Report of the Specifications and Tolerances (S&T) Committee

Mr. Brett Gurney, Committee Chair
Utah

Reference
Key Number

300 INTRODUCTION

This is the final report of the Committee on Specifications and Tolerances (S&T) (hereinafter referred to as the "Committee") for the 99th Annual Meeting of the National Conference on Weights and Measures (NCWM). This report is based on the Interim Report offered in the NCWM Publication 16, "Committee Reports," testimony at public hearings, comments received from the regional weights and measures associations and other parties, the NCWM 2014 Online Position Forum, the addendum sheets issued at the Annual Meeting, and actions taken by the membership at the voting session of the Annual Meeting. The Informational items shown below were adopted as presented when this report was approved. This report contains those recommendations to amend National Institute of Standards and Technology (NIST) Handbook 44 (2014), "Specifications, Tolerances, and Other Technical Requirements for Weighing and Measuring Devices."

Table A identifies the agenda items and appendix items. The agenda items in the Report are identified by Reference Key Number, title, page number and the appendices by appendix designations. The acronyms for organizations and technical terms used throughout the agenda are identified in Table C. The first three digits of the Reference Key Numbers of the items are assigned from The Subject Series List. The status of each item contained in the report is designated as one of the following: **(D) Developing Item:** the Committee determined the item has merit; however, the item was returned to the submitter or other designated party for further development before any action can be taken at the national level; **Informational (I) Item:** the item is under consideration by the Committee but not proposed for Voting; **(V) Voting Item:** the Committee is making recommendations requiring a vote by the active members of NCWM; **(W) Withdrawn Item:** the item has been removed from consideration by the Committee.

Table B provides a summary of the results of the voting on the Committee's items and the report in its entirety. Some Voting Items are considered individually, others may be grouped in a consent calendar. Consent calendar items are Voting Items that the Committee has assembled as a single Voting Item during their deliberation after the Open Hearings on the assumption that the items are without opposition and will not require discussion. The Voting Items that have been grouped into consent calendar items will be listed on the addendum sheets. Prior to adoption of the consent calendar, the Committee entertains any requests from the floor to remove specific items from the consent calendar to be discussed and voted upon individually.

Proposed revisions to the handbook(s) are shown as follows: 1) deleted language is indicated with a **bold face font using ~~strikeouts~~** (e.g., **~~this report~~**), 2) proposed new language is indicated with an **underscored bold faced font** (e.g., **new items**), and 3) nonretroactive items are identified in *italics*. When used in this report, the term "weight" means "mass."

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

Subject Series List

Table A
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Appendices

Table
Voting Results

Reference Key Number	*House of State Representatives*		*House of Delegates*		*Results*
	Yeas	*Nays*	*Yeas*	*Nays*	
Consent Calendar					
310-2					Adopted
320-2					Adopted
321-1					Adopted
330-1					Adopted
330-3					Adopted
330-5A					Adopted
330-5B					Adopted
332-2					Adopted
337-2* To hear amendment	Yea: 41 Nay: 0				Amendment was heard
337-2 To amend the proposal	Yea: 29 Nay: 41				Amendment failed
338-2 as presented	29	9	14	27	Returned to Committee
To Accept the Report	Voice Vote				Adopted

* Items 232-3, 237-2 and 337-2 were voted upon as a block.

Table C
Glossary of Acronyms and Terms

Acronym	Term	Acronym	Term
API	American Petroleum Institute	MMA	Meter Manufacturers Association
AREMA	American Railway Engineering and Maintenance-of-Way Association	MPMS	Manual of Petroleum Measurement Standards
AWWA	American Water Works Association	NCWM	National Conference on Weights and Measures
BCS	Belt-Conveyor Scale	NEWMA	Northeastern Weights and Measures Association
CC	Certificate of Conformance	NIST	National Institute of Standards and Technology
CNG	Compressed Natural Gas	NGSC	NCWM Natural Gas Steering Committee
CWMA	Central Weights and Measures Association	NTEP	National Type Evaluation Program
DGE	Diesel Gallon Equivalent	OIML	International Organization of Legal Metrology
DLE	Diesel Liter Equivalent	OWM	Office of Weights and Measures
DOT	Department of Transportation	PUC	Public Utilities Commission
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
GIPSA	Grain Inspection Packers and Stockyard Administration	SI	International System of Units
GLE	Gasoline Liter Equivalent	SMA	Scale Manufactures Association
GMM	Grain Moisture Meter	SWMA	Southern Weights and Measures Association
GPS	Global Positioning System	TC	Technical Committee
IATR	International Association of Transportation Regulators	USNWG	U.S. National Work Group
IEC	International Electrotechnical Commission	WIM	Weigh-in-Motion
LMD	Liquid Measuring Devices	WWMA	Western Weights and Measures Association
LNG	Liquefied Natural Gas		

Details of All Items
(In order by Reference Key)

310 NIST 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 and G-S.1.1. Location of Marking Information for Not-Built-For-Purpose, Software-Based Devices as follows:

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

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

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

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

(Added 2000) (Amended 2001)

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

(Amended 2003)

(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 electronic devices***~~***, which shall be directly linked to the software itself****;*
[Nonretroactive as of January 1, 2004]

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

(1) The version or revision identifier shall be 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)

(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)

(3) The version or revision identifier shall be accessible via the display. 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 under the following conditions:

(a) The user interface does not have any control capability to activate the indication of the version or revision identifier on the display, or the display does not technically allow the version or revision identifier to be shown (analog indicating device or electromechanical counter) or

(b) the device does not have an interface to communicate the version or revision identifier.

