. Transaction Information – Move to S.1.5. Stationary Retail Devices.

Consideration should be given to moving this paragraph (which addresses power loss requirements) to section "S.1.5. For Stationary Retail Devices Only." While it makes sense for the paragraph to fall under requirements for "indicators," comments from industry have questioned its applicability to vehicle-mounted, retail meters. Industry has pointed out that other vehicle-mounted applications, as addressed in the Vehicle-Tank Meters Code, do not include such provisions for retail deliveries. Thus, restricting its application to stationary retail devices in the LPG & NH_3 Code would eliminate this concern.

Additionally OWM suggests that the title of this paragraph be revised to include a reference to "power loss" for easier reference.

S.1.4. For Retail Devices Only

S.1.4.1. Indication of Delivery:

Modify S.1.4.1 as shown in OWM's original, 2014 comments 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.1.4.3. Zero-Set-Back interlock for Retail Motor-Fuel Dispensers:

Delete the reference to "retail motor-fuel" in the first sentence.

S.1.5. For Stationary Retail Devices Only:

S.1.5.1. Display of Unit Price and Product Identity:

Delete the proposed sub-paragraph (a). This language is redundant with the lead paragraph. Delete the letter "(b)" designation on the subsequent subparagraph and insert "and" after "fleet sales" in that same sub-paragraph. Delete the reference to "(b)" in subparagraph (2).

Change the reference to "purchaser" to "customer" in the "Note:" to be consistent with other references in this paragraph.

S.1.5. For Stationary Retail Devices Only:

OWM believes that existing paragraph "S.1.5.3. Recorded Representations, Point-of-Sale Systems" should be struck; proposed new S.1.5.5. Recorded Representations" and "S.1.5.6. Recorded Representations Where a Post-Delivery Discount(s) is Provided" would eliminate the need for the existing S.1.5.3. paragraph. Remaining paragraphs should be renumbered accordingly.

OWM believes that there is no need for the proposed "S.1.5.5. Recorded Representations" to be a given a "nonretroactive" status. The current paragraph "S.1.5.3. Recorded Representations, Point-of-Sale Systems" currently applies the *same* requirements to the *same* devices covered in the new paragraph S.1.5.5. on a "retroactive" basis. Likewise, the proposed paragraph S.1.5. mirrors a paragraph in the LMD Code which was added as a retroactive paragraph in the LMD Code in 2012.

S.1.5.3. Agreement Between Indications (Proposed by WWMA as S.1.5.4.):

Renumber to S.1.5.3. from S.1.5.4. in WWMA's latest proposal. Suggest adding a proposal to modify LMD Code paragraph S.1.6.6.(b) to mirror the proposed language in part (b) of this proposal.

S.1.5.4. Recorded Representations (Proposed by WWMA as S.1.5.5):

Renumber to S.1.5.4. from S.1.5.5. in WWMA's latest proposal.

S.1.5.5. Recorded Representations for Transactions Where a Post-Delivery Discount(s) is Provided:

Renumber to S.1.5.5. from S.1.5.6. in WWMA's latest proposal.

Add "printed" prior to "receipt" in the first sentence to be consistent with the corresponding provision in the LMD Code.

S.1.5.6. Transaction Information, Power Loss. (new)

Move the paragraph S.1.3.6. proposed by the WWMA to become S.1.5.6. and modify the title as described above under S.1.3.6.

UR.2.7.2. (b)(2) Computing Device:

Correct reference to S.1.6.4.1. (a reference to an LMD Code paragraph) to be S.1.5.1.

Incorporating the changes proposed by OWM as outlined above in the WWMA proposal, the revised version would appear as follows:

S.1.4. For Retail Devices Only.

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)

…

S.1.4.3. Zero-Set-Back Interlock for Retail Motor-Fuel Devices – A device shall be constructed so that:

(a) after a delivery cycle has been completed by moving the starting lever to any position that shuts off the device, an automatic interlock prevents a subsequent delivery until the indicating elements, and recording elements if the device is equipped and activated to record, have been returned to their zero positions;

(b) the discharge nozzle cannot be returned to its designed hanging position (that is, any position where the tip of the nozzle is placed in its designed receptacle and the lock can be inserted) until the starting lever is in its designed shut-off position and the zero-set-back interlock has been engaged; and

(c) in a system with more than one dispenser supplied by a single pump, an effective automatic control valve in each dispenser prevents product from being delivered until the indicating elements on that dispenser are in a correct zero position.

[Nonretroactive as of January 1, 201X]

(Added 201X)

S.1.5. For Stationary Retail Devices Only.

S.1.5.1. Display of Unit Price and Product Identity. – ~~In a~~ A device of the computing type~~, means~~ shall be ~~provided for~~ able to display~~ing~~ 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~~.

Except for dispensers used exclusively for fleet sales and other price contract sales, 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 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 (1) above, provided the system complies with S.1.5.5. 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 customer: 1) using controls on the device; 2) through the customer's use of personal or vehicle-mounted electronic equipment communicating with the system; or 3) verbal instructions by the customer.

[Nonretroactive as of January 1, 201X]

(Added 201X)

~~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.~~

~~(Added 2014)~~

S.1.5.3. Agreement Between Indications.

(a) When a quantity value indicated or recorded by an auxiliary element is a derived or computed value based on data received from a device, the value may differ from the quantity value displayed on the dispenser, provided that the following conditions are met:

(1) *all total values for an individual sale that are indicated or recorded by the system agree, and*

(2) *Within each element, the values indicated or recorded meet the formula (quantity x unit price = total sales price) to the closest cent.*

(b) When a system applies a post-delivery discount(s) to a fuel's unit price through an auxiliary element, the total volume of the delivery shall be in agreement between all elements in the system.

[Nonretroactive as of January 1, 201X]

(Added 201X)

S.1.5.4. Recorded Representations. – Except for fleet sales and other price contract sales and for transactions where a post-delivery discount is provided, a 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.

(Added 2016)

S.1.5.5. 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.

(Added 201X)

S.1.5.6. Transaction Information, Power Loss. 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 device or other onsite device accessible to the customer.

[Nonretroactive as of January 1, 201X]

(Added 201X)

S.1.5.7. 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.

[Nonretroactive as of January 1, 201X]

(Added 201X)

UR.2. Use Requirements.

UR.2.7. For Stationary Retail Computing Type Systems Only, Installed After January 1, 201X.

UR.2.7.1. 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 device or money-operated type device, the unit price at which the dispenser is set to compute.

Provided that the dispenser complies with S.1.5.1. Display of Unit Price and Product Identity, it is not necessary that all the unit prices 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.

(Added 201X)

UR.2.7.2. 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 unit of measure, the total quantity delivered, and the total price of the sale; and

(2) unless a dispenser complies with S.1.5.1. 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.

(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 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 after all post-delivery discounts are applied.

(Added 201X)

Based on comments heard during the open hearings indicating the proposal is nearly ready for adoption, the Committee agreed to elevate the status of this item to Informational as requested by the State of Ca. In doing so, the Committee also requested Mr. Karimov work with OWM to further refine the language to address any remaining concerns.

2015 NCWM Annual Meeting

At the 2015 NCWM Annual Meeting, the Committee heard many comments in support of this item and none opposed. Mrs. Tina Butcher (OWM) recommended the item move forward as revised at the 2014 WWMA with the proposed amendments of OWM and with continued input from the meter manufacturers. She commented that this item is very close to being ready for submittal as a Voting item.

Dmitri Karimov (Idex Corporation), speaking on behalf Idex Corporation and the MMA testified that the zero-set-back interlock requirement should be limited to stationary retail devices only. He also commented that he is working with OWM in refining this proposal and that it is very near moving forward as a Voting item.

One state weights and measures representative questioned the use of the words "shall be able to display" in the changes proposed to paragraph S.1.5.1. Display of Unit Price and Product Identity and why the words "shall display" were not proposed instead. Mrs. Butcher answered the question noting that the words "shall be able to display" is referencing unit price, which can be changed. That is, the device must be capable of displaying whatever the current unit price is for the product being offered for sale. Mr. Dick Suiter (Richard Suiter Consulting), agreeing with Mrs. Butcher, expanded upon her explanation by stating it is appropriate for "Specification" requirements in HB 44 to include terms such as "capable of" rather than be written as "hard" requirements.

The Committee agreed to maintain the Informational status of this item, noting that additional work was still needed to further develop the item. The Committee noted that it looks forward to future refinements of the item.

Regional Association Meetings:
At its 2014 Interim Meeting, CWMA received comments supporting the need for this item. The CWMA believes this item is sufficiently developed and recommended that the item be a Voting item. At the 2015 CWMA Annual Meeting, there were no comments heard on this item and CWMA recommended it move forward as an Informational item.

At the 2014 WWMA Annual Meeting open hearings the submitter of the item provided an update and stated that several changes have been made to address NIST OWM concerns. Several regulators spoke that this may impact owners of devices that are currently in use and urged caution. The submitter provided several updates to the WWMA S&T Committee to address comments heard during open hearings. These changes were included on the addendum sheet prior to the voting session. The WWMA recommended this as an Informational item to allow for additional review, comment and future consideration; including whether or not the retroactive dates should mirror the effective dates of similar paragraph in the LMD code.

S.1.3. Indicators.

S.1.3.6. 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 device or other onsite device accessible to the customer.

[Nonretroactive as of January 1, 201X]

(Added 201X)

S.1.4. For Retail Devices Only.

S.1.4.3. Zero-Set-Back Interlock for Retail Motor-Fuel Devices – A retail motor-fuel 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.

[Nonretroactive as of January 1, 201X]

(Added 201X)

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**~~.

(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, 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 be simultaneously displayed prior to the delivery of the product.

(2) For a system that offers post-delivery discounts on fuel sales, display of predelivery unit price information is exempt from (b)(1), provided the system complies with S.1.5.7. 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.

[Nonretroactive as of January 1, 201X]

(Added 201X)

S.1.5.4. Agreement Between Indications.

(c) When a quantity value indicated or recorded by an auxiliary element is a derived or computed value based on data received from a device, the value may differ from the quantity value displayed on the dispenser, provided that the following conditions are met:

(1) ***all total values for an individual sale that are indicated or recorded by the system agree, and***

(2) ***Within each element, the values indicated or recorded meet the formula (quantity x unit price = total sales price) to the closest cent.***

(d) When a system applies a post-delivery discount(s) to a fuel's unit price through an auxiliary element, the total volume of the delivery shall be in agreement between all elements in the system.

[Nonretroactive as of January 1, 201X]

(Added 201X)

S.1.5.5. Recorded Representations. – Except for fleet sales and other price contract sales and for transactions where a post-delivery discount is provided, a 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.

[Nonretroactive as of January 1, 201X]

(Added 201X)

S*.1.5.6. Recorded Representations for Transactions Where a Post-Delivery Discount(s) is Provided. – Except for fleet sales and other price contract sales, a 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.

[Nonretroactive as of January 1, 201X]

(Added 201X)

S.1.5.7. 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.

[Nonretroactive as of January 1, 201X]

(Added 201X)

UR.2. Use Requirements.

UR.2.7. For Stationary Retail Computing Type Devices Only Installed After January 1, 201X.

UR.2.7.1. 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:

(3) 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

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

Provided that the dispenser complies with S.1.5.1. Display of Unit Price and Product Identity, it is not necessary that all the unit prices 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:

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

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

(Added 201X)

UR.2.7.2. 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:

(3) all purchases of fuel are accompanied by a printed receipt of the transaction containing the applicable price per unit of measure, the total quantity delivered, and the total price of the sale; and

(4) 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.

(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:

(3) 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;

(4) all purchases of fuel are accompanied by a 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 after all post-delivery discounts are applied.

(Added 201X)

At its 2014 Annual Meeting, SWMA was informed that there was new language from the submitter and encouraged the NCWM S&T Committee to review this language. SWMA recommended that this item be a Developing item.

At its 2014 Interim Meeting, NEWMA did not receive comments on the item and recommended that it remain as a Developing item due to concerns from the OWM regarding some of the language in the proposal. At the 2015 NEWMA Annual Meeting, NEWMA recommended this item remain as informational as work continues on developing the proposal.

SWMA Action: Item 332-1
Summary of comments considered by the regional committee (in writing or during the open hearings):
No comments were received on this item.
Item as proposed by the regional committee: ***(If different than agenda item)***

S.1.4. For Retail Devices Only.

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)

S.1.5. For Stationary Retail Devices Only.

S.1.5.1. Display of Unit Price and Product Identity. – ~~In a~~ A device of the computing type~~, means~~ shall ~~be provided for~~ display~~ing~~ 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~~.

Except for dispensers used exclusively for fleet sales and other price contract sales, all of the unit prices at which that product is offered for sale shall meet the following conditions:

(3) 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 be simultaneously displayed prior to the delivery of the product.

(4) For a system that offers post-delivery discounts on fuel sales, display of pre-delivery unit price information is exempt from (1) above, provided the system complies with S.1.5.5. 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 customer: 1) using controls on the device; 2) through the customer's use of personal or vehicle-mounted electronic equipment communicating with the system; or 3) verbal instructions by the customer.
[Nonretroactive as of January 1, 201X]
(Added 201X)

~~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.~~
~~(Added 2014)~~

S.1.5.3. Agreement Between Indications.
(e) When a quantity value indicated or recorded by an auxiliary element is a derived or computed value based on data received from a device, the value may differ from the quantity value displayed on the dispenser, provided that the following conditions are met:

(1) *all total values for an individual sale that are indicated or recorded by the system agree, and*

(2) *within each element, the values indicated or recorded meet the formula (quantity x unit price = total sales price) to the closest cent.*

(f) When a system applies a post-delivery discount(s) to a fuel's unit price through an auxiliary element, the total volume of the delivery shall be in agreement between all elements in the system.

[Nonretroactive as of January 1, 201X]
(Added 201X)

S.1.5.4. Recorded Representations. – Except for fleet sales and other price contract sales and for transactions where a post-delivery discount is provided, a 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.

(Added 2016)

S.1.5.5. 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.

(Added 201X)

S.1.5.6. Transaction Information, Power Loss. 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 device or other onsite device accessible to the customer.
[Nonretroactive as of January 1, 201X]
(Added 201X)

S.1.5.7. 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.
[Nonretroactive as of January 1, 201X]
(Added 201X)

S.2. Design of Measuring Elements.

…

S.2.5. Zero-Set-Back Interlock for Stationary 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.

[Nonretroactive as of January 1, 201X]
(Added 201X)

S.2.6. ~~S.2.5.~~ Thermometer Well. – For test purposes, means shall be provided to determine the temperature of the liquid either:
(a) in the liquid chamber of the meter; or
(b) in the meter inlet or discharge line and immediately adjacent to the meter.
(Amended 1987)

S.2.7.~~S.2.6.~~ Automatic Temperature Compensation. – A device may be equipped with an adjustable automatic means for adjusting the indication and registration of the measured volume of product to the volume at 15 °C (60 °F).

S.2.7.1~~S.2.6.1.~~ Provision for Deactivating. – On a device equipped with an automatic temperature-compensating mechanism that will indicate or record only in terms of liters or gallons adjusted to 15 °C (60 °F), provision shall be made to facilitate the deactivation of the automatic temperature-compensating mechanism so that the meter may indicate, and record if it is equipped to record, in terms of the uncompensated volume.
(Amended 1972)

S.2.7.2.~~S.2.6.2.~~ Provision for Sealing. – Provision shall be made for applying security seals in such a manner that an automatic temperature-compensating system cannot be disconnected and that no adjustment may be made to the system.

UR.2. Use Requirements.

…

UR.2.7. For Stationary Retail Computing Type Systems Only, Installed After January 1, 201X.

UR.2.7.1. Unit Price and Product Identity.

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

(5) 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

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

Provided that the dispenser complies with S.1.5.1. Display of Unit Price and Product Identity, it is not necessary that all the unit prices be simultaneously displayed or posted.

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

(5) the identity of the product in descriptive commercial terms; and
(6) the identity of the grade, brand, blend, or mixture that a multi-product dispenser is set to deliver.

(Added 201X)

UR.2.7.2. 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:

(5) all purchases of fuel are accompanied by a printed receipt of the transaction containing the applicable price per unit of measure, the total quantity delivered, and the total price of the sale; and

(6) unless a dispenser complies with S.1.5.1. 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.

(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:

(5) 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;

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

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

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

4. total volume of the delivery;

5. unit price; and

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

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

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

(Added 201X)

Committee recommendation to the region:
☒ Voting Item on the NCWM Agenda
☐ Information Item on the NCWM Agenda

☐ Withdraw the Item from the NCWM Agenda (*In the case of new items, do not forward to NCWM)* ☐ Developing Item on the NCWM Agenda *(To be developed by source)*
Reasons for the committee recommendation:
The Committee feels the new language suggested by NIST is ready for voting.
COMPLETE SECTION BELOW FOLLOWING VOTING SESSION
Final updated or revised proposal from the region: ***(If different than regional committee recommendation)***
No change from committee recommendation.
Regional recommendation to NCWM for item status: ☒ Voting Item on the NCWM Agenda ☐ Information Item on the NCWM Agenda ☐ Withdraw the Item from the NCWM Agenda (*In the case of new items, do not forward to NCWM)* ☐ Developing Item on the NCWM Agenda *(To be developed by source)* ☐ Unable to consider at this time *(Provide explanation in the "Additional Comments" section below)*
Regional Report to NCWM: Please provide your report in this section exactly how you want it to appear in the NCWM reports to represent your region's considerations, support or opposition, and recommendations. **This will replace any previous reports from your region on this item.**
The Committee feels the new language suggested by NIST is ready for voting.

Additional letters, presentations and data may have been part of the committee's consideration. Please refer to http://www.ncwm.net/meetings/interim/publication-15 to review these documents.

New Item 7 S.2.1. Vapor Elimination

Source:
NIST Office of Weights and Measures (2016)

Purpose:

1) To require that the vapor eliminator on LPG and Anhydrous Ammonia liquid-measuring devices be automatic in operation;
2) To add the word, "air" to the vapor eliminator requirements for clarification and consistency with other measuring codes; and
3) To require that vapor elimination vent lines be made of metal tubing or other rigid material.

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

S.2.1. Vapor Elimination. –

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

(b) Vent lines from the vapor or air eliminator shall be made of metal tubing or other rigid material.

(Amended 20XX)

Background/Discussion:
The proposed changes to S.2.1. would clarify that the LPG or Anhydrous Ammonia liquid-measuring device's vapor eliminator must be automatic in operation and prevent both air and vapor from passing through the meter. Effective

operation should not depend on operator intervention or action. Additionally, the proposed changes would require that the vent lines be made of material that resists the potential obstruction (e.g., bending or kinking) that may otherwise prevent the free-flow of air and vapor out of the metering system. These modifications would more closely align it with similar language in the Liquid-Measuring Devices, Vehicle-Tank Meters, Cryogenic Liquid-Measuring Devices, Milk Meters, and Mass Flow Meters Codes. Non-rigid vent lines would facilitate fraud and may lead to improper operation of the air/vapor elimination system.

This proposal would provide consistency with corresponding requirements in the Liquid-Measuring Devices, Vehicle-Tank Meters, Cryogenic Liquid-Measuring Devices, Milk Meters, and Mass Flow Meters Codes.

SWMA Action: New Item 7

Summary of comments considered by the regional committee (in writing or during the open hearings):

This item was batched and heard together with New Item #10. Mr. Dick Suiter (Richard Suiter Consulting) and Mr. Hal Prince (FL) both commented on the use of the word "air" in conjunction with the term "vapor." Also, Mr. Prince suggested adding "non-corrosive" to the tubing composition statement since dealing with corrosive gasses. Mr. Michael Keilty (Endress Hauser Flowtec) agreed with Mr. Suiter and stated that the change may not be necessary. Mr. Tim Chesser (AR) preferred the option to cleanup if going to amend to which Mr. Rick Harshman (NIST) agreed, but stated that the proposal in (b) would be necessary.

Item as proposed by the regional committee: ***(If different than agenda item)***

S.2.1. Vapor Elimination. –

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

(b) Vent lines from the vapor ~~or air~~ eliminator shall be made of rigid corrosion-resistant ~~metal~~ tubing ~~or other rigid material~~.

(Amended 20XX)

Committee recommendation to the region:

- ☒ Voting Item on the NCWM Agenda
- ☐ Information Item on the NCWM Agenda
- ☐ Withdraw the Item from the NCWM Agenda (*In the case of new items, do not forward to NCWM)*
- ☐ Developing Item on the NCWM Agenda *(To be developed by source)*

Reasons for the committee recommendation:

This item was batched and heard together with New Item #10. The Committee recommends this new language based on comments received and feels the item will be ready for a vote.

COMPLETE SECTION BELOW FOLLOWING VOTING SESSION

Final updated or revised proposal from the region: ***(If different than regional committee recommendation)***

No change from committee recommendation.

Regional recommendation to NCWM for item status:

- ☒ Voting Item on the NCWM Agenda
- ☐ Information Item on the NCWM Agenda
- ☐ Withdraw the Item from the NCWM Agenda (*In the case of new items, do not forward to NCWM)*
- ☐ Developing Item on the NCWM Agenda *(To be developed by source)*
- ☐ Unable to consider at this time *(Provide explanation in the "Additional Comments" section below)*

Regional Report to NCWM:

Please provide your report in this section exactly how you want it to appear in the NCWM reports to represent your region's considerations, support or opposition, and recommendations. **This will replace any previous reports from your region on this item.**

This item was batched and heard together with New Item #10. The Committee recommends this new language based on comments received and feels the item will be ready for a vote.

Additional letters, presentations and data may have been part of the committee's consideration. Please refer to http://www.ncwm.net/meetings/interim/publication-15 to review these documents.

New Item 20 Table S.2.2. Categories of Sealing and Methods of Sealing (See Related New Items 19, 21, 22, 23, 24 and 25)

Source:
Gilbarco, Inc. (2016)

Purpose:
Allow a Category 3 event logger to have an electronic means to transfer the event logger information..

Item Under Consideration:
Amend NIST Handbook 44 Vehicle Tank Meter Code as follows:

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

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

[Nonretroactive as of January 1, 1995]

(Table Added 2006) **(Amended 20XX)**

Background/Discussion:
This amendment and similar proposals to amen other codes in Section 3 of Handbook 44 would provide the same requirements for Category 3 event loggers as was adopted for the 3.30 Liquid Measuring Devices Code at the 2015 NCWM Annual Meeting. Event logger information in an electronic format is easier to sort and search the traditional paper format.

SWMA Action: New Item 20
Summary of comments considered by the regional committee (in writing or during the open hearings):
This item was grouped in a batch consisting of New items #19-#25 and all items were heard together. Mr. Gordon Johnson (Gilbarco), the submitter, of this item noted that this was identical to the item passed in the LMD Code this past July and this series of items was to harmonize the codes.
Item as proposed by the regional committee: ***(If different than agenda item)***
No Change.
Committee recommendation to the region: ☒ Voting Item on the NCWM Agenda ☐ Information Item on the NCWM Agenda ☐ Withdraw the Item from the NCWM Agenda (*In the case of new items, do not forward to NCWM)* ☐ Developing Item on the NCWM Agenda *(To be developed by source)*
Reasons for the committee recommendation:
This item was grouped in a batch consisting of New items #19-#25 and all items were heard together. The Committee agrees with adding this language and harmonizing it with the LMD Code.
COMPLETE SECTION BELOW FOLLOWING VOTING SESSION
Final updated or revised proposal from the region: ***(If different than regional committee recommendation)***
No change.
Regional recommendation to NCWM for item status: ☒ Voting Item on the NCWM Agenda ☐ Information Item on the NCWM Agenda ☐ Withdraw the Item from the NCWM Agenda (*In the case of new items, do not forward to NCWM)* ☐ Developing Item on the NCWM Agenda *(To be developed by source)* ☐ Unable to consider at this time *(Provide explanation in the "Additional Comments" section below)*
Regional Report to NCWM: Please provide your report in this section exactly how you want it to appear in the NCWM reports to represent your region's considerations, support or opposition, and recommendations. **This will replace any previous reports from your region on this item.**
This item was grouped in a batch consisting of New items #19-#25 and all items were heard together. The Committee agrees with adding this language and harmonizing it with the LMD Code.

Additional letters, presentations and data may have been part of the committee's consideration. Please refer to http://www.ncwm.net/meetings/interim/publication-15 to review these documents.

332-2 D N.3. Test Drafts.

Source:
Endress + Hauser Flowtec AG USA (2015)

Purpose:
Allow transfer standard meters to be used to test and place into service dispensers and delivery system flow meters.

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

N.3. Test Drafts. –

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

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.

Background / Discussion:
The use of transfer standards is recognized in code sections 3.34 Cryogenic Liquid-Measuring Devices Code and 3.38 Carbon Dioxide Liquid-Measuring Devices Code and 3.39 Hydrogen Gas-Measuring Devices – Tentative Code. Field evaluation of LPG meters and CNG dispensers and LNG dispensers is very difficult using volumetric and gravimetric field standards and methods. The tolerances for these applications are such that using transfer meter standards are more efficient and safer. With CNG and LNG and LPG applications, the transfer standard meters are placed in-line with the delivery system as it is used to fill tanks and vehicles. The use of transfer standards eliminates return to storage issues. The use of transfer standard meters is easier and faster compared to the use of traditional field standards. The cost of using transfer standards and transporting them is much less than the cost of traditional field provers and standards. Recognition in Handbook 44 will enable States to allow transfer standard meters to place systems into service and for field enforcement.

Volumetric field provers and gravimetric field proving are susceptible to environmental influences. The State of Colorado uses a master meter to test propane delivery truck meters. The State of Nebraska has used a mass flow meter to test agricultural chemical meters.

In some applications, transfer standard meters are not more accurate than the meters used in the dispenser. For that reason, longer test drafts and possibly more tests need to be run.

The State of California is purported to have conducted a short study of master meters in the past. The conclusion did not lead to wide adoption of the practice. However, the State of California uses a mass flow meter as a master meter for carbon dioxide flowmeter enforcement.

Mass Flow Meters Code paragraph U.R.3.8. Return of Product to Storage, Retail Compressed Natural Gas Dispensers requires that the natural gas which is delivered into the test container must be returned to storage. This is difficult and most often not complied with when the test vessel contents are released to atmosphere.

The S&T Committee might also consider amending Sections 3.30 Liquid-Measuring Devices Code and 3.31 Vehicle-Tank Meters Code to allow transfer standard meters.

2015 NCWM Interim Meeting
At the 2015 NCWM Interim Meeting, the Committee agreed to group together Agenda Items 330-2 and 337-3 since these items are related and announced that comments on both items would be taken together during the open hearings.

Mr. Michael Keilty (Endress + Hauser Flowtec AG USA), submitter of the item, presented a short list of benefits to using a master meter as the standard in testing meters used in applications to measure CNG, LNG, and LPG in comparison to using volumetric or gravimetric standards. He stated that master meters are safer, more efficient, and provide a faster means of verifying meter accuracy. An additional benefit is that using a master meter eliminates the need to return product to storage because product can be dispensed through the master meter as part of the refueling procedure. He encouraged the recognition of master meters in HB 44 for use as a transfer standard in testing.

Mr. Henry Oppermann (Weights and Measures Consulting, LLC) provided written comments to the Committee concerning this item, which he summarized in comments presented during the open hearings. Mr. Oppermann stated there are significant differences between a transfer standard and a field standard. It is necessary to consider the accuracy of these standards. Field standards must satisfy the Fundamental Considerations of HB 44 Section 3.2 Tolerances for Standards, whereas transfer standards are recognized for use in some HB device codes, but do not satisfy the one-third requirement specified in Section 3.2. (*Technical Advisors note: Section 3.2. of the Fundamental Considerations requires the combined error and uncertainty of any standard used in testing to be less than one-third the applicable tolerance applied to the device under test unless corrections are made).* Mr. Oppermann recommended keeping clear this distinction, noting that the current proposal is incomplete if it doesn't include an additional tolerance when you test a device using a master meter (i.e., a transfer standard).

In response to Mr. Oppermann's comment regarding the need for an additional tolerance, Mr. Keilty stated that he isn't requesting a different tolerance be applied to the device under test. Current technology already enables the standard to comply.

Mrs. Tina Butcher (OWM) acknowledged that development of alternative methods of testing is beneficial because there are many applications where the nature of the product makes current methods impractical. She stressed, however, that adding a paragraph to HB 44, alone, doesn't provide recognition of a test method. There is a laundry list of pieces that need to be in place before a standard should be considered suitable for use in testing by providing traceability measurements including things such as:

- the accuracy of the standard (or the degree of accuracy that one can expect to achieve from using the standard) in relation to the tolerances that apply to the device being tested;
- HB 44 Fundamental Considerations – Tolerances for Standards;
- proper training and procedures for using the standard;
- training of laboratory personnel and the capability of the labs to verify the adequacy of the standard for use in testing another device; and
- collection and analysis of data obtained from having used the standard repeatedly over time.

Mrs. Butcher also noted that a USNWG has been assembled to review the different (alternative) test methods and this might be an appropriate group to review such equipment as resources allow. She also noted that the decision of whether or not to accept a particular method ultimately rests with the regulatory authority.

Mr. Dmitri Karimov (Liquid Control, LLC) noted that the Mass Flow Meters Code covers all applications where a mass flow meter is used. There are five measuring device codes within HB 44. Simply adding language to recognize the use of a particular piece of test equipment doesn't necessarily ensure its use is acceptable in testing. The decision of whether or not to use the test equipment resides with the regulatory authority where the meters are located.

The Committee agreed this item has merit and recommends the submitter of these items work with OWM by providing data for the WG to consider in determining the suitability of the master meter transfer standard as a standard in testing another device.

2015 NCWM Annual Meeting

At the 2015 NCWM Annual Meeting, the Committee agreed to group together Agenda Items 332-2 and 337-3 and took comments on the two items simultaneously. The Committee heard comments both in support and opposition of the proposals.

Mr. Michael Keilty (Endress + Hauser Flowtec AG USA), submitter of the item noted there is already an allowance for a field transfer standard in the Cryogenic Liquid-Measuring Devices Code, Carbon Dioxide Liquid-Measuring Devices Code, and in the Hydrogen Gas-Measuring Code. He asked there also be an allowance for a field transfer standard in the Anhydrous Ammonia Liquid-Measuring Devices Code and Mass Flow Meters Code, noting there's already information in those codes to support using a transfer standard. He also requested the Committee consider moving these two items forward as Voting items.

Mr. Henry Oppermann (Weights and Measures Consulting, LLC) speaking on behalf of Seraphin Test Measure, Co commented that there's a difference between a transfer standard and a field standard. Field standards must comply with the NIST Handbook 105 series. A transfer standard, in order to be used for testing another device, must be accurate and repeatable over the full range of how it will be used, to include temperature, flow rates, etc. Accuracy and repeatability must not change between times when it is used. He stated that Mr. Keilty is looking at a standard to meet the Fundamental Considerations of HB 44 and it is his view (that is, Mr. Oppermann's view) that that's a field standard and not a transfer standard.