(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**)

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

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

(b) The CC Number shall be:

(1) permanently marked on the device;

(2) continuously displayed; or

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

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

Background/Discussion:
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 2012.

Just prior to the 2013 NCWM Annual Meeting, the Software Sector forwarded to the Committee a modified version of the proposed changes to paragraph G-S.1., which the Sector had developed during its March 2013 meeting. The modified language, which is that shown in Item Under Consideration, included slight modifications to the previous proposal to address concerns received from other sectors and interested parties.

With regard to the revised proposal, the Sector reported the following:

- That the new language in G-S.1.1 reflects the Sector's consensus on the following positions:
    - The software version/revision should, with very few exceptions, be accessible via the user interface.
    - The means by which the software version is accessed must be described in the Certificate of Conformance (CC).
- After removing the "and inseparably" terminology from the proposal, the concerns on the possibility of controversy were reduced.
- The Sector's opinion on the interpretation of "directly linked" is that it means you can't change the version/revision without changing the software.
- It may be desirable to evaluate options that would lead to fully eliminating G-S.1.1. The Sector recognized that that this would be a more invasive modification to the existing handbook and perhaps should be delayed until the first step of addressing software in all devices (not just standalone) was accomplished.

See the Committee's 2013 Final Report for additional details and background information.

2014 NCWM Interim Meeting: The SMA reported that it continues to support the work of the Software Sector and encouraged communications with the other device sectors.

NIST, OWM raised two concerns relating to the most recent changes proposed by the Software Sector to subparagraph G-S.1.(d) and offered some suggestions relative to those concerns as follows:

1. Deleting the words "for not-built-for-purpose software-based electronic devices" creates the implication that all equipment manufactured as of January 1, 2004, except weights and separate parts necessary to the measurement process but not having any metrological effect, would be required to be permanently marked with a current software version or revision identifier. NIST, OWM questioned whether or not it was the Software Sector's intent to require a software version or revision identifier be marked on equipment that is not electronic. If not the intent, NIST, OWM suggested that the Sector consider adding additional text to better clarify the type of equipment intended to be addressed by this proposed change and offered the following additional text for consideration:

    (d) the current software version or revision identifier **for software-based electronic devices,** which shall be directly linked to the software itself;

2. The proposed changes would require a current software version or revision identifier to be marked on both built-for-purpose and not-built-for purpose software based equipment manufactured as of January 1, 2004. If it is the intent of the Sector to require that a current software version or revision identifier be marked on built-for-purpose software based equipment, then the Sector might consider proposing that such a requirement be non-retroactive considering the time and cost involved in updating equipment already in service.

NIST, OWM also provided the following additional feedback on the Software Sector's proposed changes to paragraphs G-S.1. and G-S.1.1.

- It is not clear what equipment would be affected by the proposed changes to G-S.1.(c). By proposing that the word "software" be added, is the exception intended to apply to the software itself or to equipment in which the software is installed?

- In the proposed additions to G-S.1.(d)(3)(a), it is not clear what is meant by the phrase "or the display does not technically allow the version or revision identifier to be shown." The examples "analog indicating device" and "electromechanical counter" are confusing. NIST, OWM doesn't believe these examples provide enough information to lead one to conclude that the intent is to address such things as numeric-only displays. For example, numeric-only displays that don't have the capability of displaying abbreviations for "version" or "revision" as noted in earlier comments originating from the Sector.

- NIST, OWM recommends adding some examples to clarify the types of devices described in paragraph G-S.1.(d)(3)(b).

- NIST, OWM agrees with the Software Sector's assertion that it may be possible to eventually eliminate G-S.1.1. at some future date.

The Committee expressed appreciation for the efforts of the Software Sector; but also noted the concern that this item had remained on its agenda for a long time with little progress. Recognizing the difficulty in developing a proposal that meets the needs of multiple groups, the Committee agreed to maintain the item on its agenda to allow the Sector to finalize work on this issue. The Committee made clear in its report, however, that if no progress was made in the next year, it planned to withdraw the item from its agenda. This would not preclude the Sector from resubmitting the item at some point in the future when additional work had been done or the item had been fully developed.

During the 2014 NCWM Annual Meeting, the SMA reiterated its support of the Software Sector's work and looked forward to the outcome of an August 2014 joint meeting of the Weighing and Software Sectors.

NIST, OWM reiterated the comments, concerns, and feedback it provided during the 2014 NCWM Interim Meeting and that are reflected in the Committee's Interim Report. NIST, OWM noted that an August 2014 joint meeting of the Software and Weighing Sectors is planned to consider the current proposal and to try and reach agreement on the changes needed to paragraph G-S.1. NIST, OWM encouraged the two Sectors to consider its comments and feedback when considering any changes to the language currently proposed for G-S.1. The approach used in the past has been for the sectors to review the proposal in separate meeting sessions; however, this has not resulted in a proposal amenable to all Sectors. NIST, OWM believes that it might be more expedient for all of the sectors to collaborate in a single joint meeting to try and reach agreement on the changes needed.