Mrs. Tina Butcher (OWM) commented that OWM believes that the development of alternative methods of testing commercial metering systems is an important issue. There are many applications in which using currently recognized test methods may be not be feasible because of product characteristics, safety, cost, access to equipment, and other factors. OWM is not opposed to adding a paragraph to the two device codes as proposed, but by doing so, it wouldn't ensure approval of any proposed test method. The decision on whether or not to accept a particular test method for use in testing commercial weighing and measuring equipment ultimately rests with the regulatory authority.

There are a number of things that must be considered when selecting field standards and determining whether or not they are suitable and can be used to provide traceable measurements. These factors are sometimes referred to as the "essential elements of traceability." As noted by OWM during the 2015 NCWM Interim Meeting the pieces that need to be in place before a standard should be considered suitable for use in testing by providing traceability measurements include things such as:

- the accuracy of the standard (or the degree of accuracy that one can expect to achieve from using the standard) in relation to the tolerances that apply to the device being tested;
- HB 44 Fundamental Considerations – Tolerances for Standards;
- proper training and procedures for using the standard;
- training of laboratory personnel and the capability of the labs to verify the adequacy of the standard for use in testing another device; and
- collection and analysis of data obtained from having used the standard repeatedly over time.

With regard to the relative accuracy of a particular test standard, the Fundamental Considerations in NIST HB 44 Section 3.2. Tolerances for Standards specify that when a standard is used without correction its combined error and uncertainty must be less than 1/3 of the applicable tolerance. Some of the other factors include demonstrated reliability of the device over time; device repeatability; how well it duplicates actual use; existence of documentary standards for the test equipment; availability of equipment and facilities within a state laboratory to test the equipment; and whether training has been provided for the laboratory staff, field officials, and users of the equipment. These and other factors have also been raised by others during the Committee's open hearings.

NIST OWM established a U.S. National Work Group to examine alternative test methods. A subgroup within that USNWG is presently working to establish uncertainties for selected different test methods. OWM has circulated a draft document with guidelines for collecting test data within this subgroup; once finalized, this document might be useful in collecting such data on the use of other types of standards. Currently, there are no representatives on the subcommittee to review factors that affect the uncertainties of measurements using master meters. However, several members of the larger work group have expressed interest in developing standards and test procedures for master meters in some applications. Should industry want to pursue recognition of master meters, test data may be needed to determine whether or not this is a viable method and the OWM guidelines might be used for this purpose. Collecting data to assess the test uncertainties associated with using master meters would provide useful information on the potential use of transfer standard meters (master meters) for field testing.

With regard to the specific language in the proposed new paragraph N.3.2. Transfer Standard Test, the Developer may wish to consider eliminating the phrase "test draft" and replacing it with the phrase "delivered quantity" as shown in the alternative version below. This change would be consistent with changes made in 1996 to LMD Code requirements for test drafts to better allow for the use of alternative test methods such as small volume provers.

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

Ms. Kristin Macey (CA) commented that if the proposal were adopted, it would allow use of a transfer standard and California would not be able to fully support it. She noted that the State of California had completed some comparison testing using the following different test methods: "pressure volume temperature," "gravimetric," and "master meter." Of the three methods compared, the master meter performed worst.

Several regulatory officials and one industry representative commented in support of the continued development of the two items. That industry representative also noted that the HB 44 definition of "transfer standard" needs to be expanded.

Mr. Keilty, in response to Mrs. Butcher's and Mr. Oppermann's comments, stated that he agreed completely. Adding the paragraph to these two codes is a step towards allowing the use of transfer standards and it's understood that there's a number of things that would need to be in place in order that they be considered suitable for use in testing. He further noted that a change to the tolerances in these two codes is not being proposed.

Regional Association Meetings:
At its 2014 Interim Meeting, CWMA received comments questioning the accuracy of a meter used as a mobile standard. CWMA forwarded the item to NCWM, recommending it as a Developing item. At the 2015 CWMA Annual Meeting, an official from Nebraska reported that State's use of a master meter (transfer standard). The CWMA again recommended moving the item forward as a Developing item.

At the 2014 WWMA Annual Meeting testimony was presented that this type of technology would more easily facilitate inspections. However, it was also stated that a more comprehensive evaluation of the equipment and testing procedure, including the associated uncertainty, needs to be performed. The WWMA agreed that this type of technology would be useful. WWMA forwarded the item to NCWM and recommended that it be a Developing item to allow the submitter to provide a more complete analysis.

At its 2014 Annual Meeting, SWMA heard questions and concerns that need to be addressed by the submitter. SWMA also recommended that NIST OWM continue to develop a standard for this type of equipment and other guidance documents necessary to recognize their use. Additionally, SWMA recommended that the submitter work with NIST OWM to address these concerns. SWMA recommended that Items 332-2 and 337-3 be combined into one agenda item since they are both related to test drafts. Comments were heard for both of these agenda items at the same time.

NEWMA reported at its 2014 Interim Meeting that it believed his item has merit but needs further Development before being sent to a vote. NEWMA forwarded the item to NCWM and recommended that it be a Developing item. NEWMA also recommended that this item be combined with Items 332-2 and 337-3 as a single agenda item. At the 2015 NEWMA Annual Meeting, a recommendation was made to withdraw this item with the intent that it be resubmitted once clarification has been provided regarding the accuracy of the transfer standard meters. NEWMA agreed, however, to maintain the "Developing" status at the recommendation of NEWMA's S&T Committee so that work could continue on the proposal.

SWMA Action: Item 332-2
Summary of comments considered by the regional committee (in writing or during the open hearings):
This item was batched and heard together with Item 337-2. Mr. Michael Keilty (Endress Hauser Flowtec), submitter of this item, stated this was a good idea for CNG fuels and recommend moving forward as a voting item. Mr. Hal Prince (FL) spoke in support of the item, but noted that the "one minute" language in N.3.1 works for master meters. Mr. Henry Oppermann (Weights and Measures Consulting, LLC) stated that no change may be necessary and it may be that a change to Handbook 105 is all that is necessary. Mr. Dick Suiter (Richard Suiter Consulting) stated that there was a place for transfer standards in the marketplace, but the difference is what defines a transfer standard. He noted that the definition for a transfer standard in Handbook 44 restricts them from cryogenic use and thus would need to be changed.
Item as proposed by the regional committee: ***(If different than agenda item)***
No change.

Committee recommendation to the region: ☒ Voting Item on the NCWM Agenda ☐ Information Item on the NCWM Agenda ☐ Withdraw the Item from the NCWM Agenda (*In the case of new items, do not forward to NCWM)* ☐ Developing Item on the NCWM Agenda *(To be developed by source)*
Reasons for the committee recommendation:
This item was batched and heard together with Item 337-2. The Committee feels this item is ready for voting.
COMPLETE SECTION BELOW FOLLOWING VOTING SESSION
Final updated or revised proposal from the region: ***(If different than regional committee recommendation)***
No change.
Regional recommendation to NCWM for item status: ☒ Voting Item on the NCWM Agenda ☐ Information Item on the NCWM Agenda ☐ Withdraw the Item from the NCWM Agenda (*In the case of new items, do not forward to NCWM)* ☐ Developing Item on the NCWM Agenda *(To be developed by source)* ☐ Unable to consider at this time *(Provide explanation in the "Additional Comments" section below)*
Regional Report to NCWM: Please provide your report in this section exactly how you want it to appear in the NCWM reports to represent your region's considerations, support or opposition, and recommendations. **This will replace any previous reports from your region on this item.**
This item was batched and heard together with Item 337-2. The Committee feels this item is ready for voting.

Additional letters, presentations and data may have been part of the committee's consideration. Please refer to http://www.ncwm.net/meetings/interim/publication-15 to review these documents.

New Item 8 N.4.2.3. For Wholesale Devices

Source:
NIST Office of Weights and Measures (2016)

Purpose:

1) To specify the purpose of special tests conducted on Wholesale LPG and Anhydrous Ammonia Liquid-Measuring Devices;
2) To specify that the special tests are to be conducted at or slightly above the designated flow rates in the referenced paragraph; and
3) To specify that the special tests are not to be conducted below the device's marked minimum discharge rate.

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

N.4.2.3. For Wholesale Devices. – ~~**A wholesale device shall be so tested at a minimum discharge rate of:**~~ **"Special" tests shall be made to develop the operating characteristics of a measuring system and any special elements and accessories attached to or associated with the device. "Special" tests shall include a test at or slightly above the slower of the following rates:**

(a) 40 L (10 gal) per minute for a device with a rated maximum discharge less than 180 L (50 gal) per minute~~.~~**;**

(b) 20 % of the marked maximum discharge rate for a device with a rated maximum discharge of 180 L (50 gal) per minute or more~~,~~**:** or

(c) the minimum discharge rate marked on the device~~**, whichever is least**~~.

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

(Amended 1987 **and 20XX**)

Background/Discussion:
In 2014, the Liquid-Measuring Devices (LMD) Code of NIST Handbook 44 was modified to clarify testing requirements for special tests of wholesale LMDs and to help to ensure that those tests were not conducted at flow rates less than the minimum flow rates marked by the manufacturers of the metering systems. The proposed changes outlined above would align the special test requirements for LPG and Anhydrous Ammonia Liquid-Measuring Devices with those adopted in 2014 in the LMD Code and provide consistency in testing procedures across similar measuring codes.

During training seminars for weights and measures officials and service personnel, NIST OWM and other trainers instruct students to conduct special tests slightly above the marked minimum flow rate. While an official or service agent is not precluded from setting the flow rate exactly at the marked minimum flow rate, special care must be taken to ensure that the flow rate does not drop below the marked minimum during the course of the test. This can sometimes be difficult in field environments. Flow rates can vary slightly during the course of a test draft due to factors such as changes in system pressure and the number of other devices in use within the system. If the inspector or service agent sets the flow rate exactly at the marked minimum flow rate, such variations can result in the flow rate dropping below the marked minimum flow rate for portions of the test. This could potentially result in an unfair test to the metering system. Additionally, it is sometimes difficult to control the flow rate during the course of the entire test or to even set the flow rate at "exactly" the marked minimum rate. The proposed language would provide flexibility to the inspector or service agent to conduct a special test "at" or "near" the marked minimum and still consider such a test to be valid.

This proposal would provide consistency with 2015 NIST HB 44 Section 3.30. Liquid-Measuring Devices Code, Special Tests, paragraph N.4.2.4. Special Tests, Wholesale Devices.

SWMA Action: New Item 8
Summary of comments considered by the regional committee (in writing or during the open hearings):
Comments were heard by Mr. Rick Harshman (NIST) stated the N.4.2.4. of the LMD Code was amended in 2014 and the intended proposal was to harmonize the requirements in the LPG/Anhydrous LMD Code with those in the LMD Code.
Item as proposed by the regional committee: ***(If different than agenda item)***
No change.
Committee recommendation to the region: ☒ Voting Item on the NCWM Agenda ☐ Information Item on the NCWM Agenda ☐ Withdraw the Item from the NCWM Agenda (*In the case of new items, do not forward to NCWM)* ☐ Developing Item on the NCWM Agenda *(To be developed by source)*
Reasons for the committee recommendation:
The Committee feels this item is ready for voting.
COMPLETE SECTION BELOW FOLLOWING VOTING SESSION
Final updated or revised proposal from the region: ***(If different than regional committee recommendation)***
No change.

Regional recommendation to NCWM for item status: ☒ Voting Item on the NCWM Agenda ☐ Information Item on the NCWM Agenda ☐ Withdraw the Item from the NCWM Agenda (*In the case of new items, do not forward to NCWM)* ☐ Developing Item on the NCWM Agenda *(To be developed by source)* ☐ Unable to consider at this time *(Provide explanation in the "Additional Comments" section below)*
Regional Report to NCWM: Please provide your report in this section exactly how you want it to appear in the NCWM reports to represent your region's considerations, support or opposition, and recommendations. **This will replace any previous reports from your region on this item.**
The Committee feels this item is ready for voting.

Additional letters, presentations and data may have been part of the committee's consideration. Please refer to http://www.ncwm.net/meetings/interim/publication-15 to review these documents.

New Item 9 UR.2.3. Vapor-Return Line

Source:
NIST Office of Weights and Measures (2016)

Purpose:
Clarify conditions under which the use of an LPG vapor return line connected from a supplier's tank to a receiving container is or is not permitted.

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

UR.2.3. Vapor-Return Line. – During any metered delivery of liquefied petroleum gas from a supplier's tank to a receiving container, ~~**there shall be no**~~ **a** vapor-return line from the receiving container to the supplier's tank **is prohibited except**:

(a) in the case of any receiving container to which normal deliveries ~~**can**~~ **cannot** be made without the use of such vapor-return line; or

(b) in the case of any ~~**new**~~ **top spray-fill** receiving container when the ambient temperature is ~~**below**~~ **above** 90 °F **(32 °C)**.

(Amended 20XX)

Background/Discussion:
The current language in NIST HB 44 paragraph UR.2.3. Vapor-Return Line continues to cause confusion and generates questions from inspectors, manufacturers, and measuring system users. The intent of the proposed modifications is to make this paragraph more direct and easier to understand. The proposed amendments to UR.2.3.(b) are intended to clarify the meaning of the term "new" in references to "receiving containers" in the existing language. Research of the original language revealed references to receiving containers (or tanks) that were designed with what was then considered "new" top "spray-fill" systems.

Discussion of requirements and considerations for the use of LPG vapor return lines can be traced back as early as the 1950 NCWM Conference Report and can be found specifically in the 1956, 1957, 1958, and 1964 Conference Reports.

As product flows into the receiving (customer's) tank during an LPG delivery, the liquid compresses the vapor in the customer's tank, increasing pressures and temperatures inside the tank. As the pressure increases, some of the vapor condenses into liquid and equilibrium is eventually restored. However, such increased pressure can make deliveries difficult or impossible. At one time, vapor return lines were used to help equalize the pressures. These lines would allow some vapor in the receiving tank to be pushed back into the seller's tank, thus reducing pressure in the receiving tank during the delivery. The problem with this practice is that this vapor belongs to the customer and no compensation is made to the customer for it.

The "spray-fill" design allows relatively cool product to "spray" over the insides of the tank as a delivery is being made, cooling the vapor space and promoting condensation of existing vapor in the tank, and reducing pressure buildup. The advent of the spray fill design virtually eliminated the need for a vapor-return line connected to the supplier's tank and the receiving container except in specific circumstances where other constraints may necessitate its use.

SWMA Action: New Item 9
Summary of comments considered by the regional committee (in writing or during the open hearings):
No comments were received on this item.
Item as proposed by the regional committee: ***(If different than agenda item)***
No change.
Committee recommendation to the region: ☒ Voting Item on the NCWM Agenda ☐ Information Item on the NCWM Agenda ☐ Withdraw the Item from the NCWM Agenda (*In the case of new items, do not forward to NCWM)* ☐ Developing Item on the NCWM Agenda *(To be developed by source)*
Reasons for the committee recommendation:
The Committee feels this item is ready for voting.
COMPLETE SECTION BELOW FOLLOWING VOTING SESSION
Final updated or revised proposal from the region: ***(If different than regional committee recommendation)***
No change.
Regional recommendation to NCWM for item status: ☒ Voting Item on the NCWM Agenda ☐ Information Item on the NCWM Agenda ☐ Withdraw the Item from the NCWM Agenda (*In the case of new items, do not forward to NCWM)* ☐ Developing Item on the NCWM Agenda *(To be developed by source)* ☐ Unable to consider at this time *(Provide explanation in the "Additional Comments" section below)*
Regional Report to NCWM: Please provide your report in this section exactly how you want it to appear in the NCWM reports to represent your region's considerations, support or opposition, and recommendations. **This will replace any previous reports from your region on this item.**
The Committee feels this item is ready for voting.

Additional letters, presentations and data may have been part of the committee's consideration. Please refer to http://www.ncwm.net/meetings/interim/publication-15 to review these documents.

334 CRYOGENIC LIQUID-MEASURING DEVICES

New Item 21 Table S.252. Categories of Sealing and Methods of Sealing (See Related New Items 19, 20, 22, 23, 24 and 25)

Source:
Gilbarco, Inc. (2016)

Purpose:
Allow a Category 3 event logger to have an electronic means to transfer the event logger information..

Item Under Consideration:
Amend NIST Handbook 44 Vehicle Tank Meter Code as follows:

Table S.2.5.
Categories of Device and Methods of Sealing

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

[Nonretroactive as of January 1, 1995]

(Table Added 2006) **(Amended 20XX)**

Background/Discussion:
This amendment and similar proposals to amen other codes in Section 3 of Handbook 44 would provide the same requirements for Category 3 event loggers as was adopted for the 3.30 Liquid Measuring Devices Code at the 2015 NCWM Annual Meeting. Event logger information in an electronic format is easier to sort and search the traditional paper format.

SWMA Action: New Item 21
Summary of comments considered by the regional committee (in writing or during the open hearings):
This item was grouped in a batch consisting of New items #19-#25 and all items were heard together. Mr. Gordon Johnson (Gilbarco), the submitter, of this item noted that this was identical to the item passed in the LMD Code this past July and this series of items was to harmonize the codes.
Item as proposed by the regional committee: ***(If different than agenda item)***
No Change.
Committee recommendation to the region: ☒ Voting Item on the NCWM Agenda ☐ Information Item on the NCWM Agenda ☐ Withdraw the Item from the NCWM Agenda (*In the case of new items, do not forward to NCWM)* ☐ Developing Item on the NCWM Agenda *(To be developed by source)*
Reasons for the committee recommendation:
This item was grouped in a batch consisting of New items #19-#25 and all items were heard together. The Committee agrees with adding this language and harmonizing it with the LMD Code.
COMPLETE SECTION BELOW FOLLOWING VOTING SESSION
Final updated or revised proposal from the region: ***(If different than regional committee recommendation)***
No change.
Regional recommendation to NCWM for item status: ☒ Voting Item on the NCWM Agenda ☐ Information Item on the NCWM Agenda ☐ Withdraw the Item from the NCWM Agenda (*In the case of new items, do not forward to NCWM)* ☐ Developing Item on the NCWM Agenda *(To be developed by source)* ☐ Unable to consider at this time *(Provide explanation in the "Additional Comments" section below)*
Regional Report to NCWM: Please provide your report in this section exactly how you want it to appear in the NCWM reports to represent your region's considerations, support or opposition, and recommendations. **This will replace any previous reports from your region on this item.**
This item was grouped in a batch consisting of New items #19-#25 and all items were heard together. The Committee agrees with adding this language and harmonizing it with the LMD Code.

Additional letters, presentations and data may have been part of the committee's consideration. Please refer to http://www.ncwm.net/meetings/interim/publication-15 to review these documents.

335 MILK METERS

New Item 22 Table S.2.2. Categories of Sealing and Methods of Sealing (See Related New Items 19, 20, 21, 23, 24 and 25)

Source:
Gilbarco, Inc. (2016)

Purpose:
Allow a Category 3 event logger to have an electronic means to transfer the event logger information..

Item Under Consideration:

Amend NIST Handbook 44 Vehicle Tank Meter Code as follows:

Table S.2.3. ***Categories of Device and Methods of Sealing***	
Categories of Device	***Methods of Sealing***
Category 1: *No remote configuration capability.*	*Seal by physical seal or two event counters: one for calibration parameters and one for configuration parameters.*
Category 2: *Remote configuration capability, but access is controlled by physical hardware.* *The device shall clearly indicate that it is in the remote configuration mode and record such message if capable of printing in this mode or shall not operate while in this mode.*	*The hardware enabling access for remote communication must be on-site. The hardware must be sealed using a physical seal or an event counter for calibration parameters and an event counter for configuration parameters. The event counters may be located either at the individual measuring device or at the system controller; however, an adequate number of counters must be provided to monitor the calibration and configuration parameters of the individual devices at a location. If the counters are located in the system controller rather than at the individual device, means must be provided to generate a hard copy of the information through an on-site device.*
Category 3: *Remote configuration capability access may be unlimited or controlled through a software switch (e.g., password).* *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.*	*An event logger is required in the device; it must include an event counter (000 to 999), the parameter ID, the date and time of the change, and the new value of the parameter. A printed copy of the information must be available* ***on demand*** *through the device or through another on-site device.* ***The information may also be available electronically.*** *The event logger shall have a capacity to retain records equal to 10 times the number of sealable parameters in the device, but not more than 1000 records are required. (**Note:** Does not require 1000 changes to be stored for each parameter.)*

[Nonretroactive as of January 1, 1995]

(Table Added 2006) **(Amended 20XX)**

Background/Discussion:
This amendment and similar proposals to amen other codes in Section 3 of Handbook 44 would provide the same requirements for Category 3 event loggers as was adopted for the 3.30 Liquid Measuring Devices Code at the 2015 NCWM Annual Meeting. Event logger information in an electronic format is easier to sort and search the traditional paper format.

SWMA Action: New Item 22
Summary of comments considered by the regional committee (in writing or during the open hearings):
This item was grouped in a batch consisting of New items #19-#25 and all items were heard together. Mr. Gordon Johnson (Gilbarco), the submitter, of this item noted that this was identical to the item passed in the LMD Code this past July and this series of items was to harmonize the codes.
Item as proposed by the regional committee: ***(If different than agenda item)***
No Change.
Committee recommendation to the region: ☒ Voting Item on the NCWM Agenda

☐ Information Item on the NCWM Agenda ☐ Withdraw the Item from the NCWM Agenda (*In the case of new items, do not forward to NCWM)* ☐ Developing Item on the NCWM Agenda *(To be developed by source)*
Reasons for the committee recommendation:
This item was grouped in a batch consisting of New items #19-#25 and all items were heard together. The Committee agrees with adding this language and harmonizing it with the LMD Code.
COMPLETE SECTION BELOW FOLLOWING VOTING SESSION
Final updated or revised proposal from the region: *(If different than regional committee recommendation)*
No change.
Regional recommendation to NCWM for item status: ☒ Voting Item on the NCWM Agenda ☐ Information Item on the NCWM Agenda ☐ Withdraw the Item from the NCWM Agenda (*In the case of new items, do not forward to NCWM)* ☐ Developing Item on the NCWM Agenda *(To be developed by source)* ☐ Unable to consider at this time *(Provide explanation in the "Additional Comments" section below)*
Regional Report to NCWM: Please provide your report in this section exactly how you want it to appear in the NCWM reports to represent your region's considerations, support or opposition, and recommendations. **This will replace any previous reports from your region on this item.**
This item was grouped in a batch consisting of New items #19-#25 and all items were heard together. The Committee agrees with adding this language and harmonizing it with the LMD Code.

Additional letters, presentations and data may have been part of the committee's consideration. Please refer to http://www.ncwm.net/meetings/interim/publication-15 to review these documents.

337 MASS FLOW METERS

New Item 23 Table S.3.5. Categories of Sealing and Methods of Sealing (See Related New Items 19, 20, 21, 22, 24 and 25)

Source:
Gilbarco, Inc. (2016)

Purpose:
Allow a Category 3 event logger to have an electronic means to transfer the event logger information..

Item Under Consideration:
Amend NIST Handbook 44 Vehicle Tank Meter Code as follows:

Table S.3.5. *Categories of Device and Methods of Sealing*	
Categories of Device	***Methods of Sealing***
Category 1: *No remote configuration capability.*	*Seal by physical seal or two event counters: one for calibration parameters and one for configuration parameters.*
Category 2: *Remote configuration capability, but access is controlled by physical hardware.* *The device shall clearly indicate that it is in the remote configuration mode and record such message if capable of printing in this mode or shall not operate while in this mode.*	*The hardware enabling access for remote communication must be on-site. The hardware must be sealed using a physical seal or an event counter for calibration parameters and an event counter for configuration parameters. The event counters may be located either at the individual measuring device or at the system controller; however, an adequate number of counters must be provided to monitor the calibration and configuration parameters of the individual devices at a location. If the counters are located in the system controller rather than at the individual device, means must be provided to generate a hard copy of the information through an on-site device.*
Category 3: *Remote configuration capability access may be unlimited or controlled through a software switch (e.g., password).* *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.*	*An event logger is required in the device; it must include an event counter (000 to 999), the parameter ID, the date and time of the change, and the new value of the parameter. A printed copy of the information must be available* ***on demand*** *through the device or through another on-site device.* ***The information may also be available electronically.*** *The event logger shall have a capacity to retain records equal to 10 times the number of sealable parameters in the device, but not more than 1000 records are required. (**Note:** Does not require 1000 changes to be stored for each parameter.)*

[Nonretroactive as of January 1, 1995]

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

Background/Discussion:
This amendment and similar proposals to amen other codes in Section 3 of Handbook 44 would provide the same requirements for Category 3 event loggers as was adopted for the 3.30 Liquid Measuring Devices Code at the 2015 NCWM Annual Meeting. Event logger information in an electronic format is easier to sort and search the traditional paper format.

SWMA Action: New Item 23
Summary of comments considered by the regional committee (in writing or during the open hearings):
This item was grouped in a batch consisting of New items #19-#25 and all items were heard together. Mr. Gordon Johnson (Gilbarco), the submitter, of this item noted that this was identical to the item passed in the LMD Code this past July and this series of items was to harmonize the codes.
Item as proposed by the regional committee: ***(If different than agenda item)***
No Change.
Committee recommendation to the region: ☒ Voting Item on the NCWM Agenda ☐ Information Item on the NCWM Agenda ☐ Withdraw the Item from the NCWM Agenda (*In the case of new items, do not forward to NCWM)*

☐ Developing Item on the NCWM Agenda *(To be developed by source)*
Reasons for the committee recommendation:
This item was grouped in a batch consisting of New items #19-#25 and all items were heard together. The Committee agrees with adding this language and harmonizing it with the LMD Code.
COMPLETE SECTION BELOW FOLLOWING VOTING SESSION
Final updated or revised proposal from the region: ***(If different than regional committee recommendation)***
No change.
Regional recommendation to NCWM for item status: ☒ Voting Item on the NCWM Agenda ☐ Information Item on the NCWM Agenda ☐ Withdraw the Item from the NCWM Agenda (*In the case of new items, do not forward to NCWM)* ☐ Developing Item on the NCWM Agenda *(To be developed by source)* ☐ Unable to consider at this time *(Provide explanation in the "Additional Comments" section below)*
Regional Report to NCWM: Please provide your report in this section exactly how you want it to appear in the NCWM reports to represent your region's considerations, support or opposition, and recommendations. **This will replace any previous reports from your region on this item.**
This item was grouped in a batch consisting of New items #19-#25 and all items were heard together. The Committee agrees with adding this language and harmonizing it with the LMD Code.

Additional letters, presentations and data may have been part of the committee's consideration. Please refer to http://www.ncwm.net/meetings/interim/publication-15 to review these documents.

337-1 Appendix D – Definitions: Diesel Liter Equivalent (DLE) and Diesel Gallon Equivalents (DGE) for Compressed Natural Gas and Liquefied Natural Gas; Definition of Gasoline Gallon Equivalent and Gasoline Liter Equivalent for Compressed Natural Gas; S.1.2. Compressed Natural Gas and Liquefied Natural Gas Dispensers; S.1.3.1.1. Compressed Natural Gas Used as an Engine Fuel; S.1.3.1.2. Liquefied Natural Gas Used as an Engine Fuel; S.5.2. Marking of Diesel and Gasoline Volume Equivalent Conversion Factor; Compressed Natural Gas, S.5.3. Marking of Diesel Volume Equivalent Conversion Factor; Liquefied Natural Gas, UR.3.1.1. Marking of Equivalent Conversion Factor for Compressed Natural Gas, UR.3.1.2. Marking of Equivalent Conversion Factor for Liquefied Natural Gas, and UR.3.8. Return of Product to Storage, Retail Compressed Natural Gas and Liquefied Natural Gas

(This item was returned to Committee for further consideration due to a split vote.)

Source:
Clean Vehicle Education Foundation (2014)

Purpose:
Since natural gas is sold in the retail market place as compressed natural gas (CNG) and liquefied natural gas (LNG) an alternative fuel to gasoline and diesel fuel, the proposed additions and edits to Handbook 44 will provide definitions for volume units of CNG and LNG that are the energy equivalents for diesel and/or gasoline gallons so that end users can readily compare cost and fuel economy. At present only equivalents for gasoline are included in

NIST Handbooks 44 and 130 for CNG as an engine fuel. The proposal also includes modifications to Appendix D relative to the sale of LNG and CNG.

Item Under Consideration:
Amend NIST Handbook 44 Appendix D to include the following new definition:

diesel gallon equivalent (DGE). – Diesel gallon equivalent (DGE) means 6.384 pounds of compressed natural gas or 6.059 pounds of liquefied natural gas. [3.37]
(Added 2015)

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]
(Added 1994) **(Amended 2015)**

Delete the following NIST Handbook 44 Appendix D definition as shown:

~~**gasoline liter equivalent (GLE). Gasoline liter equivalent (GLE) means 0.678 kilograms of natural gas.[3.37]**~~
~~**(Added 1994)**~~

Amend NIST Handbook 44 Mass Flow Meters Code paragraphs S.1.2., S.1.3.1.1., S.5.2., and UR.3.8. and add new paragraphs S.1.3.1.2., S.5.3., UR.3.1.1. and UR.3.1.2. as follows:

S.1.2. Compressed Natural Gas and Liquefied Natural Gas Dispensers. – Except for fleet sales and other price contract sales, a compressed **or liquefied** 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 2015)**

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 indicated in ~~"gasoline liter equivalent (GLE) units" or~~ **"**gasoline gallon equivalent (GGE) units~~"~~ **" or diesel gallon equivalent units (DGE), or in mass.** (Also see Appendix D definitions.)

(Added 1994) **(Amended 2015)**

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 indicated in diesel gallon equivalent units (DGE) or in mass. (Also see definitions.)
(Added 2015)

S.5.2. Marking of ~~Gasoline Volume~~ Equivalent Conversion Factors for Compressed Natural Gas. – 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~~ **means** 5.660 lb of **Compressed** Natural Gas" **or "1 Diesel Gallon Equivalent (DGE) means 6.384 lb of Compressed Natural Gas"** permanently and conspicuously marked on the face of the dispenser according to the method of sale used.

(Added 1994)**(Amended 2015)**

S.5.3. Marking of Equivalent Conversion Factors for Liquefied Natural Gas. – A device dispensing liquefied natural gas shall have the statement "1 Diesel Gallon Equivalent (DGE) means 6.059 lb of Liquefied Natural Gas" permanently and conspicuously marked on the face of the dispenser according to the method of sale used.

(Amended 2015)

UR.3.1.1. Marking of Equivalent Conversion Factors for Compressed Natural Gas. – A device dispensing compressed natural gas shall have either the statement "1 Gasoline Gallon Equivalent (GGE) means 5.660 lb of Compressed Natural Gas" or "1 Diesel Gallon Equivalent (DGE) means 6.384 lb of Compressed Natural Gas" permanently and conspicuously marked on the face of the dispenser according to the method of sale used.

(Added 2015)

UR.3.1.2. Marking of Equivalent Conversion Factors for Liquefied Natural Gas. – A device dispensing liquefied natural gas shall have the statement "1 Diesel Gallon Equivalent (DGE) means 6.059 lb of Liquefied Natural Gas" permanently and conspicuously marked on the face of the dispenser according to the method of sale used.