The Committee maintained its earlier position to withdraw this item at the 2015 NCWM Interim Meeting if progress on this item has not been made.

There were two positions from industry members posted on NCWM's 2014 Online Position Forum; one in support of the proposal and the other opposed to it. There were also two written comments posted.

Regional Association Comments:
CWMA recommended at their 2013 Interim Meeting that this item remain as a Developing Item and that the item be returned to the Software Sector to write a definition for software-based devices. During its 2014 Annual Meeting, CWMA supported continued development of the item and recommended it remain a Developing Item.

WWMA agreed at their 2013 fall meeting that this item has merit, but it needed further development. The WWMA also acknowledged that three regions recommended the item remain Developing. WWMA reported that it looked forward to hearing the results of the Weighing and Software Sector's joint meeting and recommended that this item remain as a Developing Item.

NEWMA recognized during its 2013 Interim Meeting that the Committee had requested input on this item from the sectors and industry during the 2013 NCWM Annual Meeting. NEWMA reported that it anticipated some new developments that could move the item forward and recommended the item be maintained as "Developing." During its 2014 Annual Meeting, NEWMA noted that development of the item is still ongoing and again recommended it remain as a Developing Item.

SWMA received a presentation by Mr. Doug Bliss (Mettler Toledo) during its 2013 fall meeting on behalf of the Software Sector. The SWMA considered recommending this as a Voting Item due to the length of time it has been on the agenda, but comments received indicated that progress would be made in the next year and, with this information, the Committee recommends it be maintained as a Developing Item.

See previous Reports of the National Conference on Weights and Measures for additional history on this item.

310-2 VC G-S.5.6. Recorded Representations

(This item was Adopted.)

Source:
Liquid Controls (2014)

Purpose:
Address the issue of receipt (printed, electronic, and optional).

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

G-S.5. Indicating and Recording Elements.

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

(Amended 1975 **and 2014**)

Background/Discussion:
NCWM 2013 Annual Meeting: Members expressed support for including requirements to address the use of electronic receipts in the General Code rather than in individual device codes. Including requirements in the General Code would eliminate confusion and inconsistency, consolidate provisions from individual codes, and confine future updates to a single code.

The concept of providing receipts electronically is incorporated in certain provisions of the Liquid-Measuring Devices Code. Similar provisions are needed in other specific NIST Handbook 44 codes. Inserting a single provision in the General Code to address the use of electronic receipts will be more efficient then proposing changes to multiple individual codes and will eliminate inconsistencies among sections.

Some concerns have been raised that recognition of electronic receipts could lead to the elimination of printed receipts, particularly for customers who have limited access to the internet, smart phones, and other electronic access. However, the proposal is written to ensure that the printed receipt remains an option for the customer.

A summary of the proposed changes is as follows:

- If a receipt is required, allow the customer to decline the option of receiving any type of receipt.
- Add an option of electronic receipt as long as the system has the capability of generating electronic receipts.
- If a receipt is desired, allow customer to select between printed and electronic receipt; or both.
- Remove references to electronic receipts from the Liquid-Measuring Devices Code as they will be redundant.

See Item 330-5 for related background and discussions. See also Item 330-1 for a related proposal.

2014 NCWM Interim Meeting: Mr. Steve Langford (Cardinal Scale Manufacturing), speaking on behalf of the SMA, stated that the SMA could see no harm in giving the consumer the option of not receiving the recorded representation or receiving the recorded representation in alternative forms. The SMA supported the item as written.

NIST, OWM noted that weighing and measuring equipment that has the capability of issuing an electronic receipt exists, yet the information contained on the receipt is <u>not</u> required by NIST Handbook 44. For example, nowhere in NIST Handbook 44 is it required that a printed ticket from a scale that is not part of a POS system contain certain information. For this reason, NIST, OWM finds the use of the word "the" immediately preceding the word "required" in the second sentence of the proposal somewhat confusing and recommended replacing the word "the" with the word "any" so that the sentence reads as follows: <u>For systems equipped with the capability of issuing an electronic receipt, ticket, or other recorded representation, the customer may be given the option to receive ~~the~~ any required information electronically (e.g., via cell phone, computer, etc.) in lieu of or in addition to a hard copy.</u>

NIST, OWM also noted that Item 330-1 includes a corresponding proposal. Should the Committee decide to advance Items 310-2 and 330-1, the Committee should give consideration to consolidating them into a single item for NCWM action. See also Items 331-1 LPG Code Modifications (UR.2.8.) and 332-2 (S.1.5.3. Recorded Representations, Point-of-Sale Systems, LPG Code) which may also be impacted by action on Item 310-2.

Ms. Fran Elson-Houston (Ohio and Chair of the Task Group (TG) on RMFD Price Posting and Computing Capability) stated that the TG on RMFD Price Posting and Computing Capability supports this item. Mr. Gordon Johnson (Gilbarco, Inc.) also supported the item. Mr. Michael Keilty (Endress & Hauser Flowtec AG USA) commented that an electronic failure would lead to consumers being unable to receive a receipt.