(Added 2015)

UR.3.8. Return of Product to Storage, Retail Compressed 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 2015)**

Background / Discussion:
The gasoline gallon equivalent (GGE) unit was defined by NCWM in 1994 to allow users of natural gas vehicles to readily compare costs and fuel economy of light-duty compressed natural gas vehicles with equivalent gasoline powered vehicles. More background on this work 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 Liquefied 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 is included in Appendix F.

2013: A summary of actions that took place in 2013 appears in the box below.

January 2013 NCWM Interim Meeting
At the 2013 NCWM Interim Meeting, the Committee heard multiple comments in opposition and no comments in support of the proposal during its open hearings. Refer to the Committee's 2013 Final Report to view specific comments and suggestions that were made and who provided them.

During its work sessions at the Interim Meeting, the S&T Committee met with the L&R Committee to discuss this item and related items on the two Committees' agendas; the corresponding items on the L&R Committee Agenda are Items 232-1 and 237-1. During the joint meeting, the L&R Committee advised the S&T Committee that it had decided to make the related item on their agenda "Informational" to allow additional time for the community to study the issue and hear from other stakeholders in the community. A proposal was made to ask the FALS to deliberate on an appropriate equivalent value for each of the proposed "units." However, the two Committees recognized that before asking the FALS to expend resources on further definitions, the questions and concerns raised in the open hearings regarding the appropriateness of recognizing such units should first be addressed. The Committees agreed to recommend to the NCWM Chairman that a small task group be established to further study

this issue. The Committees each agreed to develop a list of tasks that they would ask such a task group to take on and to recommend possible members of the group to ensure balanced representation of stakeholders.

After discussion with the L&R Committee, the S&T Committee reviewed and summarized key comments made during the open hearings for S&T Committee Agenda Items 337-1 and 337-2:

- Are equivalent units necessary to promote consumer acceptance of this fuel?
- Is there a significant need for continued comparison to other fuels once you have purchased a vehicle? Does this justify the proliferation of "equivalent" values?
- The intent is to add this for medium- and heavy-duty vehicles such as trucks that operate on LNG. Trucks that operate on LNG are generally dedicated fuel vehicles that run only on a single fuel.
- Is the dispenser the appropriate place to make comparisons with other fuels or is a better place to make those comparisons via mechanisms such as pump toppers, websites, etc.?
- Striking the word "compressed" (in the changes proposed in Item 337-2) expands the proposal to LNG.
- California's approval of LNG meters indicating in mass units was correct.
- What will the impact be on existing approval of LNG dispensers currently indicating in mass?
- There is much opposition to the proliferation of "equivalent units" for various types of fuels.
- The current recognition of GGE and GLE units has led to complaints about equivalent values from both industry and regulatory officials.
- Mass units should be considered for natural gas and other fuels.
- Will the establishment of equivalent values provide traceability to SI units?
- The community expends significant resources to achieve good meter performance and establishing "fuzzy" equivalent values seems to undermine these efforts.
- The factor for any "equivalent unit" will represent only an "estimate" of an equivalent value.
- There is disagreement amongst the industry regarding the appropriate equivalent value in this proposal. The report containing the data that is referenced as the basis for the proposal includes a disclaimer from Oakridge National Laboratory and U.S. Department of Energy regarding its validity for other than general use in the transportation industry.
- The S&T Committee only heard comments in opposition to the proposal.
- Harmonization with OIML requirements should be considered in the method of sale and associated device requirements.

With respect to Items 337-1 and 337-2, the Committee agreed to work collaboratively with the L&R Committee and to develop a small work group to decide: 1) whether or not DLE and DGE should be considered an acceptable method of sale for natural gas; and 2) if so, what should the factor be to determine their equivalents to gasoline. The Committee agreed that the above list of key points and questions heard during its open hearings should be considered, along with other Open Hearing comments, by the chairs of both the L&R and S&T Committee in the development of a list of points to be addressed by the Task Group.

Prior to the 2013 Annual Meeting, NCWM Chairman, Steve Benjamin (NC), appointed the "NCWM Natural Gas

Steering Committee (NGSC)," which will be chaired by Mr. Mahesh Albuquerque (CO). The primary charge of the Committee is to educate the membership regarding: the technical issues surrounding this application; the rationale for the proposed changes; the anticipated impact of the proposed changes and issues related to their implementation. The Committee was asked to identify and address questions raised during the 2013 Interim Meeting as well as other venues in an effort to enable NCWM members to make informed decisions about proposals under consideration in this area.

Also prior to the 2013 Annual Meeting, the Committee received a proposal from Mr. Douglas Horne (Clean Vehicle Education Foundation) to modify the "Item Under Consideration." Mr. Horne proposed separate definitions for CNG and LNG gallon equivalent values. The Committee suggested he work with the Steering Committee to further refine the proposal and suggest changes to the item as appropriate. Mr. Horne's proposals were posted on the NCWM website with other documents relative to the Committee's final report. While submitted in an NCWM Form 15 template, Mr. Horne's proposal is not addressing a new issue, but rather providing comments on a current item (337-1) on the Committee's agenda.

July 2013 NCWM Annual Meeting

During its 2013 Annual Meeting open hearings, the Committee heard an update from the NGSC Chairman, Mr. Albuquerque. He reported that the NGSC met for the first time on Sunday, July 14 at the beginning of the Annual Meeting and gathered input from those in the audience. Comments indicated that consumers may find gallon equivalent information to be helpful, but the most equitable method for measuring and selling the product is based on mass measurement.

At that Meeting, the Committee heard comments on Items 337-1 and Items 337-2 jointly. Details of those comments are outlined below.

The S&T Committee heard overwhelming comments opposing the use of gallon equivalents and favoring the use of mass as the method of sale. The Committee also heard multiple comments indicating concern about the establishment of a value that would be an approximation of the actual equivalent for a given transaction. Mr. Horne reported that some states have already or are in the process of enacting defined "gasoline equivalent" values; some adopted earlier versions of the equivalent and some are considering new values as outlined in Mr. Horne's most recent proposal.

Ms. Kristin Macey (CA) noted that the NCWM successfully adopted a method of sale for hydrogen fuel based on mass and suggested that the natural gas be held to the same standard. Mr. Michael Keilty (Endress + Hauser Flowtec AG USA) commented that sale of natural gas as a vehicle fuel has proliferated globally and those sales are based on mass units.

OWM acknowledged appreciation of the establishment of the Steering Committee to further study this issue. OWM encouraged the S&T Committee, the Steering Committee, and the weights and measures community to consider the points raised by OWM during the 2013 Interim Meeting as well as the following in their deliberations of Items 337-1 and Item 337-2:

> In addition to discussing the proposals in Items 337-1 and 337-2, OWM requested that the Steering Committee specifically discuss and consider whether or not the continued use of the terms "GLE" and "GGE" are appropriate for commercial CNG metering applications. OWM makes this request based on many of the same points made by OWM at the 2013 Interim Meeting and also given that:
>
> (1) this market is well established and consumer confidence and acceptance of CNG and other alternative fuels are not contingent upon continued comparisons with gasoline;
>
> (2) there are other methods for comparing relative efficiency and costs with gasoline;
>
> (3) experience with feedback from the community indicates problems with the application and validity of these units with changing gas supplies;

(4) the proposal in Items 337-1 and 337-2 proposes language which would address natural gas as a whole and it is, therefore, appropriate to raise the discussion of whether or not the continued use of non-traceable units is appropriate. Additionally, OWM suggests that a proposal to eliminate the use of the terms "GLE" and "GGE" in favor of indications in mass units be developed and considered by the NCWM to ensure commercial transactions for natural gas are based on NIST traceable units of measurement; and

(5) as the number of viable alternative fuel options increase, providing a relatively static comparison with only one alternative fuel will not serve the broad needs of consumers and will make it unlikely that the dispenser is the appropriate location to provide comparison information.

The Committee also heard a comment from Mr. Karimov suggesting that volume units be permitted as a method of sale for LNG.

While many people expressed an understanding of the need for consumers to make comparisons with gasoline, comments indicate that such comparisons would typically be made prior to the purchase of a vehicle and possibly for a short time while becoming accustomed to the vehicle. The Committee heard comments indicating that weights and measures officials would be amenable to permitting the posting or displaying of supplemental information regarding gallon equivalent values.

January 2014 NCWM Interim Meeting

The Committee met with the L&R Committee to discuss the comments received on Items 337-1 through 337-5 and corresponding items on the L&R Committee's agenda. Although there were three new proposals on the agenda, several appear to require clarification from the submitter on whether they are replacements for several carryover proposals. The two Committees heard an update from Mr. Albuquerque, speaking as Chairman of the NGSC on the work of that group.

Ms. Juana Williams (OWM) reviewed the following points prepared by OWM and suggested that the Committees consider these points in their deliberations on the proposals:

- OWM encourages the:
  - Efforts of the NGSC as it works to provide corresponding proposals to the L&R Committee and S&T Committee.
  - Collaboration with FALS on:
    - Fuel properties data
    - The final vetting of data, formulas, etc. used to arrive at any conversion factors that might be recognized for use in supplemental advertising/sales information
- OWM notes that some of the current wording in the 2012 and 2013 proposals is somewhat confusing, in part, because several paragraphs include previous conversion factors no longer under consideration.
- The latest proposal encourages a proliferation of equivalent units of measurement, at least six for the CNG and LNG RMFD applications.
- Measurement accuracy and traceability are not achieved through computation of the sale's information in equivalent quantity units since the conversion factor is an estimated value.
- OWM suggests input from stakeholders such as the CNG and LNG RMFD OEMs and agencies regulating other sectors (such as the motor fuels taxation departments) in the natural gas infrastructure on the impact of any new proposal.
- The last point that OWM would like to suggest the Committees consider that additional work might be necessary to further modify the code to fully recognize the LNG application. NIST has plans to outline an approach for a similar project.

The S&T Committee and L&R Committee agreed with the suggestions provided by the NGSC for addressing these items. As a result of these discussions, the S&T Committee agreed to the following regarding Items 337-1 through 337-5 on the Committee's 2014 Interim Agenda:

- Withdraw Items 337-1 and 337-4 and consolidate the remaining three items (337-2, 337-3, and 337-5) into a single item.
- Ask that the NGSC rework its proposed changes to NIST Handbook 44 to reflect the comments heard during the Committee's open hearings and in writing.
- Designate the consolidated item as a "Voting" item in anticipation that the NGSC will present a revised version of the proposed changes to NIST Handbook 44 prior to the publication of the Committee's Interim Report.

If the revised version of the code is not presented prior to the publication date or agreement cannot be reached within the NGSC or the S&T Committee on the revised version, the Committee agreed to designate this consolidated item as an "Information" item.

March 2014 NGSC Report to the L&R and S&T Committees

The NGSC was formed in July 2013 to help understand and educate the NCWM membership regarding the technical issues surrounding the proposed changes to HB 44 and HB 130 submitted by the Clean Vehicle Education Foundation (CVEF); the anticipated impact of the proposed changes; and issues related to implementation requirements when compressed natural gas (CNG) and liquefied natural gas (LNG) are dispensed and sold as a retail engine fuel in gallon equivalent units.

At the NCWM Interim Meeting in January 2014, Mr. Albuquerque, Chair of the NGSC provided the S&T and L&R Committees with an update from the NGSC, including proposed revisions to the proposals submitted by the CVEF. The NGSC heard comments from the floor related to the proposed revisions and requested additional time to further develop its recommendations. The S&T and L&R Committees agreed to allow the NGSC additional time to meet and develop alternative proposals to those on the S&T and L&R Committee's January 2014 agendas, with the expectation that the NGSC recommendations would be ready for inclusion in Publication 16 and moved forward as a Voting item at the July 2014 NCWM Annual Meeting. Mr. Albuquerque provided the following summary of the NGSC discussions.

Summary of NGSC Meeting Discussions

The NGSC met weekly following the January 2014 Interim Meeting, and focused on modifying the Clean Vehicle Education Foundation (CVEF) 2013 proposals for the recognition of diesel gallon equivalent (DGE) units for CNG/LNG dispenser indications and the method of sale for these two natural gas alternative engine fuels. The NGSC reviewed multiple modifications to those proposals including:

- limiting sales to a single unit of mass measurement enforceable by 2016;
- requiring indications in mass and gasoline and diesel gallon equivalents, while phasing in mass only units;
- require sale by mass as the primary means, but allow for the simultaneous display of volume equivalent units, so long as the purchaser always had access to the mass (traceable) measurement; and
- a proposal from NIST OWM which would allow the posting of supplemental information to assist consumers in making value comparisons and for use by taxation/other agencies, but requiring the phase in of indications in mass

The NGSC received:

- input from DOE on the latest edition of the DOE TRANSPORTATION ENERGY DATA BOOK: EDITION 32 July 2013 available on the Oak Ridge National Laboratory website at:

http://cta.ornl.gov/data/index.shtml;

- updates from CNG (3) and LNG (1) dispenser manufacturers indicating their dispensing systems comply with the requirements in the handbooks and have the capability to indicate a sale in a single unit of measurement, and any further input on adding displays to the cabinet for additional units would require further cost analysis; one OEM indicated use of their LNG RMFD in a fleet operation where indications are only in the DGE; and

- feedback from NGSC committee members related to the pros and cons of requiring the indication of sale in mass or gallon equivalent units, including traceability, equipment capabilities, marketplace considerations, and units used by state and federal agencies.

Also noted in the NGSC discussions were:

- how a gallon equivalent unit is derived using energy content, and that the gallon equivalent is defined and measured in terms of mass, not volume;

- for the last 20 years, HB44 and 130 have required all dispensing equipment to indicate deliveries of natural gas in GGE units to consumers and in mass units for inspection and testing purposes. CNG RMFD equipment in most states comply with the requirements in the handbooks;

- international practices for indicating CNG and LNG engine fuel deliveries are predominantly mass; Canada requires LNG indications in the kilogram and the corresponding OIML R 139 "Compressed gaseous fuel measuring systems for vehicles" standard requires indication of the measured gas in mass;

- the variations in engine efficiency relative to a single conversion factor based on an averaged energy content for LNG;

- the primary focus of the driving public and fleets is on mileage rather than petroleum products no longer used to fuel their vehicles;

- the work ahead over the next year by ASTM committees to develop current CNG and LNG fuel quality standards which will need to be referenced in HB 130;

- differences in the measurement of the gallon and kilogram -- since the gallon is a volume measurement and not an energy measurement;

- the HB 44 Mass Flow Meters Code includes a requirement for volume-measuring devices with ATC used in natural gas applications to be equipped with an automatic means to make corrections, if the devices is affected by changes in the properties of the product; it was also noted that U.S. gasoline and diesel dispensers are not required to have ATC. whereas ATC does occur in sales at the wholesale level;

- how traceability applies to the measurement results at each level of the custody chain (to include the determination of the uncertainty of all calibrations and use of an appropriate unit of measurement); and

- the capabilities of equipment in the marketplace.

A DOE representative supported the use of gallon equivalents and pointed out that they are used in the DOE Transportation Energy Data Book. The DOE representative also pointed out that other federal agencies including the IRS were requiring use of gallon equivalent units for reporting.

Industry representatives on the NGSC indicated that they are actively campaigning to their state and federal offices, encouraging each government branch to recognize sales of CNG and LNG in gasoline and diesel volume equivalent units. Industry sectors represented on the NGSC indicated that their customers are satisfied with the averaged fuel energy values that correspond to the conversion factors for CNG and LNG, with only one exception. The exception

was a truck stop chain indicating their customers would be amenable to a single conversion factor for both fuels. The CVEF also provided a comparison of GTI's 1992 study results and preliminary data from a 2013 study. The CVEF reported the constituents in natural gas as basically unchanged over 21 years since the NCWM first recognized the GGE. Industry unanimously opposed a recommendation for phasing in mass as the only unit of measurement, noting also that U.S. drivers would be confused by SI units while acknowledging that the U.S. is in the minority of countries whereby delivery and sales are by equivalent units. At the conclusion of the NGSC deliberations NGVAmerica provided the following statement:

> "One of the major advantages of the proposal as currently drafted with inclusion of the DGE and GGE units for natural gas is that this is a proposal that the natural gas industry can support. It further recognizes what is already the preferred practice for how natural gas is measured and dispensed. The latest proposal with DGE and GGE units provides a pathway forward toward a national consensus approach. If the proposal were to instead require use of kilograms or even pounds as the primary method of sale, industry would not support that proposal and likely would strongly oppose it this summer if NCWM were to consider it as a voting issue. Also, if NCWM finalizes on a standard that does not include DGE or GGE, industry is committed to pursuing adoption of an alternative standard on a state by state basis, which could lead to different treatment across the country. Several states have already introduced legislation to recognize the DGE standard (CA, IL, MO, and VA) and I expect more will do so later this year. And you know Colorado and Arkansas already have put in place standards that recognize the DGE units."

NGSC Recommendations:

After consideration of all of the above, the NGSC recommends alternate proposals to the L&R and S&T Committee Agenda Items which further modify and consolidate the Clean Vehicle Education Foundation 2013 proposals to include:

1) requirements for measurement in mass and indication in gallon equivalent units (HB 44 paragraphs S.1.3.1.1. and S.1.3.1.2.; and HB 130 paragraphs 3.11.2.1. and 3.12.2.1.);

2) posting of a label that has both the GGE and DGE or the GLE and DLE for CNG applications (HB 44 paragraphs S.5.2., S.5.3., UR.3.1.1., and UR.3.1.2; and HB 130 paragraphs 3.11.2.2.2. and 3.12.2.2.2.);

3) expression of all equivalent conversion factors expressed in mass units to 3 significant places beyond the decimal point for consistency (HB 44 paragraphs S.5.2., S.5.3., UR.3.1.1., and UR.3.1.2 and Appendix D and HB 130 Section 1, paragraphs 3.11.2.2.2. and 3.12.2.2.2.);

4) correction of the temperatures in the LNG definition (HB 130 Section 1);

5) addition of 16 CFR Part 309 for CNG automotive fuel rating (HB 130 paragraph 3.11.2.2.5.); and

6) reference to NFPA 52 (HB 130 paragraph 3.12.2.2.4.)

With regards to Handbook 44, the NGSC recommends withdrawing S&T Agenda Items 337-1 and 337-4 and the consolidation of Agenda Items 337-2, 337-3, and 337-5 into a newly revised single Voting item designated as 337-2. The NGSC also recommends further modifications to corresponding HB 130 prosposals to align the definitions of related terms and method of sale with definitions, indicated delivery and dispenser labeling requirements being proposed for HB 44.

With regards to Handbook 44, the NGSC also recommends consideration of new a Developing item addressing proposed changes to paragraph S.3.6 Automatic Density Correction designated as 360-4. This new proposal is consistent with the NGSC decision to encourage further work beyond the current scope of its work on the CVEF's proposals to fully address all LNG applications.

Representatives of the NGSC and the S&T and L&R Committees met in March 2014, all agreed on the course of action outlined above.

Additional Contacts: Clean Energy, Seal Beach, CA, NGVAmerica, Washington, DC, Clean Vehicle Education Foundation, Acworth, GA. Regional Association Comments: (Fall 2013 Input on the Committee's 2014 Interim Agenda Items 337-1 through 337-5)

Based on the NGSC's recommendation, the Committee agreed to modify the original proposal and present the following for a vote at the 2014 NCWM Annual Meeting:

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

diesel gallon equivalent (DGE). – means 6.380 pounds of compressed natural gas or 6.060 pounds of liquefied natural gas. [3.37]
(Added 2014)

diesel liter equivalent (DLE). – means 0.765 kilograms of compressed natural gas or 0.726 kilograms of liquefied natural gas. [3.37]
(Added 2014)

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]
(Added 1994)**(Amended 2014)**

gasoline liter equivalent (GLE). – Gasoline liter equivalent (GLE) means 0.678 kilograms of **compressed** natural gas.[3.37]
(Added 1994)**(Amended 2014)**

Amend NIST Handbook 44 Mass Flow Meters Code paragraphs S.1.2., S.1.3.1.1., S.5.2., and UR.3.8. and add new paragraphs S.1.3.1.2., S.5.3., UR.3.1.1. and UR.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)**(Amended 2014)**

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)**(Amended 2014)**

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).
(Added 2014)

S.5.2. Marking of Equivalent Conversion Factor for Compressed Natural Gas. – A device dispensing compressed natural gas shall have either the statements "1 Gasoline Liter Equivalent (GLE) is **Approximately** Equal to 0.678 kg of **Compressed** Natural Gas" **and "1 Diesel Liter Equivalent (DLE) is Approximately Equal to 0.765 kg of Compressed Natural Gas"** or **the statements** "1 Gasoline Gallon Equivalent (GGE) is **Approximately** Equal to 5.660 lb of **Compressed** Natural Gas" **and "1 Diesel Gallon Equivalent (DGE) is Approximately Equal to 6.380 lb of Compressed Natural Gas**" permanently and conspicuously marked on the face of the dispenser according to the method of sale used.
(Added 1994**, amended 2014**)

S.5.3. Marking of Diesel Volume Equivalent Conversion Factor for Liquefied Natural Gas. – A device dispensing liquefied natural gas shall have either the statement "1 Diesel Liter Equivalent (DLE) is Approximately Equal to 0.726 kg of Liquefied Natural Gas" or "1 Diesel Gallon Equivalent (DGE) is Approximately Equal to 6.060 lb of Liquefied Natural Gas" permanently and conspicuously marked on the face of the dispenser according to the method of sale used.
(Added 2014)

UR.3.1.1. Marking of Equivalent Conversion Factor for Compressed Natural Gas. – A device dispensing compressed natural gas shall have either the statements "1 Gasoline Liter Equivalent (GLE) is Approximately Equal to 0.678 kg of Compressed Natural Gas" and "1 Diesel Liter Equivalent (DLE) is Approximately Equal to 0.765 kg of Compressed Natural Gas" or the statements "1 Gasoline Gallon Equivalent (GGE) is Approximately Equal to 5.660 lb of Compressed Natural Gas" and "1 Diesel Gallon Equivalent (DGE) is Approximately Equal to 6.380 lb of Compressed Natural Gas" permanently and conspicuously marked on the face of the dispenser according to the method of sale used.
(Added 2014)

UR.3.1.2. Marking of Equivalent Conversion Factor for Liquefied Natural Gas. - A device dispensing liquefied natural gas shall have either the statement "1 Diesel Liter Equivalent (DLE) is Approximately Equal to 0.726 kg of Liquefied Natural Gas" or "1 Diesel Gallon Equivalent (DGE) is Approximately Equal to 6.060 lb of Liquefied Natural Gas" permanently and conspicuously marked on the face of the dispenser according to the method of sale used.
(Added 2014)

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 2014)

July 2014 Annual Meeting
At the July 2014 NCWM Annual Meeting, the Committee considered the revised proposal shown above. There were numerous comments in both opposition and support of the proposal as follows:

Support:

- Numerous letters of support by U.S. Senators and 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.
- Proposal is supported by those who build and supply the equipment, vehicle manufacturers, 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 marketing rather than a 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 had been done to develop the values.
- Including more than one equivalent value could lead to consumer confusion.
- 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 it sold.
- Is there a need for ongoing value comparisons if a vehicle is dedicated to natural gas fuel?
- Measurement science needs to be based on traceable standards. "Equivalent units" are not traceable to NIST standards.
- 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 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. The proposed changes that appear in this alternative proposal are shown below; the Committee was also provided with a draft of the entire Section 3.37. Mass Flow Meters Code showing these changes incorporated into the code. This draft is available upon request from NIST OWM.

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 2015)**

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.***

(b)

This paragraph will become retroactive on January 1, 2017.

(Added 2015)

(c) **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**~~**D**efinitions.)

(Added 1994)**(Amended 2015)**

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 2015**)

…

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 2015)**

…

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 2015)**

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 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, the Committee agreed to delete paragraphs S.5.2., S.5.3., UR.3.1.1., and UR.3.1.2. in their entirety from the proposal and paragraph S.5.2. from NIST Handbook 44.

Based upon the comments received and its deliberations, the Committee agreed to modify the Item Under Consideration shown in Publication 16 by deleting the following language:

~~**S.5.2. Marking of Equivalent Conversion Factor for Compressed Natural Gas.** A device dispensing compressed natural gas shall have either the statements "1 Gasoline Liter Equivalent (GLE) is **Approximately** Equal to 0.678 kg of **Compressed** Natural Gas" **and "1 Diesel Liter Equivalent (DLE) is Approximately Equal to 0.765 kg of Compressed Natural Gas"** or **the statements** "1 Gasoline Gallon Equivalent (GGE) is **Approximately** Equal to 5.660 lb of **Compressed** Natural Gas" **and "1 Diesel Gallon Equivalent (DGE) is Approximately Equal to 6.384 lb of Compressed Natural Gas**" permanently and conspicuously marked on the face of the dispenser according to the method of sale used. (Added 1994**, amended 2014**)~~

~~**S.5.3. Marking of Diesel Volume Equivalent Conversion Factor for Liquefied Natural Gas. A device dispensing liquefied natural gas shall have either the statement "1 Diesel Liter Equivalent (DLE) is Approximately Equal to 0.726 kg of Liquefied Natural Gas" or "1 Diesel Gallon Equivalent (DGE) is Approximately Equal to 6.059 lb of Liquefied Natural Gas" permanently and conspicuously marked on the face of the dispenser according to the method of sale used.**~~
~~**(Added 2014)**~~

~~**UR.3.1.1. Marking of Equivalent Conversion Factor for Compressed Natural Gas. A device dispensing compressed natural gas shall have either the statements "1 Gasoline Liter Equivalent (GLE) is Approximately Equal to 0.678 kg of Compressed Natural Gas" and "1 Diesel Liter Equivalent (DLE) is Approximately Equal to 0.765 kg of Compressed Natural Gas" or the statements "1 Gasoline Gallon Equivalent (GGE) is Approximately Equal to 5.660 lb of Compressed Natural Gas" and "1 Diesel Gallon Equivalent (DGE) is Approximately Equal to 6.384 lb of Compressed Natural Gas" permanently and conspicuously marked on the face of the dispenser according to the method of sale used.**~~
~~**(Added 2014)**~~

~~**UR.3.1.2. Marking of Equivalent Conversion Factor for Liquefied Natural Gas. A device dispensing liquefied natural gas shall have either the statement "1 Diesel Liter Equivalent (DLE) is Approximately Equal to 0.726 kg of Liquefied Natural Gas" or "1 Diesel Gallon Equivalent (DGE) is Approximately Equal to 6.059 lb of Liquefied Natural Gas" permanently and conspicuously marked on the face of the dispenser according to the method of sale used.**~~
~~**(Added 2014)**~~

The Item Under Consideration, absent the language that had been deleted by the Committee, was then offered for vote, but returned to Committee for further consideration due to a split vote. The following proposal is that which was voted on at the 2014 Annual NCWM Meeting and returned to Committee.

Proposal presented for vote and returned to Committee at the 2014 NCWM Annual Meeting:

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]
(Added 2014)

diesel liter equivalent (DLE). – means 0.765 kilograms of compressed natural gas or 0.726 kilograms of liquefied natural gas. [3.37]
(Added 2014)

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]
(Added 1994)**(Amended 2014)**

gasoline liter equivalent (GLE). – Gasoline liter equivalent (GLE) means 0.678 kilograms of **compressed** natural gas.[3.37]
(Added 1994)**(Amended 2014)**

Amend NIST Handbook 44 Mass Flow Meters Code paragraphs S.1.2., S.1.3.1.1., S.5.2., and UR.3.8. and add new paragraphs S.1.3.1.2., S.5.3., UR.3.1.1. and UR.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)**(Amended 2014)**

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)**(Amended 2014)**

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).
(Added 2014)

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 2014)

January 2015 – Separate Compromise Proposals Offered by the NGSC
In January 2015 and prior to the 2015 NCWM Interim Meeting, the Committee received a recommendation from the NGSC that the weights and measures community consider two separate proposals as alternatives to the proposal voted on at the 2014 NCWM Annual Meeting. The Steering Committee noted that the two proposals reflect compromises on viewpoints within the NGSC: (1) on the recognition of the LNG motor-fuel application; (2) to replace the term "equal" with the term "means" to establish the relationship of mass units to supplemental units; and (3) to eliminate from use liter equivalent units of measurement in natural gas motor-fuel applications since this is a newly created unit that is not recognized in jurisdictions using SI units.

The first compromise proposal titled "The Volume Equivalent Compromise Proposal" proposes modifications to NIST HB 44 Section 3.37 MFM Code and corresponding NIST HB 130 MOS requirements to:

1. Recognize the indication of natural gas fuel sales in values of either volume equivalent units or mass units based on legislative policy within a jurisdiction;

2. Mandate labeling the equivalent unit conversion factor on a natural gas motor-fuel dispenser, and

3. No longer recognize SI mass units in favor of U.S. Customary mass units (i.e., lb).

The second proposal, originally titled "Natural Gas Motor-Fuel Proposal to Phase-In Mass Indications While Recognizing Supplemental Fuel Information," but later changed to "The Mass Compromise Proposal" is intended to replace the NIST OWM fall 2014 compromise proposal. This alternate proposal was a joint collaboration of work by Mr. Ron Hayes (Missouri) and NIST OWM to further modify the HB 44 3.37 Mass Flow Meters Code where this proposal:

1. Keeps the suggested *new* phase in period where mass indications for all sales of natural gas motor-fuel will be of a specified maximum value and required for all dispensers effective January 1, 2017 as shown in amended paragraphs S.1.3.1.1. Compressed Natural Gas Used as an Engine Fuel, and S.1.3.3. Maximum Value of Quantity-Value Divisions;

2. Continues to recognize the use of *new* supplemental fuel information for use in making value comparisons and taxation purposes as well as prescribe the format for stating this information as shown in the proposed *new* Definition of diesel gallon equivalent (DGE) and *new* paragraph S.1.3.1.2. Natural Gas Used as an Engine Fuel, Supplemental Information and modifications to paragraph S.5.2. Marking of Gasoline Volume Equivalent Conversion Factor. This information might be provided in the form of placards, or on the kiosk, or as dispenser indications or labeling on the cabinet when it is clear that this is not the required transaction information; and

3. Recognizes the existing compressed natural gas motor-fuel application and includes the proposed *new* liquefied natural gas motor-fuel application as shown in modified paragraphs S.1.2. Compressed Natural Gas Dispensers and UR.3.8. Return of Product to Storage.

Both proposals are included in their entirety in the boxes below.

Proposal 1- The Volume Equivalent Compromise Proposal

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

diesel gallon equivalent (DGE). – Diesel gallon equivalent (DGE) means 6.384 pounds of compressed natural gas or 6.059 pounds of liquefied natural gas. [3.37]
(Added 2014)

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]
(Added 1994) **(Amended 2014)**

Amend NIST Handbook 44 Mass Flow Meters Code paragraphs S.1.2., S.1.3.1.1., S.5.2., and UR.3.8. and add new paragraphs S.1.3.1.2., S.5.3., UR.3.1.1. and UR.3.1.2. as follows:

S.1.2. Compressed Natural Gas and Liquefied Natural Gas Dispensers. – Except for fleet sales and other price contract sales, a compressed **or liquefied** 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 2014)**

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 indicated in **~~"gasoline liter equivalent (GLE) units" or~~ "**gasoline gallon equivalent (GGE) units**~~."~~ or diesel gallon equivalent units (DGE), or in mass if required by the weights and measures authority having jurisdiction.** (Also see definitions.)

(Added 1994) **(Amended 2014)**

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 indicated in diesel gallon equivalent units (DGE), or in mass if required by the weights and measures authority having jurisdiction (Also see definitions.)
(Added 2014)

S.5.2. Marking of ~~Gasoline Volume~~ Equivalent Conversion Factors for Compressed Natural Gas. – 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~~ means** 5.660 lb of **Compressed** Natural Gas" **or "1 Diesel Gallon Equivalent (DGE) means 6.384 lb of Compressed Natural Gas"** permanently and conspicuously marked on the face of the dispenser according to the method of sale used.

(Added 1994) **(Amended 2014)**

S.5.3. Marking of Equivalent Conversion Factors for Liquefied Natural Gas. – A device dispensing liquefied natural gas shall have the statement "1 Diesel Gallon Equivalent (DGE) means 6.059 lb of Liquefied Natural Gas" permanently and conspicuously marked on the face of the dispenser according to the method of sale used.

(Amended 2014)

UR.3.1.1. Marking of Equivalent Conversion Factors for Compressed Natural Gas. – A device dispensing compressed natural gas shall have either the statement "1 Gasoline Gallon Equivalent (GGE)

means 5.660 lb of Compressed Natural Gas" or "1 Diesel Gallon Equivalent (DGE) means 6.384 lb of Compressed Natural Gas" permanently and conspicuously marked on the face of the dispenser according to the method of sale used.

(Added 2014)

UR.3.1.2. Marking of Equivalent Conversion Factors for Liquefied Natural Gas. – A device dispensing liquefied natural gas shall have the statement "1 Diesel Gallon Equivalent (DGE) means 6.059 lb of Liquefied Natural Gas" permanently and conspicuously marked on the face of the dispenser according to the method of sale used.

(Amended 2014)

UR.3.8. Return of Product to Storage, Retail Compressed 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)

Handbook 130

Amend NIST Handbook 130, Uniform Engine Fuels and Automotive Lubricants Regulation as follows:

1.XX. Diesel Gallon Equivalent (DGE). – Diesel Gallon Equivalent (DGE) means 6.384 pounds of compressed natural gas or 6.059 pounds of liquefied natural gas.

1.25. Gasoline Gallon Equivalent (GGE). – **Gasoline Gallon** Equivalent **(GGE) means** ~~**to 2.567(**~~5.660 lb~~**)**~~ of **compressed** natural gas.

~~**1.26. Gasoline Liter Equivalent (GLE). Equivalent to 0.678 kg (1.495 lb) of natural gas.**~~

1.35. Liquefied Natural Gas (LNG). – Natural gas that has been liquefied at – ~~**126.4**~~ **162**ºC (– ~~**259**~~**260** ºF) and stored in insulated cryogenic tanks for use as an engine fuel.

3.11. Compressed Natural Gas (CNG).

3.11.1. How Compressed Natural Gas is to be Identified. – For the purposes of this regulation, compressed natural gas shall be identified by the term "Compressed Natural Gas" or "CNG."

3.11.2. Retail Sales of Compressed Natural Gas Sold as a Vehicle Fuel.

3.11.2.1. Method of Retail Sale. – All CNG kept, offered, or exposed for sale or sold at retail as a vehicle fuel shall be **either** in terms of the gasoline ~~**liter equivalent (GLE) or gasoline**~~ gallon equivalent (GGE)**, the diesel gallon equivalent (DGE), or in mass if required by the weights and measures authority having jurisdiction.**

3.11.2.2. Retail Dispenser Labeling.

3.11.2.2.1. Identification of Product. – Each retail dispenser of CNG shall be labeled as "Compressed Natural Gas."

3.11.2.2.2. Conversion Factor. – All retail CNG dispensers shall be labeled with the conversion factor in terms of ~~**kilograms or**~~ pounds. The label shall be permanently and conspicuously displayed on the face of the dispenser and 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**~~ **means** 5.660 lb of **Compressed** Natural Gas**,**" **or "1 Diesel Gallon Equivalent (DGE) means 6.384 lb of**

Compressed Natural Gas," consistent with the method of sale used.

3.11.2.2.3. Pressure. – CNG is dispensed into vehicle fuel containers with working pressures of ~~**16 574 kPa**~~ 20 684 kPa **(3,000 psig)**, or 24 821 kPa **(3,600 psig)**. The dispenser shall be labeled ~~**16 574 kPa**~~ 20 684 kPa **(3,000 psig)**, or 24 821 kPa **(3,600 psig)** corresponding to the pressure of the CNG dispensed by each fueling hose.

3.11.2.2.4. NFPA Labeling. – NFPA Labeling requirements also apply. (Refer to NFPA 52.)

3.11.3. Nozzle Requirements for CNG. – CNG fueling nozzles shall comply with ANSI/AGA/CGA NGV 1.

3.12. Liquefied Natural Gas (LNG).

3.12.1. How Liquefied Natural Gas is to be Identified. – For the purposes of this regulation, liquefied natural gas shall be identified by the term "Liquefied Natural Gas" or "LNG."

3.12.2. Retail Sales of Liquefied Natural Gas Sold as a Vehicle Fuel.

3.12.2.1. Method of Retail Sale. – All LNG kept, offered, or exposed for sale or sold at retail as a vehicle fuel shall be in terms of the diesel gallon equivalent (DGE), or in mass if required by the weights and measures authority having jurisdiction.

3.12.~~2~~3. ~~Labeling of~~ Retail Dispenser~~s of Liquefied Natural Gas Sold as a Vehicle Fuel~~ Labelling.

3.12.~~2~~3.1. Identification of Product. – Each retail dispenser of LNG shall be labeled as "Liquefied Natural Gas."

3.12.3.2. Conversion Factor. – All retail LNG dispensers shall be labeled with the conversion factor in terms of pounds. The label shall be permanently and conspicuously displayed on the face of the dispenser and shall have the statement "1 Diesel Gallon Equivalent (DGE) means 6.059 lb of Liquefied Natural Gas."

3.12.~~2~~3.~~2~~3. Automotive Fuel Rating. – LNG automotive fuel shall be labeled with its automotive fuel rating in accordance with 16 CFR Part 306.

3.12.~~2~~3.~~3~~4. NFPA Labeling. – NFPA Labeling requirements also apply. (Refer to NFPA ~~57~~52.)

Proposal 2 – The Mass Compromise Proposal

Consider the following modifications to HB 44 3.37 Mass Flow Meters Code:

S.1.3. Units.

S.1.3.1. Units of Measurement.

. . .

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 2015)

(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~~D**efinitions.)
(Added 1994**)(Amended 2015)**

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.1.3.2. Numerical Value of Quantity-Value Divisions. – The value of a scale interval shall be equal to:

. . .

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 2015**)

Include a new definition for the supplemental term diesel gallon equivalent as follows:

A Diesel Gallon Equivalent (DGE) means 6.384 pounds (2.895 kg) of CNG or 6.059 pounds (2.748 kg) of LNG
(Added 2015)

Add a new paragraph S.1.3.1.2. as shown below:

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. Quantity, unit price, and total price for the transaction must be clearly designated and distinguished from any supplemental information to ensure that the customer understands the basis for the transaction.

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 means 0.3896 Gasoline Gallon Equivalent (GGE)
1 kg of Compressed Natural Gas means 0.3455 Diesel Gallon Equivalent (DGE)

1 lb of Compressed Natural Gas means 0.177 Gasoline Gallon Equivalent (GGE)
1 lb of Compressed Natural Gas means 0.157 Diesel Gallon Equivalent (DGE)

A Gasoline Gallon Equivalent (GGE) means 5.660 pounds (2.567 kg) of CNG

For liquefied natural gas:

1 kg of Liquefied Natural Gas means 0.3638 Diesel Gallon Equivalent (DGE)

1 lb of Liquefied Natural Gas means 0.165 Diesel Gallon Equivalent (DGE)

A Diesel Gallon Equivalent means 6.059 pounds (2.748 kg) of LNG

Modify paragraph S.5.2. as follows:

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**~~ **means** 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 2015)**

Amend the following HB 44 paragraphs as recommended in Fall 2014:

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 2015)**

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 2015)**

The NGSC representatives ask that the "Natural Gas Motor Fuel Proposal to Phase-In Mass Indications While Recognizing Supplemental Fuel Information" shown above be considered on its merits for adhering to basic weights and measures philosophy and principles of measurement; that is, transactions are clear, transparent, verifiable,

protect all consumers, and promote fair competition in the marketplace. This proposal is an opportunity for a uniform method of sale by mass units and is aligned with practices adhered to globally for this application. The proposal shown above might be made more palatable by including some corresponding NIST HB 130 language to address street price signage requirements; it is highly possible to develop, distribute, and vet a set of minimal modifications to HB 130 before July 2015, if deemed necessary.

2015 NCWM Interim Meeting

During the 2015 NCWM Interim Meeting, the S&T and L&R Committees took comments on S&T Item 337-1 and L&R Items 232-4 and 237-1 collectively during a special joint open hearing session. There were two proposals offered for consideration concerning the appropriate method of sale (MOS) for natural gas and it was stated that comments would be taken on both to determine which proposal best represents the body of the NCWM. Proposal 1, titled "The Volume Equivalent Compromise Proposal" would require natural gas to be measured in mass and indicated in equivalent gallon units or mass. Proposal 2, titled "The Mass Compromise Proposal" would require natural gas to be measured and indicated in mass and supplemental equivalent information be displayed on the dispenser for value comparison only.

Comments in support of Proposal 1 were primarily heard from representatives of the gas industry, manufacturers of natural gas retail motor fuel dispensers, natural gas refueling station owners, fuel marketers, and other industry representatives. Two state weights and measures directors, Mr. Albuquerque and Mr. Joe Gomez (NM), also provided comments in support of Proposal 1. The following list includes the primary comments heard in support of Proposal 1 (this list is not all inclusive of every comment, but intended to capture the key points raised):

- Volume equivalent units recognize what's already in the marketplace – acceptance would put all retailers on the same footing.
- The first proposal provides the best chance of having a national standard.
- The proposal was submitted because of LNG; not CNG. There is no MOS specified for LNG. LNG is a fuel that will mostly be used in trucks.
- The feedback we're hearing from our customers is that they want to make value comparisons using gallon equivalent units.
- We can build dispensers that measure in mass. Providing both indications (mass and equivalent gallons) would be very expensive to build. Our customers like gallon equivalents. It would create confusion if you put two values there. These are two different units of measurement; unlike cash/credit pricing.
- It would be considered an unfair trade practice to advertise on the street in one unit of measure and dispense product in another unit of measure. The advertised unit price should match the unit price on the dispenser.
- We want to hear feedback from our customers. They value the comparison of LNG to diesel because it is a quick and easy determination. We talk to our customers. They want to make comparisons by using DGE.
- Universally, our customers want, ask, and purchase gallon equivalent units. We can provide an indication in mass units. Is it worth changing a twenty year industry MOS to something industry doesn't want? Our equipment measures in mass and indicates in gallon equivalents.
- Support gallon equivalent units for three reasons:
  1) uniformity,
  2) clarity in the marketplace (there have been no complaints…customers want it), and
  3) verification for fairness – both will be verified in mass (not BTU)

Comments heard in support of Proposal 2 were predominantly made by weights and measures officials. The following list includes the primary comments heard in support of Proposal 2 (this list also is not all inclusive of every comment, but intended to capture the key points raised):

- We're a standards organization. Equivalent units are not a standard. This is a marketing tool. Allowing equivalent units would provide industry a competitive advantage.

- Equipment is capable of providing mass indications.
- There is a general lack of support for DGE and GGE units among regulators.
- Label equivalent units on the front of the dispenser and measure and indicate in mass.
- Which method would provide the most value comparison to the customer? Many products offered for sale provide supplemental information. Examples given: fertilizer sold by weight provides square footage coverage information; paint sold by gallon provides spread dimensions, etc.
- Need to sell by a quantifiable measurement – mass.
- Proliferation of "equivalent units" is a real concern.
- There are questions concerning the validity of the equivalent values being proposed. Natural gas composition fluctuates, as does the composition of gasoline. How accurate are the numbers? We're not comfortable that the study on BTU by the Energy Department provides accurate enough information. Industry reported specific gravities change by as much as 12%.
- We stand to face the same mistake made 20 years ago. It was a mistake then and it would be a mistake now.
- There are new fuels coming onboard. The same argument can be made for equivalent units. How do you tell the next group "no?"
- Products need to be sold by a recognizable unit of measure.
- We are a standard organization – the best way to sell is the way it's actually measured.
- Consumers have purchased propane by weight for years and years. They've never asked how much they were receiving in gallon equivalent units.
- We are not the world. There are not liter equivalent units in Canada, Europe, or Japan.
- Consumers learn what the measurement is and then they do the calculations. Consumers will know before they purchase a vehicle what their cost per mile will be.
- On January 1, 2015 a California law added DGE and GGE. It is a very bad law. I urge the Conference not to follow that course. Support the second proposal.

Mr. Constantine Cotsoradis (Flint Hills Resources) commented that he would be opposed to moving forward to satisfy the marketing of one industry. He noted that Flint Hills Resources sells LNG by weight using a truck scale to weigh it. If equivalent units were required, the weight would need to be converted to equivalent gallon units. He suggested that Proposal 1 be modified to apply to retail stations rather than retail sales. However, when the Committee modified Proposal 1 after the open hearings to allow natural gas to be sold by equivalent gallon units or mass as shown in Item Under Consideration, Mr. Cotsoradis indicated his concern had been satisfied.

Following the open hearings, the S&T and L&R Committees met jointly in an open work session to decide which proposal would be presented to the NCWM for vote given the comments heard during the open hearings. Several members of the NGSC were in attendance and provided feedback during the meeting. In considering this issue, two or three members of the S&T and L&R Committees led a discussion in favor of putting forward Proposal 1 for vote by emphasizing that proposal's flexibility in allowing jurisdictions to make the decision on which MOS is appropriate. Mr. Richard Harshman, NIST Technical Advisor to the S&T, acknowledged that during the open hearings, the comments heard from industry representatives overwhelmingly supported Proposal 1, but that industry representatives were not permitted to vote. Mr. Harshman pointed out that during Sunday's joint meeting of the NGSC, S&T, and L&R Committees, it was stated that the goal for this Interim Meeting was to select the proposal that best represents the body of, and, therefore most likely to be adopted by, the NCWM. He also provided a count of the number of weights and measures officials who commented in support of each proposal during the open hearings, noting that they represented the group that could vote. Officials commenting in support of Proposal 2 numbered five. Officials commenting in support of Proposal 1 numbered two. It was then stated by Mr. Louis Sakin (Town of Hopkinton/Northbridge, MA), a member of the L&R Committee, that this tally was not a true representation of all in the room who could vote and that many who could vote had not spoken during the open hearings. Mr. Sakin concluded that most of these "silent officials" (i.e., officials who did <u>not</u> provide testimony during the open hearings) would be in favor of Proposal 1. Some others in the room agreed and consequently, the two Committees voted in favor of putting forth Proposal 1 for a July vote by NCWM.

There were mixed positions amongst the S&T Committee members as to the method of sale, but overall the Committee and in conjunction with the L&R Committee elected to put forth a version of Proposal 1 (volume equivalents) and recommend a Voting status for this version. The S&T Committee's modification to Proposal 1 included deleting the words "if required by the weights and measures authority having jurisdiction" in paragraphs S.1.3.1.1 and S.1.3.1.2. The Committee also agreed to reinsert the current HB 44 definition of "gasoline liter equivalent" shown as completely struck out into the Item Under Consideration with the understanding that the intent of the NGSC is to eliminate all references to "GLE" from HB 44. The Committee recognizes that "GLE" is referenced throughout the Mass Flow Meters Code and that these references are an issue still needing to be addressed. A final action agreed to by the Committee was to add the following option for marking supplemental information in Proposal 2 of the two proposals considered at the 2015 NCWM Interim Meeting:

A Diesel Gallon Equivalent means 6.059 pounds (2.748 kg) of LNG

The Item Under Consideration includes the Committee's modification to the S&T portion of Proposal 1 and replaces the previous Item Under Consideration proposal that was voted on and returned to Committee during the 2014 NCWM Annual Meeting due to a split vote.

2015 NCWM Annual Meeting

At the 2015 NCWM Annual Meeting, the S&T and L&R Committees took comments on S&T Item 337-1 and L&R Items 232-4 and 237-1, collectively, during a special joint open hearing session. There were comments in both support of and opposition to the proposal. Multiple people provided oral comments and Mr. Mahesh Albuquerque (CO), Chairman of the S&T Committee reported that there were over 10 letters in support of the proposal that had been posted on NCWM's website. Much of the testimony, whether it be in support or opposition, were iterations of points that had been made in previous NCWM Conference Meetings beginning from the time this item first appeared on the Committee's agenda.

The following are some examples of comments heard in support of the proposal:

- Equivalent units have been used since 1994 without issue. We can't undo what was accepted over 20 years ago.
- Equivalent units are what customers and fuel retailers desire.
- Users of natural gas are truckers and the American truckers, as well as the retailers, are on board with respect to the current proposal.
- Equivalent units are necessary for taxation purposes (it was reported that 26 states currently have adopted a DGE standard for taxation and 10 states recognize DGE as a method of sale).
- Equivalent units provide value comparison with gasoline and diesel.
- Dispensers indicating in mass units and street sign advertising indicating in volume equivalent units would conflict with some laws requiring both units be identical.
- The country needs a single standard.
- Volume equivalent values are derived from mass units. Testing will be in mass units and everyone will be using the same factor to compute mass units to a volume equivalent values.

The following are some examples of comments heard in opposition of the proposal:

- A mistake was made in 1994 allowing volume equivalent values in the marketplace for CNG. Proliferation of "equivalent units" is a real concern. When a mistake is made, it should be fixed, not allowed to continue.
- Volume equivalent units are not clear and transparent to the consumer.
- Volume equivalent units are not traceable units.
- Under the current proposal, fuel retailers may sell by volume equivalent units in one location and mass units in another (or even in another state) lending to inequity in the marketplace for businesses and confusion for consumers.

- If gallon equivalents are necessary for taxation, then the taxation agencies can use the values they deem necessary to approximate the indicated mass values to gallon equivalents.
- Customers will have already researched the value of natural gas during their decision-making process *before* purchasing a natural gas powered vehicle. Thus, they will not need to make ongoing comparisons to other types of fuel when making purchases of natural gas.
- Customers will calculate the cost per mile of operation of a natural gas powered vehicle versus a gasoline or diesel powered vehicle, thus, the need to attempt direct comparison of natural gas sold by mass to gasoline or diesel gallon equivalents is not needed.
- Natural gas being sold by mass vs. by gasoline or diesel gallon equivalents is attempting to compare "apples to oranges."

Mrs. Tina Butcher (OWM) provided an overview of OWM's analysis of the current proposal and explained that a more complete analysis had been provided in writing to the Committee. A copy of OWM's complete written analysis of this item is included in Appendix G of this report. *(To be added)*

It was also reported during the special joint open hearing that there is currently a pending legislative item before the US Congress that specifies a slightly different conversion factor for DGE (6.06 pounds) than that contained in the Item Under Consideration (6.059 pounds), essentially rounding off to two significant digits after the decimal point instead of three. Voting on the legislation is pending, awaiting the outcome of the action taken by NCWM at this Annual Conference on adopting a conversion factor. In response to this reported information, Mr. Ron Hayes (MO), Chairman of the Natural Gas Steering Committee (NGSC) stated that we shouldn't be selecting a number just because there are bills out there using another number. He reported that the NGSC could not reach consensus on a conversion factor for DGE because no data could be found that supports any factor. He further noted that gasoline has a variation in energy content. Diesel too varies. The hard part then becomes selecting a right number (conversion factor). If we were selling gasoline and diesel fuel by mass, energy content is consistent; this is not the case on a gallon basis.

During the Committee's work session, several Committee members acknowledged that the comments heard were both in favor of and in opposition to the proposal and that many of those comments were the same as those heard in previous open hearing sessions. The Committee agreed to recommend the item be presented for Vote unchanged.

Regional Association Meetings:
At its 2014 Interim Meeting, CWMA reported that a segment of the industry supports this item. The majority of the regulatory body does not support the item as written. Based on the comments received, the CWMA recommended that the item be an Informational item. CWMA recommends that the commodity shall be measured in mass units and indicated in mass units. Equivalency units may be included as supplemental information. At the 2015 CWMA Annual Meeting, the following comments were received during a joint session of the CWMA L&R and S&T Committees:

> It was recommended that comments for this item along with items L & R 237-1 and S & T 337-1 be heard together. A state regulator from Missouri commented that item 237-1 should be considered separately. Item 237-1 focuses on language relevant to the Method of Sale section, so it should be removed from the bundle of three items and considered separately. An industry representative from National Association of Convenience Stores and the Society of Independent Gasoline Marketers of America (NACS-SIGMA) rises in support of marketing and selling natural gas as a road fuel by equivalency, but be measured for accuracy by mass which would be posted on the dispenser along with a voluntary marketing statement that includes the equivalency price. He commented that the objective of the Conference is equity in the market, which fundamentally means consumers get what they bargain for in a transaction. He also believes it is essential that we get products to the market in terms that people understand. Retailers stock and sell what consumers want to buy – not the other way around. So, customers for compressed natural gas have approached the fuel retailers and have expressed a desire to purchase their product in diesel gallon equivalencies. He commented that no one wants to buy "pounds" of natural gas. He believes that some fleets prefer

purchasing in diesel gallon equivalencies. He asked why we should we sell a product in a language that consumers don't understand, even if over time they will understand it. He encourages the conference to consider allowing diesel gallon equivalency as a method of sale for both compressed and liquid natural gas. He is concerned that our inability to come up with a preferred method of sale is an obstacle to selling this fuel. He further commented that in actual terms, all weights and measures are arbitrary. By not adopting this proposal, regulators will fail in their objective to provide equity in the market. If they do not pass it, a different body will set standards. A regulator from Missouri and also a member of the natural gas steering committee commented that the committee proposed two items – one was to sell natural gas on a volumetric method; the second – considered a compromise, is to market or advertise the products in equivalency values, but measure for compliance using mass, and display that value on dispensers. Nothing would preclude a retailer from displaying a gallon equivalency value on an advertising sign as long as the mass weight is posted on the dispenser, along with that equivalency value. He further commented that he is opposed to selling in diesel gallon equivalents. He said that natural gas equivalencies will vary so much for every diesel vehicle that the equivalency information will be more misleading than informative. He provided several examples of this. He concluded his comments by saying the Conference made a mistake by establishing the gasoline gallon equivalent method of sale twenty years ago, but that should not be a precedent to make another mistake by passing an equivalency value again. The industry representative commented that all states should check in with their state attorneys general, because he believes that if an advertising sign posts an equivalency amount, it has to be posted that way on the dispenser – otherwise it is a deceptive practice. An industry representative from Flint Hills Resources commented that they sell LNG in bulk to the end user, so it is considered a retail sale. He supports the compromise the Natural Gas Steering Committee came up with, which would allow for the posting of an equivalency value, but would also require the product be measured by mass. With the compromise, jurisdictions can decide for themselves if they want to post equivalencies or if they want to sell by mass. A regulator from Minnesota has changed her mind from supporting sales strictly in mass to support sales by equivalence.

Primarily for taxing considerations, state officials and policy makers in her state want the Conference to provide a measurement in mass, pick an equivalency number for diesel gallons, and standardize the process. A second regulator from Missouri commented that a taxing unit is different from weights and measures work. He believes that the science of weights and measures is absolute, and there should be no exceptions. The NACS-SIGMA representative again commented that states are currently developing a patchwork of policies addressing this issue because there is no standard in place today, and if the Conference does not pass a standard, Congress will take the decision out of the hands of the Conference, because people who market natural gas nationally won't want to deal with a patchwork of varying policies and procedures. A regulator from Kansas expressed a concern that a DGE and a GGE price per gallon equivalency at the same station could result in a different price per pound, which would result in confusion for the consumer. The first Missouri regulator rose to remind the Conference that if this proposal fails, GGE does not go away. Currently, LNG is being taxed at the diesel rate calculated on a mass basis. A state regulator from Iowa asked for clarity as to whether there was a method of sale in Handbook 130 based on weight for compressed natural gas. There is a method of sale for GGE based on mass. A NIST representative commented that she thought this proposal addresses a method of sale for LNG. An industry representative from Gilbarco indicated their natural gas customers are requesting GGE's and DGE's. They already measure in mass and make the conversion. However, Gilbarco cannot serve the needs of their customers because they cannot sell an NTEP certified device reflecting these equivalency values. He commented that no one is asking for a display in mass, nor for a dual display. He supports the diesel gallon equivalency method for natural gas sales. The Minnesota regulator commented that they have a current scenario where a retailer in their state needs an NTEP certified device, and they are not yet available. A Missouri regulator asked if Gilbarco were displaying the sale price of natural gas in pounds, and their customers made a request to see it in an equivalency mode, would they respond to their customer's request. The Gilbarco individual answered that if their customer wants supplemental labeling, that would be possible. Beyond that, he cannot predict what is possible or likely, but there currently are no plans to develop dual-display devices to his knowledge. The NACS-SIGMA representative commented again that dispenser manufacturers are working on other issues beyond this one.

This item was presented for a vote during the L&R voting session and passed by a margin of one vote. The CWMA recommended this item move forward as a Voting item.

During open hearings at the 2014 WWMA Annual Meeting, an update on the NGSC was provided and comments were heard (pro and con) for this item, similar to what has been offered previously. The WWMA agrees that this topic needs to be addressed and resolved; therefore, it should remain as an Information item on the NCWM Agenda. The WWMA S&T Committee offers the recommendations of: 1) Consideration of the NIST Proposal; 2) Possibility of a customer selectable unit; and 3) Determination of GGE to low volume sales and DGE to high volume sales. During the S&T Committee voting session it was motioned, seconded, and approved that comments presented during the L&R Committee voting session be adopted. The comments included a call for vote by those in support of sale in mass versus those in support of sale by equivalent unit. A show of hands was recorded by the Parliamentarian and indicated those in favor of mass to be 23 and those in favor of equivalent unit to be 12.

At its 2014 Annual Meeting, SWMA recommended deferring to the NGSC which will provide recommendations at the 2015 NCWM Interim Meeting.

At its 2014 Interim Meeting, NEWMA recommended that S&T Items 337-1 and 232-3 and L&R Item 237-1 remain Information items pending final language from the NGSC at the NCWM 2015 Interim Meeting. It was further recommended that the Steering Committee consider changing the method of sale to mass and that the NIST proposal to modify section 3.37, Mass Flow Meters in Handbook 44 (2014 edition) be considered. It was noted that the draft NIST proposal was posted on the NEWMA web site as a supporting document**.** At the 2015 NEWMA Annual Meeting, this item was grouped with L&R Agenda Items 237-1 and 237-3. There were comments heard in both support of and opposition to these items as follows:

> A Maine official reported that the State of Maine believes mass is the appropriate unit of measure for this product. Maine will not support any proposal with an equivalency measure because it is not a traceable unit. A county official from New York asked how many states had proposed or accepted new laws with equivalencies. Natural Gas Steering Committee Chair Mr. Ethan Bogren (Westchester County Weights and Measures), in response to the question, indicated there were six states that had adopted equivalency language or something similar. Several other states were also moving in that direction. A retired official from New York suggested reviewing the model law of Uniform Weights & Measures – while directors can determine and issue regulations regarding method of sale, it is not the directors who should initiate the unit of measure. Buyers and sellers should determine the unit for the method of sale. He stated that he believes the weights and measures community has an obligation to listen to the stakeholders, who have made it clear that they want equivalency units.

NEWMA's S&T Committee recommendation to the region was that S&T Agenda Item 337-1 be a Voting item on NCWM's Agenda. A motion was made to accept this recommendation, but not seconded, and therefore, the item was returned to the Committee.

SWMA Action: Item 337-1
Summary of comments considered by the regional committee (in writing or during the open hearings):
This item was batched and heard together with L&R Item 232-3. Dr. Matthew Curran (FL) expressed concerns about the community not being able to get this issue addressed for the industry and marketplace cited four general possible options for this item and its L&R Companion item; adopt mass method of sale; adopt volume equivalent method of sale; adopt a dual/alternating display system; or do nothing (i.e. withdraw the items and leave it up to the individual states). Dr. Curran noted that the issue failed to pass the last two years as members appear to be firmly entrenched in their mass or volume equivalent positions so the first two options are not possible. He felt the item would find the same fate a third time through if we didn't think "outside of the box" and find a solution. He added that the fourth option (to withdraw the items) wasn't a preferred option since it would lead to individual state adoption or boutique markets. Further, he pointed out that the community received a "black eye" for failing to finish this issue as the nation was looking to us for a resolution and when we couldn't get it done in July other agencies went forward with their own resolutions and stopped following our progress. They elected to use other approaches including tax-derived and other values for the equivalencies, thus potentially creating boutique markets. Dr. Curran felt the third option was worth exploring and provided suggested language for a dual/alternating display to use as a

jumping off point, but challenged the community to get creative and come up with other ideas to move this item forward if they felt this proposal wasn't acceptable. Absent other ideas, Dr. Curran recommended exploring a dual/alternating display option and provided suggested language. The language would not be effective until 2020, or another date decided by the membership and it would be non-retroactive to prevent industry from having to replace existing devices. One industry member stated prior to the SWMA meeting that they were concerned over potential consumer confusion with a dual/alternating display option. Mr. Gordon Johnson (Gilbarco) replied that it would cost between $400 and $600 thousand to redesign the face of the dispensers and asked if a toggle switch would be an option. Mr. Johnson was reminded that the toggle switch option had been suggested when this idea was first brought to the table two years ago. Mr. Johnson also added that all of their resources were occupied with the credit card reader changes. He further stated that some of his customers require NTEP approval, but they can't get NTEP approved dispensers until this issue is resolved. Mr. Johnson did state he would take this idea back and discuss with his company. A representative from Wayne Fueling Systems agreed with Mr. Johnson's comments. Ms. Carol Hockert (NIST) added that they have witnessed testing occurring in the field based on the volume equivalent and not mass (as is read by the instrument). Mr. Mike Cleary (CA-Retired) stated that we as a community have to tackle these tough issues as that is our job and people look to us for this, but to not do anything or walk away from it is not acceptable. Mr. Jerry Bundel (WA) echoed Mr. Cleary's comments and cautioned from any recommendations to withdraw these items.