The Committee agreed with NIST, OWM's assessment that not all weighing and measuring equipment equipped with the capability of issuing an electronic receipt, ticket or recorded representation is explicitly required to provide certain information on the receipt or ticket. For example, NIST Handbook 44 does not require any of the information that typically gets recorded onto a printed ticket generated from a stand-alone small capacity computing scale used in a direct sale application. NIST Handbook 44 does require any information that is provided on the receipt or ticket of such a scale to be accurate and clearly identified. For this reason, the Committee concluded that the use of the word "the" in the second sentence of the proposal may lead to confusion and agreed to replace that word with the word "any" as suggested by NIST, OWM and shown in the "Item Under Consideration." The Committee acknowledged that there are potential overlaps with this item and Items 330-1, 330-5B, 332-1, and 332-2, which could lead to potential conflicts if this item is adopted. The Committee plans to address any conflict which might arise by modifying those items prior to presenting them for a vote.

NCWM 2014 Annual Meeting: The Committee heard comments from Mr. Ross Andersen (New York retired), reporting that he wished to explain comments that he had posted on NCWM's On-line Position Forum. *NIST Technical Advisor's note: Mr. Andersen had opposed the item on NCWM's On-line Position Forum and posted comments supporting that position.* Mr. Andersen stated that the option for customers to receive information electronically is probably already provided in each state's public records law. He suggested that the text proposed

for addition to paragraph G.S.5.6. does not relate to the design of a device and therefore should not be part of a "Specification" requirement. It would be the device owner/operator's responsibility to provide customers the option of not receiving the recorded representation or to receive any required information electronically. Thus, it was his view that the proposed text for addition would be more appropriately represented as a user requirement. He referenced the "System of Paragraph Designation" Section in the Introduction portion of NIST Handbook 44, noting that "Specification" paragraphs relate to the design of equipment; "User Requirements" are directed particularly to the owner and operator of a device, and apply to the selection, installation, use, and maintenance of devices. Mr. Andersen also acknowledged that not all customers have "Smart" phones, and consequently took the position that any ability to offer electronic receipts should not preclude customers from being able to receive a hard copy receipt.

Mr. Dmitri Karimov (Liquid Controls), submitter of the item, agreed with comments provided by Mr. Andersen, noting that the intent of the proposal is to streamline NIST Handbook 44 by eliminating "Specification" requirements in many device codes and replacing them with a single General Code requirement that applies to all devices. He acknowledged that the proposed language may not be perfect, but suggested moving the item forward as proposed and possibly refining it later.

Mr. Michael Keilty (Endress Hauser Flowtec AG) commented that he wouldn't want to see the text being proposed for addition included in a User Requirement as suggested by Mr. Andersen. If that were the case, the requirement might be interpreted to apply only to the owner of the equipment and not the user, which is the customer. The intent of this proposal is for the customer to be in charge of deciding whether he/she wants the receipt, and, if so, the form (hard copy or electronic) in which he/she wishes to receive it. The proposed language could be strengthened to ensure customers are provided the option of receiving required information in hard copy or in electronic form.

NIST, OWM commented that as a general rule, it favors the elimination of similar requirements in different device codes of the Handbook; that is, those requirement which address the same issue or concern over a single requirement in the General Code that can be applied consistently throughout all codes. Many of the points made by Mr. Ross Andersen in comments posted on the NCWM's On-line Position Forum are well taken. NIST, OWM suggested that rather than delay changes that would immediately clarify that an electronic receipt is an acceptable alternative, the Committee proceeded with the item as proposed. However, in recognition of the validity of Mr. Andersen's points, NIST, OWM suggested the Committee consider developing a new item for submission in the next NCWM cycle. This item could explore the development of a new General Code User Requirement that would require users of equipment to provide customers a receipt of all information required to be recorded by a device (or system). This paragraph could be added to either replace the text proposed for addition to G-S.5.6. or to compliment it as a stand-alone paragraph.

With respect to the comments provided by Mr. Andersen, Mr. Karimov, and NIST, OWM, the Committee received a number of additional comments mostly in favor of moving the item forward as proposed (i.e., as a "Specification") with the understanding that the Committee considers developing a new item for submission in the next NCWM cycle as suggested by NIST, OWM.

The SMA reiterated the comments provided during the NCWM Interim Meeting in support of the item.

The Committee agreed with comments suggesting that this item might be better suited as a "User Requirement," but also that, while the creation of a user proposal may have merit, the proposed changes to paragraph G-S.5.6. should not be delayed. The Committee agreed to recommend the item as shown above in the "Item Under Consideration" for a vote, noting that should there be a strong desire within the community to develop a proposal for a supplemental user requirement, it would be amenable to considering such a proposal in the future.

There were three positions posted on NCWM's 2014 Online Position Forum; two from industry in support and one from government opposed.