Item as proposed by the regional committee: ***(If different than agenda item)***

Item Under Consideration:
Amend NIST Handbook 44 Appendix D to include the following new definition:

diesel gallon equivalent (DGE). – Diesel gallon equivalent (DGE) means 6.384 pounds of compressed natural gas or 6.059 pounds of liquefied natural gas. [3.37]
(Added 2016 ~~2015~~)

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]
(Added 1994) **(Amended 2016 ~~2015~~)**

Delete the following NIST Handbook 44 Appendix D definition as shown:

~~**gasoline liter equivalent (GLE). Gasoline liter equivalent (GLE) means 0.678 kilograms of natural gas.[3.37]**~~
~~**(Added 1994)**~~

Amend NIST Handbook 44 Mass Flow Meters Code paragraphs S.1.2., S.1.3.1.1., S.5.2., and UR.3.8. and add new paragraphs S.1.3.1.2., S.5.3., UR.3.1.1. and UR.3.1.2. as follows:

S.1.2. Compressed Natural Gas and Liquefied Natural Gas Dispensers. – Except for fleet sales and other price contract sales, a compressed **or liquefied** 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 2016 ~~2015~~)**

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 indicated in ~~"gasoline liter equivalent (GLE) units" or~~ **"**gasoline gallon equivalent (GGE) units~~"~~ **or diesel gallon equivalent units (DGE), and ~~or~~ in mass. Equivalent and mass units need not be displayed simultaneously, but may be displayed individually through customer activated controls.** (Also see Appendix D definitions.)
(Added 1994) **(Amended 2016 ~~2015~~) (Nonretroactive as of January 1, 2020)**

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 indicated in diesel gallon equivalent units (DGE) and ~~or~~ in mass. Equivalent and mass units need not be displayed simultaneously, but may be displayed individually through customer activated controls. (Also see definitions.)
(Added 2016 ~~2015~~) (Nonretroactive as of January 1, 2020)

S.5.2. Marking of ~~Gasoline Volume~~ Equivalent Conversion Factors for Compressed Natural Gas. – 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~~ **means** 5.660 lb of **Compressed** Natural Gas" **or "1 Diesel Gallon Equivalent (DGE) means 6.384 lb of Compressed Natural Gas"** permanently and conspicuously marked on the face of the dispenser according to the method of sale used.
(Added 1994)**(Amended 2016 ~~2015~~)**

S.5.3. Marking of Equivalent Conversion Factors for Liquefied Natural Gas. – A device dispensing

liquefied natural gas shall have the statement "1 Diesel Gallon Equivalent (DGE) means 6.059 lb of Liquefied Natural Gas" permanently and conspicuously marked on the face of the dispenser ~~according to the method of sale used~~.

(Amended 2016 ~~2015~~)

UR.3.1.1. Marking of Equivalent Conversion Factors for Compressed Natural Gas. – A device dispensing compressed natural gas shall have either the statement "1 Gasoline Gallon Equivalent (GGE) means 5.660 lb of Compressed Natural Gas" or "1 Diesel Gallon Equivalent (DGE) means 6.384 lb of Compressed Natural Gas" permanently and conspicuously marked on the face of the dispenser ~~according to the method of sale used~~.

(Added 2016 ~~2015~~)

UR.3.1.2. Marking of Equivalent Conversion Factors for Liquefied Natural Gas. – A device dispensing liquefied natural gas shall have the statement "1 Diesel Gallon Equivalent (DGE) means 6.059 lb of Liquefied Natural Gas" permanently and conspicuously marked on the face of the dispenser ~~according to the method of sale used~~.

(Added 2016 ~~2015~~)

UR.3.8. Return of Product to Storage, Retail Compressed 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 2016 ~~2015~~)**

Committee recommendation to the region:

- ☒ Voting Item on the NCWM Agenda
- ☐ Information Item on the NCWM Agenda
- ☐ Withdraw the Item from the NCWM Agenda (*In the case of new items, do not forward to NCWM)*
- ☐ Developing Item on the NCWM Agenda *(To be developed by source)*

Reasons for the committee recommendation:

COMPLETE SECTION BELOW FOLLOWING VOTING SESSION

Final updated or revised proposal from the region: ***(If different than regional committee recommendation)***

No change from committee recommendation.

Regional recommendation to NCWM for item status:

- ☒ Voting Item on the NCWM Agenda
- ☐ Information Item on the NCWM Agenda
- ☐ Withdraw the Item from the NCWM Agenda (*In the case of new items, do not forward to NCWM)*
- ☐ Developing Item on the NCWM Agenda *(To be developed by source)*
- ☐ Unable to consider at this time *(Provide explanation in the "Additional Comments" section below)*

Regional Report to NCWM:

Please provide your report in this section exactly how you want it to appear in the NCWM reports to represent your region's considerations, support or opposition, and recommendations. **This will replace any previous reports from your region on this item.**

The Committee felt that a compromise version needed to be developed and forwarded as more votes for "mass" or "volume equivalents" would likely result in another failure to pass a method of sale and establish equivalencies for these products. Members of the Committee also expressed concerned that further delay could damage the future reputation of the Weights and Measures Community. Other agencies and states are now moving forward independently of the NCWM and thus, lessening our relevance in the area of commerce one piece at a time. The Committee believes that while its recommended proposal may not completely satisfy all corners of this debate, it is the best overall compromise to date for all interested parties. The Committee also further welcomes anyone

opposing such a compromise version to provide alternative as it would be more than welcomed to the discussion. This proposal provides for the display of both "mass" and "volume equivalent" units and gives the dispenser manufacturers a future non-retroactive implementation date for installation so devices in service prior to the effective date would not have to be converted, only when replaced with new devices.

Additional letters, presentations and data may have been part of the committee's consideration. Please refer to http://www.ncwm.net/meetings/interim/publication-15 to review these documents.

337-2 D N.3. Test Drafts.

Source:
Endress + Hauser Flowtec AG USA (2015)

Purpose:
Allow transfer standard meters to be used to test and place into service dispensers and delivery system flow meters.

Item Under Consideration:
Amend NIST Handbook 44 Mass Flow Meters Code as follows:

N.3. Test Drafts. –

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

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.

Background / Discussion:
The use of transfer standards is recognized in code sections 3.34 Cryogenic Liquid-Measuring Devices Code and 3.38 Carbon Dioxide Liquid-Measuring Devices Code and 3.39 Hydrogen Gas-Measuring Devices – Tentative Code. Field evaluation of LPG meters and CNG dispensers and LNG dispensers is very difficult using volumetric and gravimetric field standards and methods. The tolerances for these applications are such that using transfer meter standards are more efficient and safer. With CNG and LNG and LPG applications, the transfer standard meters are placed in-line with the delivery system as it is used to fill tanks and vehicles. The use of transfer standards eliminates return to storage issues. The use of transfer standard meters is easier and faster compared to the use of traditional field standards. The cost of using transfer standards and transporting them is much less than the cost of traditional field provers and standards. Recognition in Handbook 44 will enable States to allow transfer standard meters to place systems into service and for field enforcement.

Volumetric field provers and gravimetric field proving are susceptible to environmental influences. The State of Colorado uses a master meter to test propane delivery truck meters. The State of Nebraska has used a mass flow meter to test agricultural chemical meters.

In some applications, transfer standard meters are not more accurate than the meters used in the dispenser. For that reason, longer test drafts and possibly more tests need to be run.

The State of California is purported to have conducted a short study of master meters in the past. The conclusion did not lead to wide adoption of the practice. However, the State of California uses a mass flow meter as a master meter for carbon dioxide flowmeter enforcement.

Mass Flow Meters Code paragraph U.R.3.8. Return of Product to Storage, Retail Compressed Natural Gas Dispensers requires that the natural gas which is delivered into the test container must be returned to storage. This is difficult and most often not complied with when the test vessel contents are released to atmosphere.

The S&T Committee might also consider amending Sections 3.30 Liquid-Measuring Devices Code and 3.31 Vehicle-Tank Meters Code to allow transfer standard meters.

2015 NCWM Interim Meeting
At the 2015 NCWM Interim Meeting, the Committee agreed to group together Agenda Items 330-2 and 337-3 since these items are related and announced that comments on both items would be taken together during the open hearings. Refer to Agenda Item 330-2 for a summary of the comments heard concerning these two items. The Committee agreed this item has merit and recommends the submitter of these items work with OWM by providing data for the WG to consider in determining the suitability of the master meter transfer standard as a standard in testing another device.

2015 NCWM Annual Meeting:
At the 2015 NCWM Annual Meeting, the Committee agreed to group together Agenda Items 332-2 and 337-3 and take comments on the two items simultaneously. See Agenda Item 332-1 for a summary of comments heard on these two items. In consideration of the comments heard in support of the two agenda items, the Committee agreed to maintain the Developing status of both items.

Regional Association Meetings:
At its 2014 Interim Meeting, CWMA received comments questioning the accuracy of a meter used as a mobile standard. CWMA forwarded the item to NCWM, recommending it as a Developing item. At the 2015 CWMA Annual Meeting open hearings, Mr. Robert Murnane (Seraphin Test Measure Co.) questioned the validity of transfer standards and the purpose of this item. He also stated that he believed the item was too general in scope. CWMA agreed to recommend this item move forward as a Developing item noting it supported the item's continued development.

At the 2014 WWMA Annual Meeting testimony was presented that this type of technology would more easily facilitate inspections. However, it was also stated that a more comprehensive evaluation of the equipment and testing procedure, including the associated uncertainty, be performed. The WWMA agreed that this type of technology would be useful but it should be a Developing item to enable the submitter to provide a more complete analysis.

At its 2014 Annual Meeting, SWMA heard questions and concerns that needed to be addressed by the submitter. SWMA also recommended that NIST OWM continue to develop a standard for this equipment to development standards and other guidance documents necessary to recognize their use. Additionally, SWMA recommended the submitter work with NIST OWM to address these concerns. SWMA recommended that Items 332-2 and 337-3 be combined into one agenda item since they are both related to test drafts. Comments were heard for both of these agenda items at the same time.

NEWMA reported at its 2014 Interim Meeting that it believed his item has merit but needs further vetting and development before being sent to a vote. NEWMA forwarded the item to NCWM and recommended that it be a Developing item. NEWMA also recommended that this item be combined with Items 332-2 and 337-3 as a single agenda item. At the 2015 NEWMA Annual Meeting, a recommendation was made to withdraw this item with the intent that it be resubmitted once clarification has been provided regarding the accuracy of the transfer standard meters. However, at the recommendation of NEWMA's S&T Committee, NEWMA agreed to leave this item "Developing" while work continues on the proposal.

SWMA Action: Item 337-2
Summary of comments considered by the regional committee (in writing or during the open hearings):
This item was batched and heard together with Item 332-2. Mr. Michael Keilty (Endress Hauser Flowtec), submitter of this item, stated this was a good idea for CNG fuels and recommend moving forward as a voting item. Mr. Hal

Prince (FL) spoke in support of the item, but noted that the "one minute" language in N.3.1 works for master meters. Mr. Henry Oppermann (Weights and Measures Consulting, LLC) stated that no change may be necessary and it may be that a change to Handbook 105 is all that is necessary. Mr. Dick Suiter (Richard Suiter Consulting) stated that there was a place for transfer standards in the marketplace, but the difference is what defines a transfer standard. He noted that the definition for a transfer standard in Handbook 44 restricts them from cryogenic use and thus would need to be changed.
Item as proposed by the regional committee: ***(If different than agenda item)***
No change.
Committee recommendation to the region: ☒ Voting Item on the NCWM Agenda ☐ Information Item on the NCWM Agenda ☐ Withdraw the Item from the NCWM Agenda (*In the case of new items, do not forward to NCWM)* ☐ Developing Item on the NCWM Agenda *(To be developed by source)*
Reasons for the committee recommendation:
This item was batched and heard together with Item 332-2. The Committee feels this item is ready for voting.
COMPLETE SECTION BELOW FOLLOWING VOTING SESSION
Final updated or revised proposal from the region: ***(If different than regional committee recommendation)***
No change.
Regional recommendation to NCWM for item status: ☒ Voting Item on the NCWM Agenda ☐ Information Item on the NCWM Agenda ☐ Withdraw the Item from the NCWM Agenda (*In the case of new items, do not forward to NCWM)* ☐ Developing Item on the NCWM Agenda *(To be developed by source)* ☐ Unable to consider at this time *(Provide explanation in the "Additional Comments" section below)*
Regional Report to NCWM: Please provide your report in this section exactly how you want it to appear in the NCWM reports to represent your region's considerations, support or opposition, and recommendations. **This will replace any previous reports from your region on this item.**
This item was batched and heard together with Item 332-2. The Committee feels this item is ready for voting.

Additional letters, presentations and data may have been part of the committee's consideration. Please refer to http://www.ncwm.net/meetings/interim/publication-15 to review these documents.

338 CARBON DIOXIDE LIQUID-MEASURING DEVICES

New Item 24 Table S.2.5. Categories of Sealing and Methods of Sealing (See Related New Items 19, 20, 21, 22, 23 and 25)

Source:
Gilbarco, Inc. (2016)

Purpose:
Allow a Category 3 event logger to have an electronic means to transfer the event logger information..

Item Under Consideration:
Amend NIST Handbook 44 Vehicle Tank Meter Code as follows:

Table S.2.5. *Categories of Device and Methods of Sealing*	
Categories of Device	***Methods of Sealing***
Category 1: *No remote configuration capability.*	*Seal by physical seal or two event counters: one for calibration parameters and one for configuration parameters.*
Category 2: *Remote configuration capability, but access is controlled by physical hardware.* *The device shall clearly indicate that it is in the remote configuration mode and record such message if capable of printing in this mode or shall not operate while in this mode.*	*The hardware enabling access for remote communication must be on-site. The hardware must be sealed using a physical seal or an event counter for calibration parameters and an event counter for configuration parameters. The event counters may be located either at the individual measuring device or at the system controller; however, an adequate number of counters must be provided to monitor the calibration and configuration parameters of the individual devices at a location. If the counters are located in the system controller rather than at the individual device, means must be provided to generate a hard copy of the information through an on-site device.*
Category 3: *Remote configuration capability access may be unlimited or controlled through a software switch (e.g., password).* *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.*	*An event logger is required in the device; it must include an event counter (000 to 999), the parameter ID, the date and time of the change, and the new value of the parameter. A printed copy of the information must be available* ***on demand*** *through the device or through another on-site device.* ***The information may also be available electronically.*** *The event logger shall have a capacity to retain records equal to 10 times the number of sealable parameters in the device, but not more than 1000 records are required. (**Note:** Does not require 1000 changes to be stored for each parameter.)*

[Nonretroactive as of January 1, 1995]

(Table Added 2006) **(Amended 20XX)**

Background/Discussion:
This amendment and similar proposals to amen other codes in Section 3 of Handbook 44 would provide the same requirements for Category 3 event loggers as was adopted for the 3.30 Liquid Measuring Devices Code at the 2015 NCWM Annual Meeting. Event logger information in an electronic format is easier to sort and search the traditional paper format.

SWMA Action: New Item 24
Summary of comments considered by the regional committee (in writing or during the open hearings):
This item was grouped in a batch consisting of New items #19-#25 and all items were heard together. Mr. Gordon Johnson (Gilbarco), the submitter, of this item noted that this was identical to the item passed in the LMD Code this past July and this series of items was to harmonize the codes.
Item as proposed by the regional committee: ***(If different than agenda item)***
No Change.
Committee recommendation to the region: ☒ Voting Item on the NCWM Agenda ☐ Information Item on the NCWM Agenda ☐ Withdraw the Item from the NCWM Agenda (*In the case of new items, do not forward to NCWM)*

☐ Developing Item on the NCWM Agenda *(To be developed by source)*
Reasons for the committee recommendation:
This item was grouped in a batch consisting of New items #19-#25 and all items were heard together. The Committee agrees with adding this language and harmonizing it with the LMD Code.
COMPLETE SECTION BELOW FOLLOWING VOTING SESSION
Final updated or revised proposal from the region: ***(If different than regional committee recommendation)***
No change.
Regional recommendation to NCWM for item status: ☒ Voting Item on the NCWM Agenda ☐ Information Item on the NCWM Agenda ☐ Withdraw the Item from the NCWM Agenda (*In the case of new items, do not forward to NCWM)* ☐ Developing Item on the NCWM Agenda *(To be developed by source)* ☐ Unable to consider at this time *(Provide explanation in the "Additional Comments" section below)*
Regional Report to NCWM: Please provide your report in this section exactly how you want it to appear in the NCWM reports to represent your region's considerations, support or opposition, and recommendations. **This will replace any previous reports from your region on this item.**
This item was grouped in a batch consisting of New items #19-#25 and all items were heard together. The Committee agrees with adding this language and harmonizing it with the LMD Code.

Additional letters, presentations and data may have been part of the committee's consideration. Please refer to http://www.ncwm.net/meetings/interim/publication-15 to review these documents.

New Item 10 S.3.1. Vapor Elimination

Source:
NIST Office of Weights and Measures (2016)

Purpose:

1) To require that the vapor eliminator on carbon dioxide liquid-measuring devices be automatic in operation;
2) To add the word, "air" to the vapor eliminator requirements for clarification and consistency with other measuring codes; and
3) To require that vapor elimination vent lines be made of metal tubing or other rigid material.

Item Under Consideration:
Amend NIST Handbook 44, Carbon Dioxide Liquid-Measuring Devices Code as follows:

S.2.1. Vapor Elimination. –

(a) A ~~**measuring system**~~ **device** shall be equipped with an effective **automatic** vapor **or air** eliminator or other effective **automatic** means to prevent the ~~**measurement**~~ **passage** of vapor ~~**that will cause errors in excess of the applicable tolerances**~~ **and air through the meter**.

(b) Vent lines from the vapor or air eliminator shall be made of metal tubing or other rigid material.

(Amended 20XX)

Background/Discussion:

The proposed changes to S.2.1. would clarify that the carbon dioxide liquid-measuring device's vapor eliminator must be automatic in operation and prevent both air and vapor from passing through the meter. Effective operation should not depend on operator intervention or action. Additionally, the proposed changes would require that the vent lines be made of material that resists the potential obstruction (e.g., bending or kinking) that may otherwise prevent the free-flow of air and vapor out of the metering system. These modifications would more closely align it with similar language in the Liquid-Measuring Devices, Vehicle-Tank Meters, Cryogenic Liquid-Measuring Devices, Milk Meters, and Mass Flow Meters Codes.

Non-rigid vent lines would facilitate fraud and may lead to improper operation of the air/vapor elimination system.

SWMA Action: New Item 10

Summary of comments considered by the regional committee (in writing or during the open hearings):

This item was batched and heard together with New Item #7. Mr. Dick Suiter (Richard Suiter Consulting) and Mr. Hal Prince (FL) both commented on the use of the word "air" in conjunction with the term "vapor." Also, Mr. Prince suggested adding "non-corrosive" to the tubing composition statement since dealing with corrosive gasses. Mr. Michael Keilty (Endress Hauser Flowtec) agreed with Mr. Suiter and stated that the change may not be necessary. Mr. Tim Chesser (AR) preferred the option to cleanup if going to amend to which Mr. Rick Harshman (NIST) agreed, but stated that the proposal in (b) would be necessary.

Item as proposed by the regional committee: ***(If different than agenda item)***

S.2.1. Vapor Elimination. –

(a) A ~~**measuring system**~~ **device** shall be equipped with an effective **automatic** ~~vapor **or air** eliminator or other effective **automatic**~~ means to prevent the ~~**measurement**~~ **passage** of vapor ~~**that will cause errors in excess of the applicable tolerances and air**~~ **through the meter**.

(b) Vent lines from the vapor ~~or air~~ eliminator shall be made of a compatible ~~metal tubing or other~~ rigid material.

(Amended 20XX)

Committee recommendation to the region:

- ☒ Voting Item on the NCWM Agenda
- ☐ Information Item on the NCWM Agenda
- ☐ Withdraw the Item from the NCWM Agenda (*In the case of new items, do not forward to NCWM)*
- ☐ Developing Item on the NCWM Agenda *(To be developed by source)*

Reasons for the committee recommendation:

This item was batched and heard together with New Item #7. The Committee recommends this new language based on comments received and feels the item will be ready for a vote.

COMPLETE SECTION BELOW FOLLOWING VOTING SESSION

Final updated or revised proposal from the region: ***(If different than regional committee recommendation)***

No changes from committee recommendation.

Regional recommendation to NCWM for item status:

- ☒ Voting Item on the NCWM Agenda
- ☐ Information Item on the NCWM Agenda
- ☐ Withdraw the Item from the NCWM Agenda (*In the case of new items, do not forward to NCWM)*
- ☐ Developing Item on the NCWM Agenda *(To be developed by source)*
- ☐ Unable to consider at this time *(Provide explanation in the "Additional Comments" section below)*

Regional Report to NCWM:

Please provide your report in this section exactly how you want it to appear in the NCWM reports to represent your region's considerations, support or opposition, and recommendations. **This will replace any previous reports**

from your region on this item.
This item was batched and heard together with New Item #7. The Committee recommends this new language based on comments received and feels the item will be ready for a vote.

This proposal would provide consistency with corresponding requirements in the Liquid-Measuring Devices, Vehicle-Tank Meters, Cryogenic Liquid-Measuring Devices, Milk Meters, and Mass Flow Meters Codes.

Additional letters, presentations and data may have been part of the committee's consideration. Please refer to http://www.ncwm.net/meetings/interim/publication-15 to review these documents.

339 HYDROGEN GAS-METERING DEVICES

New Item 25 Table S.3.3. Categories of Sealing and Methods of Sealing (See Related New Items 19, 20, 21, 22, 23, and 24)

Source:
Gilbarco, Inc. (2016)

Purpose:
Allow a Category 3 event logger to have an electronic means to transfer the event logger information..

Item Under Consideration:
Amend NIST Handbook 44 Vehicle Tank Meter Code as follows:

Table S.3.3. *Categories of Device and Methods of Sealing*	
Categories of Device	***Methods of Sealing***
Category 1: *No remote configuration capability.*	*Seal by physical seal or two event counters: one for calibration parameters and one for configuration parameters.*
Category 2: *Remote configuration capability, but access is controlled by physical hardware.* *The device shall clearly indicate that it is in the remote configuration mode and record such message if capable of printing in this mode or shall not operate while in this mode.*	*The hardware enabling access for remote communication must be on-site. The hardware must be sealed using a physical seal or an event counter for calibration parameters and an event counter for configuration parameters. The event counters may be located either at the individual measuring device or at the system controller; however, an adequate number of counters must be provided to monitor the calibration and configuration parameters of the individual devices at a location. If the counters are located in the system controller rather than at the individual device, means must be provided to generate a hard copy of the information through an on-site device.*
Category 3: *Remote configuration capability access may be unlimited or controlled through a software switch (e.g., password).* *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.*	*An event logger is required in the device; it must include an event counter (000 to 999), the parameter ID, the date and time of the change, and the new value of the parameter. A printed copy of the information must be available* ***on demand*** *through the device or through another on-site device.* ***The information may also be available electronically.*** *The event logger shall have a capacity to retain records equal to 10 times the number of sealable parameters in the device, but not more than 1000 records are required. (**Note:** Does not require 1000 changes to be stored for each parameter.)*

(Amended 20XX)

Background/Discussion:
This amendment and similar proposals to amen other codes in Section 3 of Handbook 44 would provide the same requirements for Category 3 event loggers as was adopted for the 3.30 Liquid Measuring Devices Code at the 2015 NCWM Annual Meeting. Event logger information in an electronic format is easier to sort and search the traditional paper format.

SWMA Action: New Item 25
Summary of comments considered by the regional committee (in writing or during the open hearings):
This item was grouped in a batch consisting of New items #19-#25 and all items were heard together. Mr. Gordon Johnson (Gilbarco), the submitter, of this item noted that this was identical to the item passed in the LMD Code this past July and this series of items was to harmonize the codes.
Item as proposed by the regional committee: ***(If different than agenda item)***
No Change.
Committee recommendation to the region: ☒ Voting Item on the NCWM Agenda ☐ Information Item on the NCWM Agenda ☐ Withdraw the Item from the NCWM Agenda (*In the case of new items, do not forward to NCWM)*

☐ Developing Item on the NCWM Agenda *(To be developed by source)*
Reasons for the committee recommendation:
This item was grouped in a batch consisting of New items #19-#25 and all items were heard together. The Committee agrees with adding this language and harmonizing it with the LMD Code.
COMPLETE SECTION BELOW FOLLOWING VOTING SESSION
Final updated or revised proposal from the region: ***(If different than regional committee recommendation)***
No change.
Regional recommendation to NCWM for item status: ☒ Voting Item on the NCWM Agenda ☐ Information Item on the NCWM Agenda ☐ Withdraw the Item from the NCWM Agenda (*In the case of new items, do not forward to NCWM)* ☐ Developing Item on the NCWM Agenda *(To be developed by source)* ☐ Unable to consider at this time *(Provide explanation in the "Additional Comments" section below)*
Regional Report to NCWM: Please provide your report in this section exactly how you want it to appear in the NCWM reports to represent your region's considerations, support or opposition, and recommendations. **This will replace any previous reports from your region on this item.**
This item was grouped in a batch consisting of New items #19-#25 and all items were heard together. The Committee agrees with adding this language and harmonizing it with the LMD Code.

Additional letters, presentations and data may have been part of the committee's consideration. Please refer to http://www.ncwm.net/meetings/interim/publication-15 to review these documents.

New Item 32 Table T.2. Accuracy Classes and Tolerances for Hydrogen Gas-Measuring Devices.

Source:
California (2016)

Purpose:
Temporarily broaden tolerances to reflect the actual capability of the devices.

Item Under Consideration:
Amend NIST Handbook 44 Hydrogen Gas-Measuring Devices Code as follows:

Table T.2.
Accuracy Classes and Tolerances for Hydrogen Gas-Measuring Devices

Accuracy Class	Application or Commodity Being Measured	Acceptance Tolerance	Maintenance Tolerance
2.0	Hydrogen gas as a vehicle fuel	1.5 %	2.0 %
3.0 [1]		**2.0 %**	**3.0 %**
5.0 [1]		**4.0 %**	**5.0 %**
10.0 [2]		**5.0 %**	**10.0 %**

[1] The tolerance values for Accuracy Classes 3.0 and 5.0 hydrogen gas-measured devices are applicable to devices installed prior to January 1, 2020.

[2] The tolerance values for Accuracy Classes 10.0 hydrogen gas-measured devices are applicable to devices installed prior to January 1, 2018.

Background / Discussion:
The HB 44 accuracy tolerances (1.5% acceptance tolerance and 2.0% maintenance tolerance) are currently not achievable by manufacturers of hydrogen dispensers.

Between 2009 and 2013, several manufacturers applied to the California Type Evaluation Program (CTEP) for approval of their hydrogen dispensers but none were able to successfully pass type evaluation with these accuracy tolerances. To overcome this, California promulgated regulations in 2014 to temporarily relax the accuracy tolerances found in HB 44. Since that time, there have been three manufacturers who have successfully completed type evaluation of their hydrogen gas-measuring devices under the new regulations. Unless the accuracy tolerances of Section 3.39 are temporarily widened, other states will face the same dilemma experienced by California and NTEP will not be able to issue Provisional Certificates allowing the commercial use of these devices.

A statement in the 2012 U.S. Department of Energy's Request for Information regarding hydrogen gas-measuring devices summarizes well the current dilemma: "In order to enable the commercialization of hydrogen, fueling equipment that meets measurement standards must be available to sell hydrogen fuel to the public by weight or volume. Based on available information, no commercially available devices are capable of meeting the National Institute of Standards and Technology's (NIST's) NIST Handbook 44 measurement accuracy requirements for hydrogen while being used under fueling conditions…."

It is recognized that error free, perfect performance of mechanical equipment is unattainable. Accuracy tolerances are established to fix the legal range of inaccuracy within which equipment will be officially approved for commercial use. Accuracy tolerance values should be sufficiently small so that no serious injury to either the buyer or seller occurs. Consumers (and hydrogen fueling station owners) will be impacted by the proposed amendments, which would temporarily relax the accuracy tolerances from ± 2% to ±10%.

However, it is important to balance consumer protection with the equipment currently available for use. In order to commercialize FCEV and allow the legal sale of hydrogen in the U.S., it is necessary to set accuracy tolerances that can be achieved at this time. There is only one coriolis mass flow meter make and model available for purchase today by manufacturers wishing to build a commercial hydrogen gas-measuring device. When hydrogen fuel cell vehicles gain consumer acceptance and a profitable business model exists for equipment manufacturers, it is anticipated that companies will expend the R & D dollars to develop more accurate meters.

Sunset dates (2018 for installation of Accuracy Class 10.0 devices and 2020 for installation of Accuracy Classes 3.0 and 5.0 devices) are included to make clear that these relaxed tolerances are temporary. As technology advances and more accurate devices can be built, hydrogen gas-measuring devices will move into a more accurate or "better" accuracy class. Sunset dates also obligate the NCWM or the NIST-led USNWG for the Commercial Development of Hydrogen Measurement Standards to conduct a review of the accuracy tolerances as more data becomes available.

Hydrogen dispensers being tested today by the California Division of Measurement Standards are able to meet the expanded tolerances. Most, but not all, manufacturers have equipment that can achieve at least Accuracy Class 5.0. A summary of California's test data will be made available by January 2016 at the NCWM Interim Meeting.

In most states within the U.S., the transportation sector is the biggest contributor to air pollutants, including greenhouse gas emissions. To improve air quality, states like California are attempting to facilitate the commercialization of Zero Emission Vehicles (ZEV), which include hydrogen powered fuel cell vehicles (FCEV). However, the commercialization of hydrogen fueling stations is one of the biggest critical barriers preventing the widespread market penetration of hydrogen-fueled vehicles, and the current HB 44 tolerances for hydrogen dispensers are too restrictive.

The inability of manufacturers to comply with current HB 44 tolerances is partly due to potential hydrogen embrittlement, a safety concern since the service pressures at which hydrogen is dispensed are very high (35 mPA and 70 mPA, or 5,000 and 10,000 psi, respectively).

The Governors of eight states (California, Connecticut, Maryland, Massachusetts, New York, Oregon, Rhode Island and Vermont signed a Memorandum of Understanding in 2013 to put 3.3M zero-emission vehicles on roads by 2025; 15% of new vehicle sales. Car manufacturers are launching FCEV vehicles in California today, with statements that their next steps are to establish an East Coast Hydrogen Highway in states surrounding the New York and Boston regions, specifically, New York, New Jersey, Massachusetts, Connecticut, and Rhode Island.

SWMA Action: New Item 32

Summary of comments considered by the regional committee (in writing or during the open hearings):

Ms. Kristin Macey (CA), submitter of the item, stated that the item was submitted because no dispensers manufactured today could meet the tolerances in the tentative code, thus cannot get type approval. She further stated that the tolerances need to be expanded to allow the use of devices, but acknowledged more work may need to be done. This item was to head this problem off. Members of NIST OWM's Legal Metrology Devices Program had reviewed this item and expressed concern over approach for four tolerances for the same application. He also expressed a concern for a "phase in" date, but no "phase out" date. Ms. Macey replied that the reason for this is there is currently a lack of data, but the problem still exists. Mr. Michael Keilty (Endress Hauser Flowtec) stated that he was a member of the workgroup that developed the tentative code and was worried the tolerances were so wide that they would allow other types of devices to be used.

Item as proposed by the regional committee: ***(If different than agenda item)***

No change.

Committee recommendation to the region:

- ☐ Voting Item on the NCWM Agenda
- ☐ Information Item on the NCWM Agenda
- ☐ Withdraw the Item from the NCWM Agenda (*In the case of new items, do not forward to NCWM)*
- ☒ Developing Item on the NCWM Agenda *(To be developed by source)*

Reasons for the committee recommendation:

The Committee understands and appreciates the intent, but feels there were several concerns elevated during the open hearings and thus the item needs further development. The Committee encourages NIST to work with the submitter to develop this item.