Regional Association Comments:
CWMA reported that comments were heard during their 2013 Interim Meeting regarding the ability of weights and measures officials to review receipts in an electronic format (e.g., delays, ability to retrieve, etc.) and that it believed the proposal adequately addressed these concerns. Consequently, the CWMA supported moving the item forward as

a Voting item. At their 2014 Annual Meeting, the CWMA reported that it believes the item has been sufficiently developed and recommended the item be a Voting Item. NEWMA supported the item moving forward as a Voting item during their 2014 Annual Meeting and reported that the proposed changes recognize the evolution of a transaction between buyer and seller and new technologies used to deliver receipts other than printed documents. This language is necessary to recognize new technology and address it in NIST Handbook 44.

SWMA noted at their 2013 fall meeting that it did not receive any comments opposing this item when it met in 2013, reported that the item has merit and should be considered by the NCWM S&T Committee.

320 SCALES

320-1 W S.2.1.6. Combined Zero-Tare ("0/T") Key

(This item was Withdrawn.)

Source:
California Division of Measurement Standards (2014)

Purpose:
Allow a combined "zero/tare" feature under specified conditions.

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

S.2.1.6. Combined Zero-Tare ("0/T") Key. – <u>The semi-automatic zero-setting and the semi-automatic tare-mechanism can be operated by the same key on Class I, II, and III scales with digital indications provided that:</u>

(a) <u>The overall effect of semi-automatic zero-setting and zero-tracking mechanisms shall be not more than 4 % of the maximum capacity; and</u>

(b) <u>Either automatically maintain a "center-of-zero" condition to ± ¼ scale division or less, or have an auxiliary or supplemental "center-of-zero" indicator that defines a zero-balance condition to ± ¼ of a scale division or less. A "center-of-zero" indication may operate when zero is indicated for gross and/or net mode(s).</u>

~~Scales not intended to be used in direct sales applications may be equipped with a combined zero and tare function key, provided that the device is clearly marked as to how the key functions. The device must also be clearly marked on or adjacent to the weight display with the statement "Not for Direct Sales."~~

Background/Discussion:

Various scale manufacturers have manufactured or imported Class II scales that are equipped with a combined zero/tare button for jewelry sale/purchase applications. Many of these scales are in use in direct retail sales, particularly in the purchasing of gold, silver, and other precious metals and stones. It has not been demonstrated, or documented, how the combination of tare/zero function causes fraud if the feature complies with the following similar clause in OIML R 76: Automatic Indicating Weighing Instruments:

> **4.6.9 Combined zero-setting and tare-balancing devices**
> If the semi-automatic zero-setting device and the semi-automatic tare-balancing device are operated by the same key, 4.5.2 (*zero within ± 0.25 e*), 4.5.5 (*zero within ± 0.25 e*) and if appropriate 4.5.7 (*operation of zero-tracking*) apply at any load.

The existence of a unique "type-approved" scale which cannot be used in a "direct sales" transaction, combined with the fact that so many of these scales are being sold by manufacturers and distributors into direct sales applications without the required statement "Not For Use in Direct Sales" has caused confusion. It is believed that this proposal would be preferable to legal actions against the manufacturers for failing to meet conditions on the type-approval certificate because they failed to place the required "Not for Direct Sales" statement on their machines without demonstrated harm to customers. Additionally, it appears that the combination zero/tare feature in NIST Handbook 44 Scales Code paragraph S.2.1.6. is not addressed in NCWM Publication 14 checklist for Digital Electronic Scales.

An argument against the amendment is the inability for a customer to see the "net" weight indication when all (intended) tare values are less than 4 % of the capacity of the scale. However, at least one manufacturer submitted a scale with the 0/T feature without the required marking that was not evaluated due to omissions on the NTEP application. The NTEP CC has been active for several years with nearly 20 000 scales sold in California alone. Weights and measures jurisdictions in California have not reported any complaints or made observations that the feature was used to facilitate inaccurate transactions.

This subject was originally considered by the NTEP Weighing Sector in 1997 and paragraph S.2.1.6. was subsequently adopted by the NCWM in 1998. During the deliberations of Specifications and Tolerances (S&T) Committee Agenda Item 220-3, the Weighing Sector stated that "because it is common to find tares taken in direct sales operations that are less than seven divisions (7d), they were concerned over the use of this feature in direct sales applications. The laboratories consider these devices acceptable in applications where there would be a clear understanding of the "zero/tare" key function provided: (1) there are clear and definite markings on the scale adjacent to the zero tare key with a statement describing its operation (e.g., for the scale in the example given "Zero up to 7d; tare over 7d" or similar wording); and (2) the scale must be clearly and definitely marked with the statement "Not for Use in Direct Sales to the Public." The NCWM S&T Committee noted that jurisdictions vary in the type of operations which are considered "direct sales." For instance, only some jurisdictions consider produce grading and meat room packaging scales to be "direct sale" applications. The Committee felt that the classification of an operation should be left to the jurisdiction. The Committee recommended that devices equipped with a "0/T" key be clearly and permanently marked with: (1) a description of how the key functions; and (2) the statement "Not for Direct Sales" adjacent to the display on both the customer's and operator's side of the device.

NCWM 2014 Interim Meeting: The SMA opposed the inclusion of Class III devices in the proposal and the 4 % maximum overall effect of semi-automatic zero-setting and zero-tracking mechanisms imposed by the proposal. The SMA noted that NIST Handbook 44 does not limit the zeroing effect of a semi-automatic zero setting mechanism. The SMA also noted that S.1.1.1.(b) is redundant and that if each of these references were removed, there would be no point in making any changes to the paragraph.

The Committee also heard from Mr. Lou Straub (Fairbanks Scales) opposing the inclusion of Class III scales in the proposal.

The Committee heard concerns from NIST, OWM regarding the fact that, should the combined "0/T" key be permitted on scales used in direct sales, there will not be a clear indication that a weighing operation starts with the scale on zero or that tare has been taken, and therefore, the feature may not provide adequate consumer protection in direct sale applications. Additionally, the proposal only addresses semiautomatic zero setting and semiautomatic tare mechanisms and doesn't restrict other types of tare or zero from being used, which might possibly facilitate the perpetration of fraud.

Ms. Angela Godwin (Ventura County Department of Weights and Measures) and Mr. John Young (Yolo County California Agriculture Department) provided comments in support of the proposal.

In considering this item, the Committee first questioned the availability of Class II scales in the marketplace that have been issued an NTEP CC and could be considered suitable for use in direct sale applications. The Committee concluded that there are numerous Class II scales available for purchase meeting these criteria. The Committee then considered whether it's appropriate to change NIST Handbook 44 to allow scales equipped with a combined "0/T" key be used in direct sale applications. The Committee agreed that it would not be appropriate given the number of available Class II scales already in the marketplace that have been designed for direct sale applications, the concerns

raised by NIST, OWM, and the opposition expressed by the SMA. Consequently, the Committee agreed to withdraw this item from its agenda.

At their spring 2014 Meeting, the SMA supported the withdrawal of this item.

Regional Association Comments:
The WWMA reported at their fall 2013 meeting that it had received similar proposals on this item. The first proposal by Mr. Paul Jordan (Ventura County California) was withdrawn by the submitter and the second proposal by Mr. Steve Cook (California) was recommended. The WWMA after hearing testimony from Ms. Juana Williams (NIST, OWM) and Mr. Darrell Flocken (Mettler Toledo) had concerns about the need for this section in NIST Handbook 44. The WWMA recommended that Mr. Cook meet with the Weighing Sector to determine whether or not there is a need for this section and, if so, consider if 4 % of the scale capacity is an appropriate limit. WWMA forwarded this item to NCWM, recommending that it be a Developing item.

WWMA heard comments in support of the item at their fall 2013 meeting, but had some concerns about the 4 % limitation. There were also issues regarding the need for the limitation on such a small market of scales in commercial applications. The Committee recommended the item continue to be developed. SWMA forwarded the item to NCWM.

320-2 VC UR.2.4. Foundations, Supports, and Clearance

(This item was Adopted.)

Source:
Schenck Process Inc. (2014)

Purpose:
Allow for an in-motion rail scale to have a continuous rail on the approach and weighing area. Such a design is presently in conflict with Scales Code paragraph UR.2.4., which states "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 scale."

Item Under Consideration:
Amend NIST Handbook 44, Section 2.20. Scales as follows:

> **UR.2.4. Foundation, Supports, and Clearance. –** The foundation and supports of any scale installed in a fixed location shall be such as to provide strength, rigidity, and permanence of all components, and 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 scale. **An in-motion railway track scale is not required to provide clearance using rail gaps to separate the live rail portion of the weighing/load-receiving element from that which is not live if the scale is designed to be installed and operated using continuous rail.** *On vehicle and livestock scales, the clearance between the load receiving elements and the coping at the bottom edge of the platform shall be greater than at the top edge of the platform.**
> *[*Nonretroactive as of January 1, 1973]*
>
> **(Amended 2014)**

Background/Discussion:
Schenck Process, Inc. is presently testing a scale called the "MultiRail," that is used to weigh rail cars in-motion and statically and which does not require the rail to be cut prior to the weighing area. During the August 2013 Weighing Sector meeting, the Sector recommended that the requirement for rail gaps that is presently in the checklist/procedures section of Publication 14 be removed.

This equipment was also presented to the AREMA Scales Committee 34 at the October 2013 meeting in Nashville, Tennessee. Discussions have previously been held with Committee 34 regarding the "MultiRail" scale, and Committee 34 wants to ensure the equipment complies with weighing accuracies in NIST Handbook 44.

The Schenck MultiRail is new technology for weighing rail cars in the US, but it has been used around the world and is OIML approved.

Testing of the system has been on-going at the American Association of Railroads test center in Pueblo, Colorado, for over one year. These tests have proved the durability of the design, since over 350 million gross tons have crossed the system during this period and NTEP testing is now being conducted in conjunction with GIPSA.

This issue was also presented to the NTEP Committee at the 2013 NCWM Interim Meeting and Schenck Process agreed to install equipment and pass the NTEP test for static and in-motion weighing. When the testing was completed, Schenck advised they wanted to have the requirement for rail gaps removed from NCWM Publication 14 and a CC issued for the device.