COMPLETE SECTION BELOW FOLLOWING VOTING SESSION

Final updated or revised proposal from the region: ***(If different than regional committee recommendation)***

No change.

Regional recommendation to NCWM for item status:

- ☐ Voting Item on the NCWM Agenda
- ☐ Information Item on the NCWM Agenda
- ☐ Withdraw the Item from the NCWM Agenda (*In the case of new items, do not forward to NCWM)*
- ☒ Developing Item on the NCWM Agenda *(To be developed by source)*
- ☐ Unable to consider at this time *(Provide explanation in the "Additional Comments" section below)*

Regional Report to NCWM:

Please provide your report in this section exactly how you want it to appear in the NCWM reports to represent your region's considerations, support or opposition, and recommendations. **This will replace any previous reports from your region on this item.**

The Committee understands and appreciates the intent, but feels there were several concerns elevated during the open hearings and thus the item needs further development. The Committee encourages NIST to work with the submitter to develop this item.

Additional letters, presentations and data may have been part of the committee's consideration. Please refer to http://www.ncwm.net/meetings/interim/publication-15 to review these documents.

354 TAXIMETERS

354-1 S.1.2. Advancement of Indicating Elements.

Source:
NIST USNWG on Taximeters (2015)

Purpose:
To recognize that, when the use of flat rates or negotiated rates are permitted as passenger charges, the entry of a flat rate or negotiated rate must result in that charge being displayed on the primary indicating element and (if applicable) through the recording element. Also that, at the time a transaction has been completed, there shall be no further advancement of indicated customer charges.

Item Under Consideration:
Amend NIST Handbook 44 Taximeter Code as follows:

> **S.1.2. Advancement of Indicating Elements. –** Except when a taximeter is being cleared, the primary indicating and recording elements shall be susceptible of advancement only by the movement of the vehicle or by the time mechanism.
> **No advancement of fare, extras, or other charges shall occur after these charges have been totaled and the transaction is completed, which may include a customer receipt being issued.**
>
> Note: Where permitted, the application of a flat rate or negotiated rate shall be displayed on the primary indicating/recording element as a non-incrementing charge.
>
> (Amended 1988 **and 201X**)

Background / Discussion:
This amended proposal is a follow-up action to the proposal that was submitted for consideration during the previous cycle (2014-2015) of regional weights and measures association meetings. That proposal was subsequently listed on the 2015 NCWM Annual Meeting agenda as a voting item however, during that meeting it was requested that the status be changed to "informational" to allow for further development by the USNWG on Taximeters. The S&T Committee did honor that request and the status was changed to informational. This item has been revised by the work group and is now being re-submitted with a recommendation for the work group that it be considered as a "voting" item.

The use of non-incrementing (fixed amount) customer charges resulting from the application of a flat or negotiated rate in some jurisdictions is not addressed in HB44 Taximeters Code requirements. Where the use of this type of charge is permitted, those customer charges will normally be displayed on the primary indicating element in the display area reserved for "fare." The customer charge based on these particular types of rates do not align with the definition found in HB44 Appendix D for "fare" because the charge is not based on distance traveled or time elapsed. Some confusion over the interpretation of the existing requirement has been reported to the USNWG on Taximeters due to the use of flat rates and the resulting passenger charges being displayed by the taximeter in a display area reserved for "fare." The charge to the passenger resulting from the use of a flat or negotiated rate, when entered will cause the indicating element to change from zero or a no-charge to the amount that is associated with the flat or negotiated rate. This change from no charge to the value of the flat/negotiated rate has been interpreted by some as an advancement of the indicating elements. To account for this change in the displayed amount, the amendments shown above are being proposed by the USNWG on Taximeters.

Additionally, it was reported to the USNWG on Taximeters that during the type evaluation of a particular taximeter system, an advancement of the indicating element was observed after the passenger charges had been totaled and a receipt was printed. The members of the USNWG on Taximeters have determined that the indication of passenger charges should not continue to advance after the completion of a transaction and before the taximeter has been cleared of that transaction's data. Because there is no current requirement that addresses this advancement of indications after the completion of a transaction, the proposed amendment as shown is being recommended by the USNWG.

A number of jurisdictions are reportedly allowing the use of flat (fixed) rates to assess passenger charges for frequently traveled routes such as those trips between hotel/business districts and nearby airports. Some jurisdictions are alos permitting the use of a negotiated rate that results in a passenger being charged by an amount that has been agreed upon by the passenger and driver. While these types of charges are not a product of calculations made by a commercial measuring device, taxicab owners/operators benefit from having those charges processed through a taximeter for documentation of vehicle use, revenue verification, invoicing, etc. In those cases the flat/negotiated charges are to be entered into the taximeter and displayed by that commercial measuring device. For that reason the USNWG believes that it is appropriate recognize this practice and to regulate how those passenger charges appear and are displayed on the device. The requirement to have those fixed amounts displayed on the primary indicator and through the recording element will provide the passenger with a visual display of the charges assessed.

2015 NCWM Interim Meeting:
During the 2015 NCWM Interim Meeting, he Committee agreed to group together all of the "354" Taximeter Items (i.e., Agenda Items 354-1 through 354-6, inclusive) since it considered these items related and announced that comments on all six items would be taken together during the open hearings. See Agenda Item 354-1 for a summary of comments received during the open hearings relating to these items.

With respect to this particular item (354-2), the Committee agreed to replace the language in the original proposal (shown in the box below), with that recommended by the SWMA, shown in "Item Under Consideration," and recommend the item for vote at the July NCWM Annual Meeting.

Original Proposal:

S.1.2. Advancement of Indicating Elements. – Except when a taximeter is being cleared, the **fare charges displayed on the** primary indicating and recording elements shall be susceptible of advancement only by:

- **a).** the movement of the vehicle;
- **b).** by the time mechanism**;**
- **c). a combination of both a) and b*); or**
- **d). the entry of a monetary amount associated with a flat rate or negotiated rate where permitted.**

Advancement of the indications for charges, other than fare may occur through manual or automatic means.

*** The advancement of fare may occur by either the movement of the vehicle or by the time mechanism but shall not occur by both of these means operating simultaneously (see also S.4. Interference).**

(Amended 1988, **and 201X)**

2015 NCWM Annual Meeting
At the 2015 NCWM Annual Meeting, the Committee agreed to group together Agenda Items 354-1 through 354-5 and 360-3 and take comments simultaneously on these six items. See Agenda Item 354-1 for the summary of comments provided on these items.

Although grouped by the Committee with the other "taximeter" items, the Committee agreed during its work session to make this item a stand-alone voting item due to comments heard during the open hearings recommending this item be downgraded to Informational.

During the voting session, when asked if there were any comments on Agenda Item 354-2, Ms. Kristin Macey (CA) rose to request that the Committee downgrade this item to Informational. She noted that members of the USNWG are the experts and they had recommended this action to allow time for the group to continue working on the proposal.

Mr. Ross Andersen (NY retired) also recommended the item be downgraded to Informational. He stated that a flat fare is not associated with the advancement of the indicating elements and therefore should not be a part of paragraph S.1.2. Advancement of Indicating Elements.

Mr. Mike Sikula (NY) noted that a "flat rate" does not meet the definition of "fare" in Appendix D of HB 44 in that the word "fare," according to the definition, is calculated through the operation of the distance and/or time mechanism of a taximeter. A flat rate is not calculated by distance or time.

The 2015 item was as follows:

> **S.1.2. Advancement of Indicating Elements.** – Except when a taximeter is being cleared, the **fare charges displayed on the** primary indicating and recording elements shall **advance ~~be susceptible of advancement~~** only by:
>
> a) the movement of the vehicle;
>
> b) by the time mechanism**;**
>
> **c) the movement of the vehicle and by the time mechanism but shall not occur by both of these means operating simultaneously (see also S.4. Interference).; or**
>
> **d) the entry of a monetary amount associated with a flat rate or negotiated rate where permitted.**
>
> **Advancement of the indications for charges, other than fare may occur through manual or automatic means.**
>
> (Amended 1988, **and 201X)**

The Committee took a short recess to consider the comments heard during the voting session. In consideration of those comments, the Committee agreed to downgrade this item to Informational.

Regional Association Meetings:
At the 2014 CWMA Interim Meeting, CWMA's S&T Committee received comments supporting further development of this item. It was noted that this item has been under development for two years by the NIST USNWG on Taximeters. Multiple jurisdiction voiced support for this item. CWMA thinks this is sufficiently developed and forwarded the item to NCWM, recommending it as a Voting item. No comments were received on this item during the 2015 CWMA Annual Meeting open hearings. The CWMA recommended this item move forward as a voting item.

During open hearings at the 2014 WWMA Annual Meeting a member of the USNWG on Taximeters reported that this proposal has been in development for three years and is ready to be a Voting item. Further, he stressed that it is imperative that these changes be adopted to ensure the W&M community stay current with today's environment. No opposition to this item was presented. The WWMA recognizes the amount of work that has been done on this item and forwarded it to NCWM, recommending that it be a Voting item. Further, the WWMA recommends that 2014 WWMA S&T Committee Items 354-1, 354-2, 354-3, 354-4, and 354-5 be combined into one proposal.

At its 2014 Annual Meeting, SWMA did not hear any comments in opposition to this item and made recommendations based on confusion during review of the item. The Committee recommended that Items 354-1 through 354-5 be combined into one agenda item since they are all related to taximeters. Comments were heard for all five of these agenda items at the same time. SWMA forwarded this item to NCWM, recommending it as a Voting item as amended below:

S.1.2. Advancement of Indicating Elements. – Except when a taximeter is being cleared, the **fare charges displayed on the** primary indicating and recording elements shall **advance** ~~**be susceptible of advancement**~~ only by:

a) the movement of the vehicle;

b) by the time mechanism**;**

c) the movement of the vehicle and by the time mechanism but shall not occur by both of these means operating simultaneously (see also S.4. Interference).; or

d) the entry of a monetary amount associated with a flat rate or negotiated rate where permitted.

Advancement of the indications for charges, other than fare may occur through manual or automatic means.

(Amended 1988, **and 201X)**

At its 2014 Interim Meeting, NEWMA received comment from a member of the USNWG on Taximeters that the language has been cleaned up in the taxi code as new technology and point-of-sale systems are becoming more prevalent in all the states. As there was no opposition to this item it was recommended that the item move forward to a vote. It was suggested that related Items 354-1, 354-2, 354-3, 354-4, and 354-5 be combined into a single item. NEWMA forwarded the item to NCWM recommending it as a Voting item.

At the 2015 NEWMA Annual Meeting, the NEWMA S&T Committee agreed to group together Agenda Items 354-1 through 354-5 and take comments simultaneously on all these items since it considered them related. Refer to Agenda Item 354-1 to view the comments received by the Committee on this group of agenda items. NEWMA agreed to recommend Taximeter Agenda Items 354-1 through 354-5 move forward for vote.

SWMA Action: Item 354-1

Summary of comments considered by the regional committee (in writing or during the open hearings):

This item was grouped in a batch consisting of Item 354-1 and New items #12-#14 and all items were heard together. Mr. Hal Prince (FL) expressed concern that introducing the terms "flat rate" and "negotiated rate" may have unintended consequences and may now subject entities that only charge by a flat rate or negotiated rate to the taximeter code.

Item as proposed by the regional committee: ***(If different than agenda item)***

A.2. Exceptions. – This code does not apply to:

(a) Odometers ~~odometers~~ on vehicles that are rented on a distance basis (for which see Section 5.53. Code for Odometers).

(b) Entities that only charge a flat rate or negotiated rate.

(Amended 1977 and 201X)

S.1.2. Advancement of Indicating Elements. – Except when a taximeter is being cleared, the primary indicating and recording elements shall be susceptible of advancement only by the movement of the vehicle or by the time mechanism.

No advancement of fare, extras, or other charges shall occur after these charges have been totaled and the transaction is completed, which may include a customer receipt being issued.

Note: Where permitted, the application of a flat rate or negotiated rate shall be displayed on the primary indicating/recording element as a non-incrementing charge.

(Amended 1988 **and 201X**)

Committee recommendation to the region:

☒ Voting Item on the NCWM Agenda

☐ Information Item on the NCWM Agenda

☐ Withdraw the Item from the NCWM Agenda (*In the case of new items, do not forward to NCWM)*

☐ Developing Item on the NCWM Agenda *(To be developed by source)*

Reasons for the committee recommendation:
This item was grouped in a batch consisting of Item 354-1 and New items #12-#14 and all items were heard together. The Committee had concerns the proposed language would include entities that only charge a flat rate or negotiated rate, but feels changes to Section A.2 would make it clear such entities are not subject to the requirements of this code. The Committee has proposed changes to Section A.2.
COMPLETE SECTION BELOW FOLLOWING VOTING SESSION
Final updated or revised proposal from the region: ***(If different than regional committee recommendation)***
No changes from committee recommendation.
Regional recommendation to NCWM for item status: ☒ Voting Item on the NCWM Agenda ☐ Information Item on the NCWM Agenda ☐ Withdraw the Item from the NCWM Agenda (*In the case of new items, do not forward to NCWM)* ☐ Developing Item on the NCWM Agenda *(To be developed by source)* ☐ Unable to consider at this time *(Provide explanation in the "Additional Comments" section below)*
Regional Report to NCWM: Please provide your report in this section exactly how you want it to appear in the NCWM reports to represent your region's considerations, support or opposition, and recommendations. **This will replace any previous reports from your region on this item.**
This item was grouped in a batch consisting of Item 354-1 and New items #12-#14 and all items were heard together. The Committee had concerns the proposed language would include entities that only charge a flat rate or negotiated rate, but feels changes to Section A.2 would make it clear such entities are not subject to the requirements of this code. The Committee has proposed changes to Section A.2.

Additional letters, presentations and data may have been part of the committee's consideration. Please refer to http://www.ncwm.net/meetings/interim/publication-15 to review these documents.

New Item 12 S.2. Basis of Fare Calculations

Source:
U.S. National Working Group on Taximeters (2016)

Purpose:
To provide a clear statement that more than one rate may be used to calculate a single fare, this proposal would add language to the existing S.2. Basis of Fare Calculations. The changes proposed will also specify that the only time during the sequence of fare calculations at which a change in the rate applied would be permitted to occur.

Item Under Consideration:
Amend NIST Handbook 44, Taximeters Code as follows:

S.2. Basis of Fare Calculations. – A taximeter shall calculate fares only upon the basis of:

(a) distance traveled;

(b) time elapsed; or

(c) a combination of distance traveled and time elapsed.

Note: A taximeter may utilize more than one rate to calculate the fare during a trip. Any change in the applied rate must occur at the completion of the current interval.

(Amended 1977 **and 20XX)**

Background/Discussion:

In some jurisdictions it is a permitted practice to apply more than one rate used in the calculation of passenger fare during a single trip. While there is no prohibitive language in the Taximeters Code preventing this at this time, there is no language that would expressly permit this practice. Because it has been reported by some regulatory officials that there is a question whether the use of multiple rates for the calculation of a single fare should be permitted, the additional language suggested in this proposal will explicitly state that this practice is permissible. It is also necessary to ensure that any change in the rate applied in the calculation of a single fare be as clearly observable to the passenger as possible. Therefore it is important that no change to the rate being applied to calculate a fare would occur in the middle of a "money drop" or interval. If that were to occur, the monetary value of that particular interval during the trip would involve a complex series of calculations that would be very difficult to analyze. This is believed to be a potential cause for confusion and misunderstanding by the average passenger or operator.

SWMA Action: New Item 12
Summary of comments considered by the regional committee (in writing or during the open hearings):
This item was grouped in a batch consisting of Item 354-1 and New items #12-#14 and all items were heard together. Mr. Hal Prince (FL) expressed concern that introducing the terms "flat rate" and "negotiated rate" may have unintended consequences and may now subject entities that only charge by a flat rate or negotiated rate to the taximeter code.
Item as proposed by the regional committee: ***(If different than agenda item)***
No change.
Committee recommendation to the region: ☒ Voting Item on the NCWM Agenda ☐ Information Item on the NCWM Agenda ☐ Withdraw the Item from the NCWM Agenda (*In the case of new items, do not forward to NCWM)* ☐ Developing Item on the NCWM Agenda *(To be developed by source)*
Reasons for the committee recommendation:
This item was grouped in a batch consisting of Item 354-1 and New items #12-#14 and all items were heard together. The Committee feels this item is ready for voting.
COMPLETE SECTION BELOW FOLLOWING VOTING SESSION
Final updated or revised proposal from the region: ***(If different than regional committee recommendation)***
No change.
Regional recommendation to NCWM for item status: ☒ Voting Item on the NCWM Agenda ☐ Information Item on the NCWM Agenda ☐ Withdraw the Item from the NCWM Agenda (*In the case of new items, do not forward to NCWM)* ☐ Developing Item on the NCWM Agenda *(To be developed by source)* ☐ Unable to consider at this time *(Provide explanation in the "Additional Comments" section below)*
Regional Report to NCWM: Please provide your report in this section exactly how you want it to appear in the NCWM reports to represent your region's considerations, support or opposition, and recommendations. **This will replace any previous reports from your region on this item.**
This item was grouped in a batch consisting of Item 354-1 and New items #12-#14 and all items were heard together. The Committee feels this item is ready for voting.

Additional letters, presentations and data may have been part of the committee's consideration. Please refer to http://www.ncwm.net/meetings/interim/publication-15 to review these documents.

New Item 13 S.3.2. Flag

Source:

U.S. National Working Group on Taximeters (2016)

Purpose:
Eliminate unnecessary and archaic language from the NIST Handbook 44 Taximeters Code.

Item Under Consideration:
Amend NIST Handbook 44, Taximeters Code as follows:

~~**S.3.2. Flag. – If the control for the operating condition is a lever arm and flag, the flag shall be at its highest position when the taximeter is cleared, and in this position the whole of the flag shall be above the level of the taximeter housing.**~~

Background/Discussion:
The language describing the operation of taximeters in this existing paragraph refers to specific mechanisms in older, obsolete models of taximeters such as a flag and lever arm. Based on information gathered through the USNWG, personal accounts, and the fact that there are no NTEP Certificates of Conformance found (active or inactive) for mechanical-type taximeters, the USNWG has surmised that the taxi industry relies exclusively on electronic-type meters today and that there is no need for a requirement that specifically addresses these mechanical-based meters that are no longer being used in commercial service.

The reference to the mechanical components in S.3.2. has no relevance to the electronic meters currently used and are therefore this requirement is believed no longer needed for the examination of today's taximeters.

The formation of the USNWG on Taximeters was performed through an exhaustive process where any and all stakeholders were identified. All efforts were made to establish contact with those stakeholders. Those identified included device manufacturers, regulatory officials, subject matter experts, and trade associations. Agendas and meeting summaries that included details concerning this proposal were made available to all stakeholders. Throughout the three years of deliberations of the USNWG, there has been no reported use of mechanical-type taximeters. To this date, there has been no information provided to the USNWG that would indicate the existence of in-service mechanical-based taximeters.

SWMA Action: New Item 13

Summary of comments considered by the regional committee (in writing or during the open hearings):

This item was grouped in a batch consisting of Item 354-1 and New items #12-#14 and all items were heard together. Mr. Hal Prince (FL) expressed concern that introducing the terms "flat rate" and "negotiated rate" may have unintended consequences and may now subject entities that only charge by a flat rate or negotiated rate to the taximeter code.

Item as proposed by the regional committee: ***(If different than agenda item)***

F D-**Error! Bookmark not defined.**

~~face. ..... D **Error! Bookmark not defined.**~~
~~fare. ..... D **Error! Bookmark not defined.**~~
~~farm milk tank. ..... D **Error! Bookmark not defined.**~~
~~feeding mechanism ..... D **Error! Bookmark not defined.**~~
~~fifth wheel. ..... D **Error! Bookmark not defined.**~~
~~fifth wheel test. ..... D **Error! Bookmark not defined.**~~
flag~~.~~ D-157
~~fractional bar. ..... D **Error! Bookmark not defined.**~~
~~ft3/h. ..... D **Error! Bookmark not defined.**~~

~~**flag.** – A plate at the end of the lever arm or similar part by which the operating condition of a taximeter is controlled and indicated.[5.54]~~

Committee recommendation to the region:

- ☒ Voting Item on the NCWM Agenda
- ☐ Information Item on the NCWM Agenda
- ☐ Withdraw the Item from the NCWM Agenda (*In the case of new items, do not forward to NCWM)*
- ☐ Developing Item on the NCWM Agenda *(To be developed by source)*

Reasons for the committee recommendation:

This item was grouped in a batch consisting of Item 354-1 and New items #12-#14 and all items were heard together. The Committee feels this item is ready for voting, but added deleting the definition of 'flag' in Appendix D and the reference to the definition in the index.

COMPLETE SECTION BELOW FOLLOWING VOTING SESSION

Final updated or revised proposal from the region: ***(If different than regional committee recommendation)***

No changes from committee recommendation.

Regional recommendation to NCWM for item status:

- ☒ Voting Item on the NCWM Agenda
- ☐ Information Item on the NCWM Agenda
- ☐ Withdraw the Item from the NCWM Agenda (*In the case of new items, do not forward to NCWM)*
- ☐ Developing Item on the NCWM Agenda *(To be developed by source)*
- ☐ Unable to consider at this time *(Provide explanation in the "Additional Comments" section below)*

Regional Report to NCWM:

Please provide your report in this section exactly how you want it to appear in the NCWM reports to represent your region's considerations, support or opposition, and recommendations. **This will replace any previous reports from your region on this item.**

This item was grouped in a batch consisting of Item 354-1 and New items #12-#14 and all items were heard together. The Committee feels this item is ready for voting, but added deleting the definition of 'flag' in Appendix D and the reference to the definition in the index.

Additional letters, presentations and data may have been part of the committee's consideration. Please refer to http://www.ncwm.net/meetings/interim/publication-15 to review these documents.

New Item 14 Appendix D - Definitions: Flat Rate and Negotiated Rate

Source:
U.S. National Working Group on Taximeters (2016)

Purpose:
Provide definitions for two terms introduced in a proposed amendment to S.1.2. Advancement of Indicating Elements in the NIST Handbook 44 Taximeters Code.

Item Under Consideration:
Amend NIST Handbook 44, Appendix D - Definitions as follows:

> **flat rate. – a rate selection that when applied results in the indication of a fixed (non-incrementing) amount for passenger charges. This rate shall be included on the statement of established rates that is required to be posted in the vehicle. [5.54]**
>
> **(Added 201X)**

negotiated rate. – a rate selection that when applied results in passenger charges based on a value that has been agreed upon by the operator and passenger. The amount set by a negotiated rate does not increment. [5.54]

(Added 201X)

Background/Discussion:
While not appearing in the current edition of HB44, the terms "flat rate" and "negotiated rate" are used in another proposal to amend the existing requirement S.1.2. Advancement of Indicating Elements. The proposal to amend S.1.2. is also being submitted to the four regional weights and measures associations for consideration and does include the use of the two terms that are defined under this proposal. Both terms have specific meaning when used in the context of HB44 Taximeters Code and therefore it is believed to be beneficial to provide the definition for both terms in HB44 Appendix D to provide a clear understanding of the terms and the requirement that they would be used in.

SWMA Action: New Item 14

Summary of comments considered by the regional committee (in writing or during the open hearings):

This item was grouped in a batch consisting of Item 354-1 and New items #12-#14 and all items were heard together. Mr. Hal Prince (FL) expressed concern that introducing the terms "flat rate" and "negotiated rate" may have unintended consequences and may now subject entities that only charge by a flat rate or negotiated rate to the taximeter code.

Item as proposed by the regional committee: ***(If different than agenda item)***

A.2. Exceptions. – This code does not apply to:

(a) Odometers ~~odometers~~ on vehicles that are rented on a distance basis (for which see Section 5.53. Code for Odometers).

(b) Entities that only charge a flat rate or negotiated rate.

(Amended 1977 and 201X)

flat rate. – a rate selection that when applied results in the indication of a fixed (non-incrementing) amount for passenger charges. This rate shall be included on the statement of established rates that is required to be posted in the vehicle. [5.54]

(Added 201X)

negotiated rate. – a rate selection that when applied results in passenger charges based on a value that has been agreed upon by the operator and passenger. The amount set by a negotiated rate does not increment. [5.54]

(Added 201X)

Committee recommendation to the region:

- ☒ Voting Item on the NCWM Agenda
- ☐ Information Item on the NCWM Agenda
- ☐ Withdraw the Item from the NCWM Agenda (*In the case of new items, do not forward to NCWM)*
- ☐ Developing Item on the NCWM Agenda *(To be developed by source)*

Reasons for the committee recommendation:

This item was grouped in a batch consisting of Item 354-1 and New items #12-#14 and all items were heard together. The Committee had concerns the proposed language would include entities that only charge a flat rate or negotiated rate, but feels changes to Section A.2 would make it clear such entities are not subject to the requirements of this code. The Committee has proposed changes to Section A.2.

COMPLETE SECTION BELOW FOLLOWING VOTING SESSION

Final updated or revised proposal from the region: ***(If different than regional committee recommendation)***
No change from committee recommendation.
Regional recommendation to NCWM for item status: ☒ Voting Item on the NCWM Agenda ☐ Information Item on the NCWM Agenda ☐ Withdraw the Item from the NCWM Agenda (*In the case of new items, do not forward to NCWM)* ☐ Developing Item on the NCWM Agenda *(To be developed by source)* ☐ Unable to consider at this time *(Provide explanation in the "Additional Comments" section below)*
Regional Report to NCWM: Please provide your report in this section exactly how you want it to appear in the NCWM reports to represent your region's considerations, support or opposition, and recommendations. **This will replace any previous reports from your region on this item.**
This item was grouped in a batch consisting of Item 354-1 and New items #12-#14 and all items were heard together. The Committee had concerns the proposed language would include entities that only charge a flat rate or negotiated rate, but feels changes to Section A.2 would make it clear such entities are not subject to the requirements of this code. The Committee has proposed changes to Section A.2.

Additional letters, presentations and data may have been part of the committee's consideration. Please refer to http://www.ncwm.net/meetings/interim/publication-15 to review these documents.

354-2 D USNWG on Taximeters – Taximeter Code Revisions and Global Positioning System-Based Systems for Time and Distance Measurement

Note: This item was originally titled "Item 360-5 S.5. Provision for Security Seals" in the Committee's 2013 Interim Agenda. At the 2013 NCWM Interim Meeting, the Committee combined that item with "Item 354-1 Global Positioning Systems for Taximeters" and "Item 360-6 Global Positioning Systems for Taximeters" to create this new, consolidated item to address the development of recommendations on multiple topics related to taximeters and GPS-based time and distance measuring systems.

Source:
NIST USNWG on Taximeters

Purpose:
Develop recommendations for modifying the existing Taximeters Code to reflect current technology (including requirements for sealing, display requirements, and other features) and to examine GPS-based time and distance measuring systems to determine how to best address these measuring systems in NIST Handbook 44 to ensure accuracy and transparency for passengers and businesses.

Item Under Consideration:
This item is under development. Comments and inquiries may be directed to Mr. John Barton (NIST OWM) at 301-975-4002 or john.barton@nist.gov.

The USNWG is considering proposals to modify the sealing requirements in the Taximeters Code to reflect more advanced sealing methods (see 2012 NCWM Final S&T Report); to amend the Taximeters Code to specifically recognize GPS-based time and distance measuring systems; and to amend other sections of the Taximeters Code to reflect current technology and business practices while ensuring accuracy and transparency for customers and a level playing field for transportation service companies.

Background / Discussion:
The Committee has received multiple proposals over the past several years related to updating the current NIST Handbook 44 Taximeters Code to reflect current technology as well as a request to establish criteria for GPS-based

time and distance measuring systems. In April 2012, NIST OWM established a U.S. National Working Group to work on these issues. The USNWG has met multiple times since it was established. For details of those meetings as well as the current proposals being developed by the USNWG, please contact Mr. Barton as noted in the "Item Under Consideration" above.

Additional background information and updates on the progress associated with this item can be found in the Committee's 2014 and earlier final reports.

2015 NCWM Interim Meeting
During the 2015 NCWM Interim Meeting, the Committee agreed to group together all of the "354" Taximeter Items (i.e., Agenda Items 354-1 through 354-6, inclusive) since it considered these items related and announced that comments on all six items would be taken together during the open hearings. See Agenda Item 354-1 for a summary of comments received during the open hearings relating to these items.

With respect to this particular item (354-6) the Committee agreed to assign it a "Developing" status based on the update provided by the NIST Technical Advisor to the USNWG on Taximeters indicating the item is still being developed.

2015 NCWM Annual Meeting
At the 2015 NCWM Annual Meeting open hearings, the Committee heard comments from several officials voicing concern about the limited amount of progress being made by the work group to develop requirements that address GPS-based time and distance measuring systems and the need for those requirements. Mr. Jimmy Cassidy (City of Cambridge, MA), a member of the USNWG on Taximeters, reported that this item needed to be revived and that the WG needed fresh ideas on how best to proceed.

Mr. John Barton (OWM), NIST Technical Advisor to the USNWG on Taximeters reported that there is a large amount of proprietary information involved in the development of this type of system that the manufacturers of these systems are not willing to share. This is a major challenge for the WG to overcome in order to move forward in this effort.

Ms. Kristin Macey (CA) suggested developing proposed requirements that are performance based. She assured those concerned that testing can be accomplished and indicated that California is currently type evaluating a GPS-based device. She suggested possibly downloading the taxi service provider's application onto an IPhone or IPad and verify the accuracy of the system over a track as is currently done when testing a conventional taximeter in accordance with NIST Handbook 44 test procedures.

Mr. Ross Andersen (NY retired) commented that current taximeter tests may not be appropriate in that it specifies the track should be straight. He noted that GPS based systems are more sensitive side to side than to changes in elevation. He also questioned the factors being used by the service providers to determine a customer's rate and suggested more work is needed in this area. A final suggestion was that the WG concentrate efforts on developing methods of testing system performance.

The Committee agreed to maintain the Developing status of this item and looks forward to future refinements by the submitter.

Regional Associations Meetings:
CWMA did not receive comments on this item at its 2014 Interim Meeting or 2015 Annual Meeting and agreed at both meetings to recommend that the item be forwarded to NCWM as a Developing item.

During open hearings at the 2014 WWMA Annual Meeting, a NIST representative stated that NIST is currently in the process of contracting a chair for the sub-committee. The WWMA recommends that this item remain as a Developing item to allow more work to be completed in this area.

At its 2014 Annual Meeting, SWMA expressed support for the work of the USNWG on Taximeters and agreed to recommend this item move forward as a Developing item.

At its 2014 Interim Meeting, NEWMA received comments from members of the USNWG that an updated proposal was near completion. NEWMA recommended that this item remain a Developing item. At the 2015 NEWMA Annual Meeting, NEWMA noted that no comments were received and agreed to recommend the item be forwarded to NCWM as a Developing item.

SWMA Action: Item 354-2
Summary of comments considered by the regional committee (in writing or during the open hearings):
No comments were received on this item.
Item as proposed by the regional committee: ***(If different than agenda item)***
No change.
Committee recommendation to the region: ☐ Voting Item on the NCWM Agenda ☐ Information Item on the NCWM Agenda ☐ Withdraw the Item from the NCWM Agenda (*In the case of new items, do not forward to NCWM)* ☒ Developing Item on the NCWM Agenda *(To be developed by source)*
Reasons for the committee recommendation:
The Committee encourages the Taximeter Workgroup to continue to develop the GPS specifications and tolerances.
COMPLETE SECTION BELOW FOLLOWING VOTING SESSION
Final updated or revised proposal from the region: ***(If different than regional committee recommendation)***
No change.
Regional recommendation to NCWM for item status: ☐ Voting Item on the NCWM Agenda ☐ Information Item on the NCWM Agenda ☐ Withdraw the Item from the NCWM Agenda (*In the case of new items, do not forward to NCWM)* ☒ Developing Item on the NCWM Agenda *(To be developed by source)* ☐ Unable to consider at this time *(Provide explanation in the "Additional Comments" section below)*
Regional Report to NCWM: Please provide your report in this section exactly how you want it to appear in the NCWM reports to represent your region's considerations, support or opposition, and recommendations. **This will replace any previous reports from your region on this item.**
The Committee encourages the Taximeter Workgroup to continue to develop the GPS specifications and tolerances.

Additional letters, presentations and data may have been part of the committee's consideration. Please refer to http://www.ncwm.net/meetings/interim/publication-15 to review these documents.

New Item 11 Transportation Network Systems – Draft code

Source:
California Department of Food and Agriculture, Division of Measurement Standards (2016)

Purpose:
Create an Informational item to engage the weights and measures community in a discussion to create a code section within HB 44 for transportation measuring devices that determine fares using GPS to calculate time and distance.

Item Under Consideration:
Amend NIST Handbook 44, Taximeter Code as follows:

- Rename Section 5.54. Taximeters to Transportation Measuring Devices;

- Within Section 5.54., create Section 5.54.(a) for Taximeters and Section 5.54.(b) for Transportation Network Systems;
- Move current requirements in Section 5.54. Taximeters to Section 5.54(a). Taximeters; and
- Add draft requirements for Transportation Network Systems to new Section 5.54.(b) as presented here:

Transportation Network Systems – Tentative Code

This tentative code has only a trial or experimental status and is not intended to be enforced. The requirements are designed for study prior to the development and adoption of a final code. Officials wanting to conduct an official examination of a device or system are advised to see paragraph G-A.3. Special and Unclassified Equipment.

(Tentative Code Added 20XX)

A. Application

A.1. General. – This code applies to systems that utilize Global Positioning System (GPS) software and associated equipment or other comparable software-based system to determine distance and time, separately or simultaneously, to calculate a rate or rates and indicate the charge for hire of a vehicle or other mode of transport.

A.2. Exceptions. – This code does not apply to taximeters that use distance measurement transducer or odometers on vehicles that are rented on a distance basis (for which see Section 5.53. Code for Odometers).

A.3. Additional Code Requirements. – In addition to the requirements of this code, Transportation Network Systems shall meet the requirements of Section 1.10. General Code.

S. Specifications

S.1. Design of Indicating and Recording Elements.

S.1.1. General. – A system shall be equipped with a primary indicating element and may be equipped with a recording element.

S.1.1.1. Recording Elements. – A receipt providing information as required in S.1.9. Recorded Representations shall be available from the system or other means through an integral or separate recording element for all transactions conducted.

S.1.2. Identification. – The system 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) the current software version or revision identifier shall be:

(1) prefaced by words or an abbreviation that clearly identifies the number as the required version or revision.

i. Abbreviations for the word "Version" shall, as a minimum, begin with the letter "V" and may be followed by the word "Number";

ii. 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.);

(2) directly linked to the software itself.

(c) a California Type Evaluation Program (CTEP) Certificate of Approval (COA) number or a corresponding COA Addendum Number. The COA Number or a corresponding COA Addendum Number shall be prefaced by the terms "CTEP COA," "COA," 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.).

(d) If the system is it designed such that it consists of more than one part, the part dedicated to the metrologically significant software shall be clearly identified.

S.1.3. Location of Marking Information. – The required information in S.1.2. Identification. shall be:

(a) continuously displayed; or

(b) 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," "Weights and Measures Identification," or "Identification."

Note: Clear instructions for accessing the location of the information required in S.1.2. Identification. shall be listed on the CTEP COA, including information necessary to identify that the software is the same type that was evaluated.

S.1.4. Advancement of Indicating Elements. – Except when a system is being reset, the primary indicating and recording elements shall be susceptible of advancement only by the movement of the vehicle or the time mechanism.

S.1.5. Visibility of Indications. – The indication of fare shall be available at the beginning of the transaction. All fares shall be available whenever the vehicle is hired and in operation. All indications of passenger interest shall be displayed to the passenger, either in the vehicle from a distance of 1.2 m (4 ft) under any condition of normal operation, or on a device operated by the passenger. If the display is not on continuously, it shall be accumulated continuously so that real-time measurement is displayed during activation, no more than every 60 seconds. (Nonretroactive as of 20XX)

S.1.5.1. Minimum Height of Figures, Words, and Symbols. – If the indications are displayed in the vehicle, the minimum height of the figures used to indicate the fare shall be 10 mm and for extras, 8 mm. The minimum height of the figures, words, or symbols used for other indications, including those used to identify or define, shall be 3.5 mm.

S.1.5.2. Lighting of Indications. – If the indications are displayed in the vehicle, integral lighting shall be provided to illuminate the fare and extras.

S.1.5.3. Supplemental Indications. – If a supplementary indicating element is installed in a vehicle to provide information regarding the service to the passenger, it shall clearly display the current total of all charges incurred for the transaction. The accruing total of all charges must remain clearly visible on the passenger's display unless disabled by the passenger at all times during the transaction.

S.1.5.3.1. Fare and extras charges – The indication of fare and extras charges on the indicating element shall agree with similar indications displayed on all other indicating elements in the system.

S.1.6. Actuation of Fare-Indicating System. – A system shall be designed to calculate fares upon the basis of a combination of distance traveled and time elapsed.

S.1.7. Operating Condition.

S.1.7.1. Fare Identification. – Fare indications shall be identified by the word "Fare" or by an equivalent expression. Values shall be defined by suitable words or monetary signs.

S.1.7.2. Extras. – Extras shall be indicated as a separate item and shall not be included in the fare indication. They shall be identified by the word "Extras" or by an equivalent expression. Values shall be defined by suitable words or monetary signs. Means may be provided to totalize the fare and extras if the totalized amount returns to separate indications of fare and extras within 5 seconds or less.

S.1.7.2.1. Nonuse of Extras. – If and when system extras are prohibited by a legal authority or are discontinued by a vehicle operator, the extras mechanisms shall be rendered inoperable or the extras indications shall be effectively obscured by permanent means.

S.1.8. Protection of Indications. – All indications of fare and extras shall be protected from unauthorized alteration or manipulation.

S.1.9. Recorded Representation. – A receipt issued from a system, whether through an integral or separate recording element, shall include the following:

(a) date;

(b) unique vehicle identification number, or other identifying information as specified by the statutory authority;

(c) start and end time of trip, and total time of trip, maximum increment of one second;

(d) distance traveled, maximum increment of 0.01 kilometer or 0.01 mile;

(e) the associated fare in $ at each rate;

(f) additional charges where permitted such as extras; and

(g) total fare in $ (total charge).

S.2. Basis of Fare Calculations. – A system may calculate fares upon the basis of:

(a) distance traveled;

(b) time elapsed; or

(c) a combination of distance traveled and time elapsed.

S.3. Interference. – For systems that determine distance and time separately there shall be no interference between the time and the distance portions of the mechanism device at any speed of operation.

S.4. Provision for Sealing.

S.4.1. System Security. – A system shall be designed with provisions to ensure that no change can be made that detrimentally affects its metrological integrity.

S.4.2. Changelog. – The system shall provide a changelog, with the information available electronically to the weights and measures official. The changelog shall include a chronological record of all changes affecting the metrological integrity of the system.

S.4.3. Software Authenticity. Technical means shall be employed to guarantee the authenticity of the loaded software, to ensure that it originates from the owner of the type approval certificate.

S.5. Provisions for Power Loss.

S.5.1. Transaction Information. – In the event of a power loss, the system shall be capable of determining the information needed to complete any transaction in progress at the time of the power loss.

N. Notes

N.1. Distance Tests.

N.1.1. Test Methods. – To determine compliance with distance tolerances, a distance test of a system shall be conducted utilizing a distance test or a transfer standard test where applicable.

(a) Specific Distance Test. – The test consists of operating the conveyance over a precisely measured course at least one mile in length.

(b) Transfer Standard Test. - When comparing a system with a calibrated transfer standard, the distance shall be equal to at least the distance traveled on the specific distance test.

N.1.2. Test Procedures. - Not less than two test runs shall be conducted for a distance test and shall be at a speed approximating the average speed traveled by the vehicle in normal service.

N.1.3. Test Conditions. – Tests shall be conducted under conditions that are usual and customary with respect to the location and use of the device.

N.2. Time Test. – A system equipped with a timing device shall be tested during the specific distance and transfer standard tests.

N.3. Isolation Test. – If a system is designed to calculate fares for time and distance separately, tests for time and distance shall be conducted independently.

N.4. Software Tests. – The system software shall be loaded onto a smartphone and tested for authenticity and version number.

T. Tolerances

T.1. Tolerance Values.

T.1.1. Distance Tests. – Maintenance and acceptance tolerances shall be as follows:

(a) On Overregistration: 1 %

(b) On Underregistration: 4 %

T.1.2. Time Tests. – Maintenance and acceptance tolerances shall be as follows:

(a) On Overregistration: 5 seconds per test

(b) On Underregistration: 5 seconds per test

Background/Discussion:
Transportation Network Companies (TNC), e.g., Uber, Lyft, and possibly others, have developed software applications for use with a mobile device, which enables their drivers to provide transportation services for hire to customers who also have TNC applications downloaded on their mobile device. The software has significant metrological importance and is essential to these commercial transactions. Fares are determined based on a Global Positioning System- (GPS)-calculating distance and time.

There are unique operating characteristics of these software-based systems that distinguish them from traditional mechanical and electronic taximeters. For this reason, a separate code section is appropriate.

Weights and measures jurisdictions throughout the United States are coming under increasing pressure to demonstrate equal application of weights and measures laws to companies offering alternative transportation services to the traditional taxicab business model.

Taximeter manufacturers may soon decide to use GPS technology to calculate time and distance in an effort to be more like the TNC business model, which has gained widespread public acceptance.

In the U.S., Uber operates in 43 states and Washington, DC, and Lyft operates in 27 states and Washington, DC. Both these and other similar companies are growing and expanding their market share.

SWMA Action: New Item 11
Summary of comments considered by the regional committee (in writing or during the open hearings):
Ms. Kristin Macey (CA), submitter of the item, stated that this splits the taximeter code into two sections; taxis and transportation network services. She also stated that the TNC code is based around software types whereas the taximeter code is not. Ms. Macey also stated that existing TNCs were getting engaged with this process, which was encouraging. Ms. Carol Hockert (NIST) added that a couple of TNCs have contacted the Department of Commerce and are engaging in the process as they have run into issues internationally.
Item as proposed by the regional committee: ***(If different than agenda item)***
No change.
Committee recommendation to the region: ☐ Voting Item on the NCWM Agenda ☐ Information Item on the NCWM Agenda ☐ Withdraw the Item from the NCWM Agenda (*In the case of new items, do not forward to NCWM)* ☒ Developing Item on the NCWM Agenda *(To be developed by source)*
Reasons for the committee recommendation:
The Committee encourages the submitter to continue to develop the GPS specifications and tolerances.
COMPLETE SECTION BELOW FOLLOWING VOTING SESSION
Final updated or revised proposal from the region: ***(If different than regional committee recommendation)***
No change.
Regional recommendation to NCWM for item status: ☐ Voting Item on the NCWM Agenda ☐ Information Item on the NCWM Agenda ☐ Withdraw the Item from the NCWM Agenda (*In the case of new items, do not forward to NCWM)* ☒ Developing Item on the NCWM Agenda *(To be developed by source)* ☐ Unable to consider at this time *(Provide explanation in the "Additional Comments" section below)*
Regional Report to NCWM: Please provide your report in this section exactly how you want it to appear in the NCWM reports to represent your region's considerations, support or opposition, and recommendations. **This will replace any previous reports**

from your region on this item.
The Committee encourages the submitter to continue to develop the GPS specifications and tolerances.

Additional letters, presentations and data may have been part of the committee's consideration. Please refer to http://www.ncwm.net/meetings/interim/publication-15 to review these documents.

360 MULTIPLE DIMENSION MEASUREING DEVICES

New Item 26 Table S.4.1.a. Marking Requirements for Multiple Dimension Measuring Systems, Table S.4.1.b. Multiple Dimension Measuring Systems Notes for Table S.4.1.a.

Source:
NTEP Multiple Dimension Measuring Device Work Group (MDMD) (2016)

Purpose:
Create a new specification in the Multiple Dimensioning Measuring Device Code to require that the measurement result of all axes being displayed, printed or recorded in the same unit of measure.

Item Under Consideration:
Amend NIST Handbook 44, Multiple Dimension Measuring Devices Code as follows:

S.1.5. Value of Dimension /Volume Division Units. – The value of a device division "d" expressed in a unit of dimension shall be presented in a decimal format**. All dimensions shall be in the same unit of measure** with the value of the division expressed as:
…

Background/Discussion:
All dimensions being measured and used in the calculation of the volume of the object being measured must be the same unit measure so as not to misrepresent the accuracy of the measurement.

SWMA Action: New Item 26
Summary of comments considered by the regional committee (in writing or during the open hearings):
Mr. Rick Harshman (NIST) stated that this item was to harmonize type evaluation criteria. Mr. Dick Suiter (Richard Suiter Consulting) stated that a workgroup made up of manufacturers, users and regulators submitted this item.
Item as proposed by the regional committee: ***(If different than agenda item)***
No change.
Committee recommendation to the region: ☒ Voting Item on the NCWM Agenda ☐ Information Item on the NCWM Agenda ☐ Withdraw the Item from the NCWM Agenda (*In the case of new items, do not forward to NCWM)* ☐ Developing Item on the NCWM Agenda *(To be developed by source)*
Reasons for the committee recommendation:
The Committee feels this item is ready for voting.
COMPLETE SECTION BELOW FOLLOWING VOTING SESSION
Final updated or revised proposal from the region: ***(If different than regional committee recommendation)***
No change.

Regional recommendation to NCWM for item status:
☒ Voting Item on the NCWM Agenda ☐ Information Item on the NCWM Agenda ☐ Withdraw the Item from the NCWM Agenda (*In the case of new items, do not forward to NCWM)* ☐ Developing Item on the NCWM Agenda *(To be developed by source)* ☐ Unable to consider at this time *(Provide explanation in the "Additional Comments" section below)*
Regional Report to NCWM: Please provide your report in this section exactly how you want it to appear in the NCWM reports to represent your region's considerations, support or opposition, and recommendations. **This will replace any previous reports from your region on this item.**
The Committee feels this item is ready for voting.

Additional letters, presentations and data may have been part of the committee's consideration. Please refer to http://www.ncwm.net/meetings/interim/publication-15 to review these documents.

New Item 27 Table S.4.1.a. Marking Requirements for Multiple Dimension Measuring Systems, Table S.4.1.b. Multiple Dimension Measuring Systems Notes for Table S.4.1.a.

Source:
NTEP Multiple Dimension Measuring Device Work Group (MDMD) (2016)

Purpose:
Provide requirements pertaining to the use of multi-intervals on an MDMD.

Item Under Consideration:
Amend NIST Handbook 44, Multiple Dimension Measuring Devices Code as follows:

> Modify NIST Handbook-44 Table S.4.1.b. to add a note 9 which reads [9] **This marking information may be provided by a display or accompanying document. If an accompanying document is provided, the accompanying document shall include the manufacturers name and model designation.**

Note 9 to be added to the following marking requirements listed in Table S.4.1.a. to be marked with: Minimum and Maximum Dimensions for Each Axis, Value of Measuring Division (d), Temperature Limits, Minimum & Maximum speeds, Special Application, and Limitation of Use

.

To Be Marked With	**Multiple Dimensions Measuring Equipment**			
	Multiple Dimensions Measuring Device and Indicating Element in Same Housing	**Indicating Element Not Permanently Attached to Multiple Dimension Measuring Element**	**Multiple Dimension Measuring Element not Permanently Attached to the Indicating Element**	**Other Equipment[1]**
Manufacturer's ID	X	X	X	X
Model Designation	X	X	X	X
Serial Number and Prefix	X	X	X	X[2]
Certificate of Conformance Number[3]	X	X	X	X[3]
Minimum and Maximum Dimensions for Each Axis[4 9]	X	X	X	
Value of Measuring Division, d for Each Axis[3 9]	X	X	X	
Temperature Limits[5 9]	X	X	X	
Minimum and Maximum Speed[6 9]	X	X	X	
Special Application[7 9]	X	X	X	
Limitation of Use[8 9]	X	X	X	

[1] Necessary to the dimension and/pr volume measuring system, but having no effect on the measuring value (e.g., auxiliary remote display, keyboard, etc.)

[2] Modules without "intelligence" on a modular system (e.g., printer, keyboard module, etc.) are not required to have serial numbers.

[3] Required only if a Certificate of Conformance has been issued for the equipment.

[4] The minimum and maximum dimensions and measuring division, d (using upper and lower case type) can be shown as follows: Length: min ___ max ___ d___ Width: min ___ max ___ d___ Height: min ___ max ___ d___

[5] Required if the range is other than -10 °C to 40 °C (14 °F to 104 °F.)

[6] Multiple dimension measuring devices, which require that the object or device be moved relative to one another, shall be marked with the minimum and maximum speeds at which the device is capable of making measurements that are within the applicable tolerances.

[7] A device designed for a special application rather than general use shall be conspicuously marked with suitable words visible to the operator and the customer restricting its use to that application.

[8] Materials, shapes, structures, combination of object dimensions, speed, spacing, minimum protrusion size, or object orientations that are inappropriate for the device or those that are appropriate.

[9] This marking information may be provided by a display or accompanying document.

Background/Discussion:

Devices are continually being developed and have less space to include all marking requirements in a legible and readable format. This proposal provides harmonization with existing OIML marking requirements stated in R-129 and the European Measuring Instruments Directive 2014/32/EU.

SWMA Action: New Item 27
Summary of comments considered by the regional committee (in writing or during the open hearings):
Mr. Dick Suiter (Richard Suiter Consulting) stated that a workgroup made up of manufacturers, users and regulators submitted this item. Mr. Suiter added that one issue that was discussed was the need for serial numbers for load cells versus multiple dimension measuring systems. There are variations between load cells, but not multiple dimension measuring systems.
Item as proposed by the regional committee: ***(If different than agenda item)***
No change.
Committee recommendation to the region: ☒ Voting Item on the NCWM Agenda ☐ Information Item on the NCWM Agenda ☐ Withdraw the Item from the NCWM Agenda (*In the case of new items, do not forward to NCWM)* ☐ Developing Item on the NCWM Agenda *(To be developed by source)*
Reasons for the committee recommendation:
The Committee feels this item is ready for voting.
COMPLETE SECTION BELOW FOLLOWING VOTING SESSION
Final updated or revised proposal from the region: ***(If different than regional committee recommendation)***
No change.
Regional recommendation to NCWM for item status: ☒ Voting Item on the NCWM Agenda ☐ Information Item on the NCWM Agenda ☐ Withdraw the Item from the NCWM Agenda (*In the case of new items, do not forward to NCWM)* ☐ Developing Item on the NCWM Agenda *(To be developed by source)* ☐ Unable to consider at this time *(Provide explanation in the "Additional Comments" section below)*
Regional Report to NCWM: Please provide your report in this section exactly how you want it to appear in the NCWM reports to represent your region's considerations, support or opposition, and recommendations. **This will replace any previous reports from your region on this item.**
The Committee feels this item is ready for voting.

Additional letters, presentations and data may have been part of the committee's consideration. Please refer to http://www.ncwm.net/meetings/interim/publication-15 to review these documents.

New Item 16 **S.2.2.1. Maximum Value of Tare for Multi-Interval (Variable Division Value) Devices. S.2.2.2. Net Values, Mathematical Agreement, Table 1: Examples of Acceptable Altering of Tare to Achieve Accurate Net Indication, Table 2: Examples of Acceptable Rounding of the Net Result (Following the Subtraction of Tare) to Achieve Accurate Net Indication, Table S.4.1.a., Marking Requirements for Multiple Dimension Measuring Systems, T.2.3. Multi-interval (Variable Division-Value) Devices., T.2.4. Mixed-interval Devices.**

Source:
NTEP Multiple Dimension Measuring Device Work Group (MDMD) (2016)

Purpose:
Provide requirements pertaining to the use of multi-intervals on an MDMD.

Item Under Consideration:
Amend NIST Handbook 44, Multiple Dimension Measuring Devices Code as follows:

Add new sub-paragraphs S.2.2.1. Maximum Value of Tare for Multi-Interval (Variable Division- Value) Devices and S.2.2.2. Net Values, Mathematical Agreement beneath existing paragraph S.2.2. Tare as follows:

S.2.2. Tare. – The tare function…

S.2.2.1. Maximum Value of Tare for Multi-Interval (Variable Division-Value) Devices. – A multi-interval device shall not accept any tare value greater than the maximum capacity of the lowest range of the axis for which the tare is being entered.

S.2.2.2. Net Values, Mathematical Agreement. - All net values resulting from a device subtracting a tare entry from a gross value indication shall be indicated and recorded, if so equipped, to the nearest division of the measuring range in which the net value occurs. In instances where the tare value entered on a multi-interval device is in a lower partial measuring range (or segment) than the gross indication, the system shall either alter the tare entered or round the net result after subtraction of the tare in order to achieve correct mathematical agreement.

The following example (of a multi-interval device having two partial measuring ranges for the "x" axis) and accompanying two tables are provided to further clarify the two acceptable methods a device can use to achieve mathematical agreement when tare has been entered in a lower partial measuring range than the gross indication:

Example multi-interval device having two partial measuring ranges for the "x" axis:

- **Partial measuring range 1: 0 – 100 inches by 0.2 inch**
- **Partial measuring range 2: 100 – 300 inches by 0.5 inch**

Table 1: Examples of Acceptable Altering of Tare to Achieve Accurate Net Indication

Gross Indication of Item Being Measured	Tare Entered	Value of Tare after Being Altered by the Device	Acceptable Net Indication
154.5 inches	41.2 inches	41.0 inches	113.5 inches
154.5 inches	41.4 inches	41.5 inches	113.0 inches

Table 2: Examples of Acceptable Rounding of the Net Result (Following the Subtraction of Tare) to Achieve Accurate Net Indication

Gross Indication of Item Being Measured	**Tare Entered**	**Net Result Before Rounding** ***(Gross Indication minus Tare Entered)***	**Acceptable Net Indication Rounded to Nearest 0.5 inch**
154.5 inches	**41.2 inches**	**113.3 inches**	**113.5 inches**
154.5 inches	**41.4 inches**	**113.1 inches**	**113.0 inches**

Amend Table S.4.1.a. Marking Requirements for Multiple Dimension Measuring Equipment as follows:

Table S.4.1.a.
Marking Requirements for Multiple Dimension Measuring Systems

To Be Marked With ∴	**Multiple Dimension Measuring Equipment**			
	Multiple Dimension Measuring Device and Indicating Element in Same Housing	**Indicating Element not Permanently Attached to Multiple Dimension Measuring Element**	**Multiple Dimension Measuring Element not Permanently Attached to the Indicating Element**	**Other Equipment (1)**
Manufacturer's ID	x	x	x	x
Model Designation	x	x	x	x
Serial Number and Prefix	x	x	x	x (2)
Certificate of Conformance Number (8)	x	x	x	x (8)
Minimum and Maximum Dimensions for Each Axis **for Each Range in Each Axis** (3)	x	x	x	
Value of Measuring Division, d (for each axis and range)	x	x	x	
Temperature Limits (4)	x	x	x	
Minimum & Maximum speed (5)	x	x	x	
Special Application (6)	x	x	x	
Limitation of Use (7)	x	x	x	

Amend paragraph T.2.3. Multi-Interval (Variable Division-Value) Devices and add a new paragraph T.2.4.* Mixed-interval Devices.** ***as follows:

T.2.3. Multi-interval (Variable Division-Value) Devices. – ~~**For multi-interval (variable division-value) devices,**~~ **When there exists two or more partial measuring ranges (or segments) specified for any of the "dimensioning" axes (length (x), width (y), or height (z)) and the division values corresponding to those partial measuring ranges (or segments) within the same "dimensioning" axis differ,** the tolerance values ~~**are**~~ **shall be** based on the value of the ~~**device**~~ division of the range in use.

T.2.4. Mixed-interval Devices. - For devices that measure to a different division value in at least one dimensioning axes and all axes are single range, the tolerance values shall be based on the value of the division of the axis in use.

Background/Discuission
Members of the NTEP Multiple Dimension Measuring Device (MDMD) Work Group (WG) agreed during their May 2015 WG Meeting that the MDMD Code of NIST Handbook 44 (HB 44) does not contain any requirements pertaining to the use of multi-intervals on an MDMD. The WG notes that HB 44 MDMD Code paragraph T.2.3., despite its title (i.e., Multi-interval (Variable Division-Value) Devices) was never intended to apply to devices that measure using multi-intervals in two or more partial measuring ranges within the same axes. Instead, the paragraph applies to devices that measure to a different division value in at least one of the dimensioning axes in comparison to the other two. Multi-interval MDMDs intended for commercial application exist in today's marketplace. The purpose of this proposal is to amend HB 44 so as to differentiate between these two different applications and add requirements to address the use of multi-intervals on MDMDs. There are currently no requirements in the MDMD Code of HB 44 that apply to the use of multi-intervals on an MDMD, yet there currently exists such equipment in the marketplace intended for commercial use.

SWMA Action: New Item 16
Summary of comments considered by the regional committee (in writing or during the open hearings):
Mr. Rick Harshman (NIST) stated that this item was to harmonize type evaluation criteria. Mr. Dick Suiter (Richard Suiter Consulting) stated that a workgroup made up of manufacturers, users and regulators submitted this item. Mr. Suiter noted that the Western Region had concerns over this item in that it may work against consumers, but he didn't feel that it did.
Item as proposed by the regional committee: ***(If different than agenda item)***
No change.
Committee recommendation to the region: ☒ Voting Item on the NCWM Agenda ☐ Information Item on the NCWM Agenda ☐ Withdraw the Item from the NCWM Agenda (*In the case of new items, do not forward to NCWM)* ☐ Developing Item on the NCWM Agenda *(To be developed by source)*
Reasons for the committee recommendation:
The Committee feels this item is ready for voting.
COMPLETE SECTION BELOW FOLLOWING VOTING SESSION
Final updated or revised proposal from the region: ***(If different than regional committee recommendation)***
No change.
Regional recommendation to NCWM for item status: ☒ Voting Item on the NCWM Agenda ☐ Information Item on the NCWM Agenda ☐ Withdraw the Item from the NCWM Agenda (*In the case of new items, do not forward to NCWM)* ☐ Developing Item on the NCWM Agenda *(To be developed by source)* ☐ Unable to consider at this time *(Provide explanation in the "Additional Comments" section below)*
Regional Report to NCWM: Please provide your report in this section exactly how you want it to appear in the NCWM reports to represent your region's considerations, support or opposition, and recommendations. **This will replace any previous reports from your region on this item.**
The Committee feels this item is ready for voting.

Additional letters, presentations and data may have been part of the committee's consideration. Please refer to http://www.ncwm.net/meetings/interim/publication-15 to review these documents.

360 OTHER ITEMS

New Item 28 Electric Watthour Meters Code under Development

Source:
NIST OWM (2016)

Purpose:

1) Make the weights and measures community aware of work being done within the U.S. National Work Group on Electric Vehicle Fueling and Submetering to develop proposed requirements for electric watthour meters used in submeter applications in residences and businesses;
2) Encourage participation in this work by interested regulatory officials, manufacturers, and users of electric submeters.
3) Allow an opportunity for the USNWG to provide regular updates to the S&T Committee and the weights and measures community on the progress of this work;
4) Allow the USWNG to vet specific proposals as input is needed.

Item Under Consideration:

Create a "Developing Item" for inclusion on the NCWM S&T Committee Agenda where progress of the USNWG can be reported as it develops legal metrology requirements for electric watthour meters and continues work to develop test procedures and test equipment standards. The following narrative is proposed for this item:

In 2012, NIST OWM formed the U.S. National Working Group on Electric Vehicle Fueling and Submetering to develop proposed requirements for commercial electricity-measuring devices (including those used in sub-metering electricity at residential and business locations and those used to measure and sell electricity dispensed as a vehicle fuel) and to ensure that the prescribed methodologies and standards facilitate measurements that are traceable to the International System of Units (SI).

In 2013, the NCWM adopted changes recommended by the USNWG to the NIST Handbook 130 requirements for the Method of Sale of Commodities to specify the method of sale for electric vehicle refueling. At the 2015 NCWM Annual Meeting, the NCWM adopted NIST Handbook 44 Section 3.40 Electric Vehicle Refueling Systems developed by the USNWG.

This Developing Item is included on the Committee's agenda (and a corresponding item is proposed for inclusion on the L&R Committee Agenda) to keep the weights and measures community apprised of USNWG current projects, including the following:

- The USNWG continues to develop recommended test procedures for inclusion in a new EPO 30 for Electric Vehicle Refueling Equipment along with proposed requirements for field test standards.

- The USWNG is continuing work to develop a proposed code for electricity-measuring devices used in sub-metering electricity at residential and business locations. This does not include metering systems under the jurisdiction of public utilities. The USNWG hopes to have a draft code for consideration by the community in the 2016-2107 NCWM cycle.

The USNWG will provide regular updates on the progress of this work and welcomes input from the community.

For additional information, contact USNWG Chairman Tina Butcher at tbutcher@nist.gov or 301-975-2196 or Technical Advisor, Juana Williams at Juana.williams@nist.gov or 301-975-3989

Background/Discussion:
The creation of Developing Items on both the L&R and S&T Committee agendas will provide for a venue to allow the USNWG to update the weights and measures community on continued work to develop test procedures and test equipment standards. This item will also provide a forum for reporting on work to develop proposed method of sale requirements for electric watthour meters and a tentative device code for electric watthour meters in residential and business locations and serve as a placeholder for eventual submission of these proposals for consideration by NCWM.