NCWM 2014 Interim Meeting: Dr. Ulrich Rauchschwalbe (Schenck Process, Inc.) provided a presentation regarding the operation of a Schenck in-motion railway track scale, which does not use rail gaps to separate the live rail portion of the weighing/load receiving element from portions of the rail that are not live. That is, continuous rail is used throughout. Dr. Rauchschwalbe clarified that the application of this railway track scale is restricted to coupled-in-motion and uncoupled-in-motion weighing and is not intended to be used commercially for static weighing, although there may be instances where the scale could be used statically as a reference scale. That is, the scale could be used statically to determine the reference weights of railcars selected for use in conducting an uncoupled-in-motion or coupled-in-motion test of the scale. Mr. Ed Luthy (Schenck Process, Inc.) indicated that NTEP evaluations have successfully been completed on a device of this design.

Mr. Rafael Jimenez (AAR Transportation Technology Center) commented that the AAR supports the proposal as written.

Mr. Steve Beitzel (Systems Associates, Inc.) questioned whether enough U.S. data is available to be able to properly evaluate the performance of the system, noting that "railroading" is much different in the United States than in Europe. More U.S. field experience using the system is needed because trains travel at faster speeds in Europe and railcar loads are significantly heavier in the United States. Mr. Beitzel also questioned the impact of shear forces on device performance and the degree of sensitivity of the device relative to longitudinal or vertical forces that result from the use of continuous rail installed over the weighing/load-receiving element of the scale.

NIST, OWM noted that some of the written comments and suggestions it provided to the Committee in advance of the 2014 NCWM Interim Meeting had been addressed, although perhaps not fully, in the presentation provided by Dr. Rauchschwalbe. NIST, OWM provided the following written comments to the Committee in advance of the meeting:

- It might be helpful if additional information concerning the technology used and/or the safeguards incorporated into the design of the scale system were made available by the manufacturer of the equipment. Once made available, this information could be used to make an informed decision on whether or not adequate protections have been incorporated into the design of the equipment to ensure weighments will be accurate under normal service conditions and adjustments will remain reasonably permanent. This information might also be beneficial in determining whether or not additional Specification and/or User Requirements are needed.

- One particular issue needing explanation is how an in-motion railroad weighing system, which uses continuous rail (no rail gaps), is able to differentiate between loads applied to the live portion of the weighing/load-receiving element of the scale and loads approaching the live portion, but not yet having arrived, and where the separation occurs between live and dead rail (if in fact there is such a separation). More specifically, how are weight influences from approaching cars in a train filtered out by the system that they have no effect on railcars that are being weighed?

- The intended application of the railroad weighing system needs to be clarified. The proposed footnote to be added specifies "coupled-in-motion railway track scale," but the "Purpose" of the item specifies "static or in-motion," leading one to believe the application could be any type of railroad weighing system.

In considering this item, members of the Committee agreed that, based on the presentation and the comments provided during the Open Hearings, which confirmed the NTEP evaluations had been successfully completed, this item was ready for vote. Consequently, the Committee agreed to recommend the item as shown above in the "Item Under Consideration" for a vote.

NCWM 2014 Annual Meeting: Dr. Rauchschwalbe provided a presentation, similar to the one given during the 2014 Interim Meeting, regarding the operation of the Schenck MultiRail in-motion railway track scale. A copy of his presentation slides is included in Appendix A. Dr. Rauchschwalbe reported that there are over 300 commercial installations of the scale worldwide. Dr. Rauchschwalbe responded to a number of questions from the Committee and the audience.

The Committee received numerous industry comments in support of the proposal. Some of the more significant comments heard in support of the proposal are as follows:

- The scale has passed NTEP's evaluation for both static and in-motion weighing. The intended application is for in-motion railroad weighing.

- The procedures for reference car weighing in static mode are just like those used for any other static railroad scale.

- We've received many requests for the scale (comments from a scale installer). The scale will serve a great need. There is much less rail down time during installation compared to other railcar weighing systems.

- Gaps in the rail create a maintenance problem. Stones, ice, debris, etc., can get lodged in the gap between the live and dead rails causing binding. Also, rails expand when exposed to heat causing a lessening of the gap to the extent that sometimes the live and dead rails contact one another. Having no rail gap is a step forward.

- We operate the first ever Schenck MultiRail in-motion railroad scale installed in the United States for commercial application (comment from PBF Energy, DE.). The scale is accurate and durable. We've completed over 9100 weighings at speeds up to seven miles per hour and at an accuracy of 0.2 percent. Installation was completed over a weekend on track that could not be taken out of service.

NIST, OWM noted that it was stated during the 2014 NCWM Interim Meeting S&T open hearings that the "MultiRail" scale is not intended to be used commercially for static weighing, although there may be instances where the scale could be used statically as a reference scale. NIST, OWM interpreted that comment to mean that there may be instances where the scale could be used statically to determine the reference weights of railcars selected for use in conducting an uncoupled-in-motion or coupled-in-motion test of the scale. If that interpretation is correct, NIST, OWM believes it would be important for the manufacture to provide instructions for using the scale in a static mode to weigh the reference test cars. That is, the procedures that would need to be followed in order to attain the degree of accuracy necessary to be able to use those railcars as a standard in testing a coupled-in-motion or uncoupled-in-motion railway track scale, whichever the case may be. As a reminder, NIST, OWM noted that in order to qualify as a standard in testing commercial weighing and measuring equipment, the Fundamental Considerations of NIST Handbook 44 requires the combined error and uncertainty of the standard to be less than one-third the applicable device tolerance when the standard is used without correction.