SWMA Action: New Item 28
Summary of comments considered by the regional committee (in writing or during the open hearings):
No comments were received on this item.
Item as proposed by the regional committee: ***(If different than agenda item)***
No change.
Committee recommendation to the region: ☐ Voting Item on the NCWM Agenda ☐ Information Item on the NCWM Agenda ☐ Withdraw the Item from the NCWM Agenda (*In the case of new items, do not forward to NCWM)* ☒ Developing Item on the NCWM Agenda *(To be developed by source)*
Reasons for the committee recommendation:
The Committee supports the development of this item.
COMPLETE SECTION BELOW FOLLOWING VOTING SESSION
Final updated or revised proposal from the region: ***(If different than regional committee recommendation)***
No change.
Regional recommendation to NCWM for item status: ☐ Voting Item on the NCWM Agenda ☐ Information Item on the NCWM Agenda ☐ Withdraw the Item from the NCWM Agenda (*In the case of new items, do not forward to NCWM)* ☒ Developing Item on the NCWM Agenda *(To be developed by source)* ☐ Unable to consider at this time *(Provide explanation in the "Additional Comments" section below)*
Regional Report to NCWM: Please provide your report in this section exactly how you want it to appear in the NCWM reports to represent your region's considerations, support or opposition, and recommendations. **This will replace any previous reports from your region on this item.**
The Committee supports the development of this item.

Additional letters, presentations and data may have been part of the committee's consideration. Please refer to http://www.ncwm.net/meetings/interim/publication-15 to review these documents.

New Item 3 Appendix A – Fundamental Considerations, 2.1. Acceptance and Maintenance Tolerances

Source:
Ross Andersen, Retired (2016)

Purpose:

Amend Section 2.1 of Fundamental Considerations to make it more effectively explain the purpose and application of HB44 tolerances.

Item Under Consideration:
Amend NIST Handbook 44 Appendix A, Fundamental Considerations as follows:

~~**2.1. Acceptance and Maintenance Tolerances. The official tolerances prescribed by a weights and measures jurisdiction for commercial equipment are the limits of inaccuracy officially permissible within that jurisdiction. It is recognized that errorless value or performance of mechanical equipment is unattainable. Tolerances are established, therefore, to fix the range of inaccuracy within which equipment will be officially approved for commercial use. In the case of classes of equipment on which the magnitude of the errors of value or performance may be expected to change as a result of use, two sets of tolerances are established: acceptance tolerances and maintenance tolerances.**~~

~~**Acceptance tolerances are applied to new or newly reconditioned or adjusted equipment, and are smaller than (usually one-half of) the maintenance tolerances. Maintenance tolerances thus provide an additional range of inaccuracy within which equipment will be approved on subsequent tests, permitting a limited amount of deterioration before the equipment will be officially rejected for inaccuracy and before reconditioning or adjustment will be required. In effect, there is assured a reasonable period of use for equipment after it is placed in service before reconditioning will be officially required. The foregoing comments do not apply, of course, when only a single set of tolerance values is established, as is the case with equipment such as glass milk bottles and graduates, which maintain their original accuracy regardless of use, and measure-containers, which are used only once.**~~

2.1. Equipment Tolerances. – The official tolerances prescribed by a weights and measures jurisdiction for commercial equipment are the limits of inaccuracy officially permissible within that jurisdiction. These limits are set by means of tolerances which are codified to fix the range of inaccuracy within which equipment will be approved for commercial use when undergoing official tests. Alternatively, equipment that is performing outside these tolerance limits will be rejected and removed from service.

Regulatory decisions, to either approve or reject equipment, come with risks. Measurements are imperfect; meaning measurement without error is unattainable. All measurements involve rounding to the chosen increment of scale, all are subject to random variations, and all are affected by influences, disturbances, biases, and drift. This applies equally to the measurements being made by the commercial equipment, and to the official measurements made to verify that equipment. With these unavoidable uncertainties in the measurements, it is possible, and in fact likely, that compliant equipment will sometimes be rejected and non-compliant equipment will sometimes be approved. The regulatory approach used in this handbook recognizes the risks, attempts to limit the risks to reasonable levels, and, most importantly, balances the risks between buyer and seller. The approach has three primary concerns; accurate official standards, uniform test procedures, and limited equipment variability.

Accurate Official Standards – Each of the specific codes in the handbook prescribes the appropriate verification standards for official testing. The error in the verification standards is limited by a separate set of tolerances that are smaller than the tolerances applied to the equipment under test. These tolerances (see Part 3 of this Appendix) limit the biases imparted to the test directly from any error or bias inherent in the standards. However, these tolerances for the standards do not address the effects of influences, disturbances and drift on the standards when used in official testing.

Uniform Test Procedures - Each of the specific codes in this handbook prescribes uniform test procedures in the Notes section for various types of commercial equipment. These procedures evaluate equipment performance under varying operating conditions consistent with normal usage. The official performing the tests should ensure the procedures are followed meticulously so as to minimize the variability from these procedural sources. Although the procedures may be performed correctly, it is not possible to eliminate the effects of random variations, influences, disturbances, and biases from the procedures.

Limited Equipment Variability – Each of the specific codes in this handbook recognizes a reasonable amount of variability normally expected for each type of commercial equipment and the unique commodities or services measured. The equipment is subject to the effects of random variations, influences, disturbances, biases, and drift. In addition, the commodities and services are variables, as their properties affect how they are measured by the equipment.

Any official test result includes the variability from all three of the sources described above. When dealing with this variability, however, it is not practical to evaluate testing uncertainties for each inspector and each individual piece of equipment. The costs would be enormous to the regulatory agencies. Instead, the regulatory approach used in this Handbook is to view the process in terms of the tests on the entire population rather than on the single piece of equipment. In this context, the variability of the combined measurement is not a simple sum of the three parts, but rather a combination based on probabilities. We can express those probabilities using standard deviations (sd) for each of the terms. If we use S for standards, P for procedures and E for equipment, then we can express the total variation of the system using the formula below.

$$\text{Total Variability} = \sqrt{(sd^2S + sd^2P + sd^2E)}$$

Essentially the prescribed tolerance limit is a formal cap to equipment variability including variation from all sources in the verification, i.e. variability in the standards and in the performance of prescribed test procedures. (See General Code G-S.5.4.) If the variability of the standards and the test procedure are small relative to that of the equipment, their impact on the total variability can be shown to be relatively small. Thus the equipment variability emerges as the primary source of the variation within the population. Measurement science confirms that measurement performance behaves normally, producing a population that has probabilities approximating a bell-shaped curve. It is critical to understand that the probabilities of false rejection and false acceptance are equal under this approach and the risks are equally distributed between buyers and sellers. The tolerance limits serve to identify individual pieces of equipment in the tails of the bell that should be rejected and then adjusted back to the middle of the population. Examples of the impacts of various levels of variability for the three components are shown in the table below.

sd Equipment	sd Standards	sd Procedures	sd Total Variability	*Contribution of Equipment %
1	1/3	1/3	1.106	90
1	1/4	1/4	1.061	94
1	1/5	1/5	1.039	96
1	1/10	1/10	1.010	99

Contribution of Equipment% is calculated as sd Equipment/sd Total Variability*100

The general rule for tolerance application pertains to equipment that is adjustable. It employs two levels of tolerances, acceptance tolerances and maintenance tolerances, where acceptance tolerance values are generally one-half the value of maintenance tolerances. These tolerances are applied based on a timeline. The timeline begins when the equipment is initially placed in service and ends when the equipment is either officially rejected, undergoes a major reconditioning or overhaul, or is decommissioned by the user.

A) Tolerances when placed in service: Equipment is tested when it is initially placed in service. Based on the test result(s), it is adjusted to bring performance error(s) as close as practicable to zero error. In addition, all errors must be within the acceptance tolerances. (See General Code Paragraphs G-UR.4.3. and G-T.1.) However, when making any adjustment it is not possible to know the impacts of the random variations, influences, disturbances, and biases on the measurements at that moment. By adjusting as close as practicable to zero error, there is a balanced risk of introducing bias in the equipment to either overregister or underregister (but still perform within the acceptance tolerance). Thus, over the entire population of equipment, the adjustments result in equipment performance that is bunched close to zero error and a population that is not skewed in favor of either buyer or seller.

B) Tolerances on official tests made within the first 30 days after placement in service: In the first 30 days after adjustment, acceptance tolerances are applied to any official tests of the equipment. Over a 30 day period after adjustment, the range of influences is expected to be small and there should be minimal drift in the equipment, thus the smaller acceptance tolerances are deemed appropriate.

C) Tolerances on official tests made 31 or more days after placement in service: For any official test after the first 30 days in service, maintenance tolerances are applied. This larger tolerance recognizes the effects of a full range of influences and allows for small amounts of drift before the equipment will be officially rejected and require readjustment, repair, or major reconditioning or overhaul. Provided performance is maintained within the maintenance tolerances, the equipment can remain in service indefinitely. However, any out-of-tolerance performance in an official test is grounds for rejection and this creates a new timeline starting again at placement in service.

The special rule for tolerance application pertains to devices that at not adjustable, like steel tapes, timing devices, glass graduates, and measure-containers. For these devices the specific code prescribes only a single level of tolerances that are applied in all official tests of the equipment. These tolerances are applicable at all times the device is in service.

Background/Discussion:
The submitter provided the following statements:

> Recent discussions within the work Group on Multi-Point Calibrations have, I believe, exposed a significant weakness in this section of the Fundamental Considerations. Those discussions revealed that people may misunderstand what tolerances are for and why they are necessary. In particular, I would point to the following sentences from the first and second paragraphs of section 2.1.:
>
> In the case of classes of equipment on which the magnitude of the errors of value or performance may be expected to change as a result of use, two sets of tolerances are established: acceptance tolerances and maintenance tolerances. (emphasis added)
>
> Maintenance tolerances thus provide an additional range of inaccuracy within which equipment will be approved on subsequent tests permitting a limited amount of deterioration before the equipment will be officially rejected for inaccuracy and before reconditioning or adjustment will be required. (emphasis added)
>
> These passages seem to suggest that any change in performance in a commercial device performance between tests is due to deterioration, or to be more precise, instrumental drift. I strongly believe this section has reinforced some poor assumptions by failing to recognize that variability in test results are most often due to the impact of influences and other random factors. We easily recognize influences that change device performance over short time frames. Consider the impact of flow rate on many metering devices. We can imagine a single performance curve of delivery error vs flow rate where the errors at minimum rated flow rate show underregistration (plus error) but are close to zero error at maximum delivery rate. This is why we test both at normal and low flow rates. With a limited timeframe there is a tendency to think those results are representative of all possible test conditions.
>
> However, if we collect data over an extended time period we see that changes in viscosity may not only offset the device performance curve but also change the shape of the flow rate curve. I have seen test results from Measurement Canada's volumetric lab on a positive displacement meter using the same product at temperatures of 0 C, 15 C and 30 C. Their analysis clearly shows that performance changes reached 0.4% at fast flow over a 30 C range for diesel fuel. These changes were show to correlate very closely with the observed change in viscosity due to temperature. For petrosol over the same temperature range, the difference was about 0.34%. I think this makes sense as the change in viscosity over temperature will be less for products with lower viscosity.

In 1986, the entire Scales Code was revised. A major part of that revision was the inclusion of tolerances for influence factors. We began to understand why some scales set to zero in the summer failed when tested in the winter and vice versa. These failures weren't being caused by instrumental drift, i.e. permanent changes in performance. It was just a case of the normal range of influences on the output of the load cells. The Code changes required production of load cells that could maintain performance within acceptance tolerance over the temperature ranges a device should normally see. No one picked up that this section in Fundamental Considerations should have been changed when influence factor tolerances were added to the Scales Code, but not only for the scales code. It should have been changed for all codes since influences affect all measurements. This proposal seeks to correct that omission and give influences and other sources of variability due recognition in the explanation of how tolerances work in Handbook 44.

There is another related issue, which requires us to understanding the real purpose of G-S.5.4. Because the title of G-S.5.4. includes the term "repeatability" and we have tests for repeatability, people think this paragraph refers only to repeatability tests. Instead I suggest it refers to any and all tests. It can't reasonably be restricted to repeatability tests because the second sentence clearly covers performance under varying conditions. In a repeatability test, you are required to test under only one set of conditions.

If I ask you to point out where in the Handbook 44 Codes it specifically says that a device must perform within tolerance, where would you point? The tendency is to point either to the tolerance sections of either the General Code or the specific codes. However, those sections only declare what the tolerances values are when you are to apply the various types of tolerances. Nowhere in these sections can you find it clearly stated that the commercial device is required to conform to the tolerances. You can try to stretch it from the general meaning of the term tolerance, but I think that is unnecessary. The specific code requirement requiring performance within tolerances under all test conditions is G-S.5.4.! It is by extension that we expect the equipment to perform within tolerance under normal conditions of use.

There is another critical bit of text in G-S.5.4. that significantly affects our application of tolerances. It deals with the text: "repeated performance of steps or operations that are embraced in the testing procedure." We have to understand why this text is there. My explanation is the text is necessary to specifically explain that the prescribed tolerances include all of the uncertainties associated with the test procedures and the standards used in the tests. It says clearly that you do not need to make any further allowances or corrections for uncertainties when performing the prescribed tests with suitable standards (see Fundamental Considerations section 3).

This becomes clearer if we parse the sentence to its basic elements.

G-S.5.4. Repeatability of Indications. – A device shall be capable of repeating, within prescribed tolerances, its indications and recorded representations. This requirement shall be met irrespective of *condition A* and of *condition B.*

Note that because of the underlined and, both conditions A and B must be met simultaneously.

Condition A is – "repeated manipulation of any element of the device in a manner approximating normal usage (including displacement of the indicating elements to the full extent allowed by the construction of the device and repeated operation of a locking or relieving mechanism)"

Condition B is – "the repeated performance of steps or operations that are embraced in the testing procedure."

Metrology has several ways of dealing with measurement uncertainty in the verification process, where uncertainties are well established. One method is to explicitly state the uncertainties, as is done for most calibration work. Another method is called guard banding. This method essentially reduces the applicable tolerance by the uncertainty of the test. Thus if the prescribed equipment tolerance is +/-10 units and the test uncertainty +/-2 units, then you pass only equipment with errors up to +/-8 units. In the case of field tests of commercial devices, guard banding may not be feasible because it requires rigorous evaluation of the test uncertainty. I don't believe that many of us in the enforcement areas have the resources to fully

evaluate those test uncertainties. It would require each and every inspector to be evaluated individually over a range of devices and varying test conditions. I would add that it is unreasonable to assert that this has ever been the accepted application of the tolerances in HB44. A third method is the Test Uncertainty Ratio. In this method you establish a limit to test uncertainty that is small relative to the performance limits, i.e. usually something like 4:1.

Handbook 44 is not using any of these methods because the measurement uncertainty of the verification of commercial equipment is not well established. Instead it is using a method that aims to control the population of devices using a broad probabilistic approach. What the revisions to this section do is attempt to clarify that performance changes in equipment that we observe in official tests can be caused by a variety of causes including influences on the equipment as well as variability in the test. These tend to be the dominant causes of variability and we will find that the instrumental drift that was the target of the original text is really a minor effect. The tolerances in HB44, both on the standards and on the equipment, recognize reasonable variations but provide black-and-white pass-fail decision criteria for the inspector when conducting official tests. The overall outcome is a population that fits a bell curve centered at zero error.

While the revised text is somewhat longer than the original, I believe it is necessary to discuss all of the important measurement variables in this section and explain how they are addressed in the regulatory approach of HB44. This fills a void that I believe exists in the original text.

SWMA Action: New Item 3
Summary of comments considered by the regional committee (in writing or during the open hearings):
No comments were received on this item.
Item as proposed by the regional committee: ***(If different than agenda item)***
The item was recommended to be withdrawn.
Committee recommendation to the region: ☐ Voting Item on the NCWM Agenda ☐ Information Item on the NCWM Agenda ☒ Withdraw the Item from the NCWM Agenda (*In the case of new items, do not forward to NCWM)* ☐ Developing Item on the NCWM Agenda *(To be developed by source)*
Reasons for the committee recommendation:
The Committee doesn't feel this item is necessary and the current language is sufficient.
COMPLETE SECTION BELOW FOLLOWING VOTING SESSION
Final updated or revised proposal from the region: ***(If different than regional committee recommendation)***
No change.
Regional recommendation to NCWM for item status: ☐ Voting Item on the NCWM Agenda ☐ Information Item on the NCWM Agenda ☒ Withdraw the Item from the NCWM Agenda (*In the case of new items, do not forward to NCWM)* ☐ Developing Item on the NCWM Agenda *(To be developed by source)* ☐ Unable to consider at this time *(Provide explanation in the "Additional Comments" section below)*
Regional Report to NCWM: Please provide your report in this section exactly how you want it to appear in the NCWM reports to represent your region's considerations, support or opposition, and recommendations. **This will replace any previous reports from your region on this item.**
The Committee doesn't feel this item is necessary and the current language is sufficient.

Additional letters, presentations and data may have been part of the committee's consideration. Please refer to http://www.ncwm.net/meetings/interim/publication-15 to review these documents.

New Item 18 Appendix D – Definitions: Batching System (See related New Item 17)

This item was not submitted to your region.

360-1 D Appendix D – Definitions: calibration parameter and multi-point calibrated device.

Source:
NCWM Multi-Point Calibration Group (MPCG) (2015)

Purpose:
Update the definitions in Appendix D to reflect advances in device calibration technology.

Item Under Consideration:
Amend NIST Handbook 44 Appendix D – Definitions as follows:

> **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 coarse zero adjustments.[2.20, 2.21, 2.24, 3.30, **3.31, 3.32, 3.34, 3.35,** 3.37, 5.56(a)]
>
> **multi-point calibrated device – A device equipped with means to electronically program linearization factors at multiple measurement points.**

Background / Discussion:
Calibration parameter - In 2006, "calibration parameter" was added in sections 3.31, 3.32 3.34, and 3.35; these section now need to be added to the reference string in the definition of "calibration parameter"

Multi-point calibrated device - New technology makes it possible to use linearization factors to optimize accuracy at multiple measurement points on devices such as meters, weighing devices, and other devices. 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 term is used in proposals already before the Committee, and if those proposals are adopted, the term should be included in the definitions. Multi-point calibrated devices are increasingly used as commercial scales and meters. Whether or not the current meter proposals are adopted, the Conference will need to have a term to describe these devices.

2015 NCWM Interim Meeting
At the 2015 NCWM Interim Meeting, Agenda Items 330-3, 331-1 and 360-2 were grouped together and comments taken simultaneously as the Committee considered them related. See Agenda Item 330-3 for a summary of the comments heard on all three of these agenda items.

The Committee agreed this item should move forward as a Developing item based on the comments received and the submitter's recommendation that it remain Developing because additional work is needed.

2015 NCWM Annual Meeting
At the 2015 NCWM Annual Meeting, the Committee agreed to group together Agenda Items 330-3, 331-1 and 360-2 and take comments on these items simultaneously. Mr. Russ Vires (Mettler-Toledo, LLC) speaking on behalf of the SMA reported that the SMA was opposed to the definition being proposed for "multi-point calibrated device" in Agenda Item 360-2. Ms. Julie Quinn (MN), submitter of all the items in the group recommended Items 330-3 and 331-1 be withdrawn in their entirety. She also recommended that the Committee delete the definition of "multi-point calibrated device" in this item and maintain its "Developing" status because further updates to the HB 44 Code references beneath the current HB 44 definition of "calibration parameter" were planned.

Hearing no comments in support of Agenda Items 330-3 and 331-1 and a recommendation by the submitter to withdraw them, the Committee agreed to withdraw these items. The Committee also agreed to delete the proposed definition of "multi-point calibrated device" from Agenda Item 360-2 and maintain its "Developing" status to allow the submitter of the item additional time to develop the proposal. The following changes to Item Under Consideration in Agenda Item 360-2 were agreed to by the Committee:

Item Under Consideration
Amend NIST Handbook 44 Appendix D – Definition~~s~~ as follows:

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 coarse zero adjustments.[2.20, 2.21, 2.24, 3.30, **3.31, 3.32, 3.34, 3.35,** 3.37, 5.56(a)]

~~**multi-point calibrated device – A device equipped with means to electronically program linearization factors at multiple measurement points.**~~

Regional Association Meetings:
At its 2014 Interim Meeting, CWMA heard a presentation intended to clarify the purpose of this item. CWMA noted that it believes the item is sufficiently developed and forwarded the item to NCWM, recommending it as a Voting item. During the 2015 CWMA Annual Meeting, the submitter of the item indicated that the item was still being developed. Mr. Lou Straub, speaking on behalf of the SMA noted that the SMA opposes the current definition, but supports the continued development of this item. The CWMA agreed to recommend this item move forward as a Developing item.

Testimony was presented at the 2014 WWMA Annual Meeting by a member of the Multi-Point Calibration Group, stating that the item is fully developed and ready to be a Voting item. No opposition was heard during open hearing and the WWMA agreed that the item was sufficiently developed. WWMA forwarded the item to NCWM and recommended that it be a Voting item.

At the 2014 SWMA Annual Meeting, the S&T Committee recommended the item be withdrawn based on concerns that if adopted, it would result in extensive additional work required by inspectors; increased downtime for businesses; questionable gain when compared to existing tolerances; and result in the approval of devices for each product type. The Committee noted it doesn't believe the Handbooks are the proper place for examples. Based on the Committee's recommendation, SWMA did not forward this item to NCWM; recommending instead, that it be withdrawn.

At its 2014 Interim Meeting, NEWMA combined Agenda Items 330-3, 331-1 and 360-2 as one agenda item. NEWMA reported it believes the item has merit but required more information before any further judgment could be made on it. NEWMA forwarded the item to NCWM and recommended it as an Information item. NEWMA agreed to combine Agenda Items 360-2, 330-3, and 331-1 at its 2015 Annual Meeting. The SMA opposed the current proposed definition of "multi-point calibrated device," but noted it looked forward to further changes by the work group. NEWMA agreed to recommend this item move forward as a Developing item as the work group amends language in the proposal.

SWMA Action: Item 360-1
Summary of comments considered by the regional committee (in writing or during the open hearings):
No comments were received on this item.
Item as proposed by the regional committee: ***(If different than agenda item)***
No change.
Committee recommendation to the region: ☐ Voting Item on the NCWM Agenda

☐ Information Item on the NCWM Agenda ☐ Withdraw the Item from the NCWM Agenda (*In the case of new items, do not forward to NCWM)* ☒ Developing Item on the NCWM Agenda *(To be developed by source)*
Reasons for the committee recommendation:
The Committee feels this item will be ready for voting if items 330-1 and 331-1 moved forward for voting.
COMPLETE SECTION BELOW FOLLOWING VOTING SESSION
Final updated or revised proposal from the region: ***(If different than regional committee recommendation)***
No change.
Regional recommendation to NCWM for item status: ☐ Voting Item on the NCWM Agenda ☐ Information Item on the NCWM Agenda ☐ Withdraw the Item from the NCWM Agenda (*In the case of new items, do not forward to NCWM)* ☒ Developing Item on the NCWM Agenda *(To be developed by source)* ☐ Unable to consider at this time *(Provide explanation in the "Additional Comments" section below)*
Regional Report to NCWM: Please provide your report in this section exactly how you want it to appear in the NCWM reports to represent your region's considerations, support or opposition, and recommendations. **This will replace any previous reports from your region on this item.**
The Committee feels this item will be ready for voting if items 330-1 and 331-1 moved forward for voting.

Additional letters, presentations and data may have been part of the committee's consideration. Please refer to http://www.ncwm.net/meetings/interim/publication-15 to review these documents.

360-2 D Appendix D – Definitions: Remote Configuration Capability

Source:
NTEP Grain Analyzer Sector (2013)

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

Item Under Consideration:
This item is under development. Comments and inquiries may be directed to NIST Office of Weights and Measures.

A proposal to modify the definition for "remote configuration capability" as follows is under consideration:

> **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**)

Background / Discussion:
Removable digital storage devices can be used in GMMs as either data transfer devices that are not necessary to the operation of the GMM or as data storage devices which are necessary to the operation of the GMM. If removable

data storage devices are necessary to the operation of the device, they are not covered by the current definition of remote configuration capability.

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

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

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

At its 2011 Grain Analyzer Sector Meeting the Sector agreed by consensus that the following changes to Table S.2.5. of §5.56.(a) of NIST Handbook 44 should be forwarded to the S&T Committee for consideration:

- Add a note to Table S.2.5. to recognize the expanded scope of remote capability.
- Delete "remotely" from the second paragraph of Category 3 requirements that begins, "When accessed remotely …" to make it clear that the requirements of Category 3 apply whether accessed manually using the keyboard or accessed by remote means.
- Add the modified second paragraph of Category 3 requirements to Categories 3a and 3b to make it clear that these requirements apply to all the subcategories of Category 3.

Because a change to the definition of remote configuration capability will apply to other device types, NIST OWM recommended that the changes to Table S.2.5. approved by the Sector in 2011 be separated into two independent proposals. One proposal would deal with the changes to Category 3 and its subcategories. The second would recommend a modification of the definition of "remote configuration capability" appearing in Appendix D of NIST Handbook 44 to recognize the expanded scope of remote capability; this proposal would be an alternative to adding a note to the bottom of Table S.2.5. to expand the definition for remote configuration for grain moisture meters (as shown in this proposal).

At its 2012 Meeting, the Grain Analyzer Sector agreed to separate its original proposal into two separate proposals and agreed to forward this proposal to change the definition of "remote configuration capability" to the S&T to Committee for consideration. See also August 2012 NTEP Grain Analyzer Sector Summary, Item 5.

See the Committee's 2013 and 2014 Final Reports for additional background information and to review the different proposals considered by the Committee to address security of equipment; the metrological parameters of which can be changed by use of some form of removable digital storage device.

2015 NCWM Interim Meeting
At the 2015 NCWM Interim Meeting S&T open hearings, Mrs. Tina Butcher (OWM) requested that the Committee reassign this item to OWM noting that the issue identified by the Grain Analyzer Sector had not been resolved. Mrs. Butcher noted that a gap still exists concerning the sealing of equipment in which the sealable parameters of that equipment can be changed by use of a removable digital storage device. She stated that members of OWM's Legal Metrology Devices Program (LMDP) have agreed to take up this issue after the 2015 Interim Meeting in hopes of being able to develop a proposal that addresses the issue and be able to report on its progress at the next NCWM Conference.

Mr. Michael Keilty (Endress + Hauser Flowtec AG USA) stated he too would be willing to work with OWM on a proposal to address this issue.

The SMA commented that it looks forward to further clarification of this item.

The Committee agreed to reassign this item to OWM for additional development based on OWM's assessment there remains an unresolved issue involving the sealing of equipment using removable digital storage devices.

2015 NCWM Annual Meeting
At the 2015 NCWM Annual Meeting, Mrs. Tina Butcher (OWM) provided an update to the Committee on OWM's progress in developing this item. Mrs. Butcher noted that OWM's Legal Metrology Devices Program (LMDP) had met several times since the 2015 Interim Meeting to work on this issue. Rather than attempting to modify current sealing requirements, which never envisioned this method of adjustment, the LMDP propose creating a separate set of sealing requirements for this technology. Members of the LMDP developed a draft General Code paragraph they believe will address the sealing of devices using this technology to make adjustments. The LMDP requests the following draft General Code paragraph be included in this item to begin generating feedback to assist in further development of this item:

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

Mrs. Butcher also noted that OWM plans to propose modifications to a number of the individual device codes in HB 44 to reference the new General Code sealing requirement. The following draft example requirement was developed by the LMDP and included in OWM's written analysis of this item, to provide an indication of how some of the device codes in HB 44 will need to be amended that this type of sealing can be addressed:

Proposed changes to Scales Code paragraph S.1.11. Provision for Sealing:

S.1.11. Provision for Sealing.

S.1.11.1 Devices Adjusted Using a Removable Digital Storage Device. - For those devices adjusted using a removable digital storage device, G-S.8.2. applies.

S.1.11.2 All Other Devices.- Except on Class I scales and devices specified in S.1.11.1. the following provisions for sealing applies:

(a) Provision shall be made for applying a security seal in a manner that requires the security seal to be broken before an adjustment can be made to any component affecting the performance of an electronic device.
[Nonretroactive as of January 1, 1979]

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

(c) Audit trails shall use the format set forth in Table S.1.11.
[Nonretroactive as of January 1, 1995]

A device may be fitted with an automatic or a semi-automatic calibration mechanism. This mechanism shall be incorporated inside the device. After sealing, neither the mechanism nor the calibration process shall facilitate fraud.
(Amended 1989, 1991, and 1993)

As final comment regarding this item, Mrs. Butcher indicated that devices using other means to access adjustments would continue to be addressed by current sealing requirements.

Regional Association Meetings:
At its 2014 Interim Meeting, CWMA did not receive any comments on this item and believes the item is sufficiently developed. CWMA recommended that the item be a Voting item on the NCWM Agenda. During the 2015 CWMA Annual Meeting, the SMA reported that it looks forward to the further clarification of this item, yet it has concerns about changing metrological parameters without proper re-sealing. The CWMA agreed to recommend the item move forward as a Developing item noting that it supported the continued development of this item.

During open hearing at the 2014 WWMA Annual Meeting and industry representative questioned whether or not this item would affect definitions for other device types. An NCWM representative expressed the opinion that it does affect other devices. The WWMA recommended that this item remain as a Developing item to allow additional input and consideration.

At its 2014 Annual Meeting, SWMA recommended that this item be withdrawn noting it believes this item is not necessary and the existing definition in Appendix D of Handbook 44 is adequate.

At its 2014 Interim Meeting, NEWMA recommended this item be withdrawn noting it believes the existing definition in Appendix D of Handbook 44 is adequate. At the 2015 NEWMA Annual Meeting, no comments were received on this item. NEWMA agreed to recommend the item move forward as a Developing item as OWM continues its work on the proposal.

SWMA Action: Item 360-2
Summary of comments considered by the regional committee (in writing or during the open hearings):
No comments were received on this item.

Item as proposed by the regional committee: ***(If different than agenda item)***
No change.
Committee recommendation to the region: ☐ Voting Item on the NCWM Agenda ☐ Information Item on the NCWM Agenda ☐ Withdraw the Item from the NCWM Agenda (*In the case of new items, do not forward to NCWM)* ☒ Developing Item on the NCWM Agenda *(To be developed by source)*
Reasons for the committee recommendation:
The Committee understands that NIST OWM is going to take over the development of this item.
COMPLETE SECTION BELOW FOLLOWING VOTING SESSION
Final updated or revised proposal from the region: ***(If different than regional committee recommendation)***
No change.
Regional recommendation to NCWM for item status: ☐ Voting Item on the NCWM Agenda ☐ Information Item on the NCWM Agenda ☐ Withdraw the Item from the NCWM Agenda (*In the case of new items, do not forward to NCWM)* ☒ Developing Item on the NCWM Agenda *(To be developed by source)* ☐ Unable to consider at this time *(Provide explanation in the "Additional Comments" section below)*
Regional Report to NCWM: Please provide your report in this section exactly how you want it to appear in the NCWM reports to represent your region's considerations, support or opposition, and recommendations. **This will replace any previous reports from your region on this item.**
The Committee understands that NIST OWM is going to take over the development of this item.

Additional letters, presentations and data may have been part of the committee's consideration. Please refer to http://www.ncwm.net/meetings/interim/publication-15 to review these documents.

Dr. Matthew Curran, Florida | Committee Chair
Mr. Allen Katalinic, North Carolina | Member
Mr. Alan Walker, Florida | Member
Mr. Kenneth Ramsburg, Maryland | Member
Mr. Tim Chesser, Arkansas | Member

Specifications and Tolerances Committee