With respect to the scale's use as a reference scale, NIST, OWM suggested that if the determination is made that the "MultiRail" scale isn't capable of providing accurate enough weight determinations for the scale to be used to establish the reference weights of railcars, then a User Requirement may need to be added to the Scales Code of NIST Handbook 44 making it the user's responsibility to ensure there is a suitable reference scale available for this purpose.

The SMA supported the item, commenting it feels that restrictions limiting technology should be eliminated.

Mr. Rafael Jimenez (AAR Transportation Technology Center) commented that the AAR supports the proposal as written.

The Committee agreed to recommend the item be presented for vote as shown in "Item Under Consideration," hearing numerous comments in support of the proposal and no comments in opposition.

There were two positions from industry members posted on NCWM's 2014 Online Position Forum in support of the proposal.

Regional Association Comments:
CWMA recommended the item as "Developing" during their 2013 Interim Meeting, noting the following reasons:

- The NTEP evaluation is incomplete.
- This is an emerging technology; a new code(s) may be appropriate for this type of device.
- There hasn't been enough data provided to show if this device is suitable for use in this application.

At their 2014 Annual Meeting, CWMA reported that at it believed the item had been sufficiently developed and recommended it move forward for a vote.

NEWMA forwarded the item to NCWM and recommended it as a Voting Item at their 2014 Annual Meeting. NEWMA reported that it believes the item has been fully developed, the technology has been tested, the NTEP evaluation has been successfully completed, and the device suitable for use its intended application.

SWMA worked with the submitter this of item and editorially corrected it during the Committee work session in 2013. The Committee heard comments in support of the item from the Weighing Sector and other scale manufacturers. The Committee supported this item as a Voting Item and forwarded it to NCWM.

320-3 I Part 2.20. Weigh-In-Motion Vehicle Scales for Law Enforcement – Work Group

Source:
NIST, OWM, Mr. Richard Harshman, on behalf of the U.S. Federal Highway Administration (FHWA) (2011)

Purpose:
To provide the U.S. weights and measures community (equipment manufacturers, weights and measures officials, truck weight enforcement officials, and other users) with legal metrology requirements to address WIM systems used for vehicle enforcement screening.

Item Under Consideration:
Adopt the proposed Section 2.25. Weigh-In-Motion Systems Used for Vehicle Enforcement Screening Code shown in Appendix B as a tentative code in NIST Handbook 44, and adopt the proposed definitions of terms used in the tentative code (also included in Appendix B) into NIST Handbook 44 Appendix D - Definitions.

Background/Discussion:
The nation's highways, freight transportation system, and enforcement resources are being strained by the volume of freight being moved and the corresponding number of commercial vehicles operating on its roads. Traditional, static-based vehicle inspection activities simply cannot keep pace with anticipated truck volume increases. Current U.S. Department of Transportation (DOT) forecasts project freight volumes to double by 2035 and commercial vehicles to travel an additional 100 billion miles per year by 2020. WIM technology has been targeted by FHWA and Federal Motor Carrier Safety Administration as a technology capable of supporting more effective and efficient truck weight enforcement programs.

Several DOT efforts are underway and planned for the future to maintain adequate levels of enforcement that ensure equity in the trucking industry market and protection of highway infrastructure. Judicial support for enforcement decisions to apply more intense enforcement actions on specific trucks depends on support from the U.S. legal metrology community. Standards are needed in NIST Handbook 44 to address the design, installation, accuracy, and use of WIM systems used in a screening/sorting application. The implementation of a uniform set of standards will greatly improve the overall efficiency of the nation's commercial vehicle enforcement process.

Once adopted by the truck weight enforcement community, these requirements will enhance the accuracy of the nation's WIM scale systems; serve as a sound basis for judicial support of next-generation truck weight enforcement programs; and result in fewer legally loaded vehicles being delayed at static weigh station locations, thus reducing traffic congestion and non-productive fuel consumption and improving the movement of freight on our nation's roadways.

Purpose of the Project:
The FHWA's Office of Freight Management and Operations recognized a need to encourage uniformity in the design, testing, installation, and performance of WIM technology and subsequently encourage acceptance by prosecution agencies (administrative or judicial) regarding the validity of WIM technology's role in supporting commercial motor vehicle weight enforcement.

In response to this need and recognizing the value of having a standard included in NIST Handbook 44 because it lends integrity and is more recognizable in legal actions, the FHWA seeks to integrate WIM technology into the Handbook. The FHWA contracted the services of the Texas Transportation Institute of the Texas A&M University System and Battelle (a private company) to begin this process. Additionally, a small oversight Committee was formed by the FHWA, made up of three representatives from the FHWA, NIST, and a U.S. manufacturer of WIM equipment to validate that each contract deliverable is completed according to contract. NIST, OWM also agreed to provide a technical advisor to the associated work group tasked with development of the proposed code.

The intended application of the proposed new code is for screening purposes only (i.e., for screening/sorting commercial vehicles for possible violations of FHWA vehicle weight requirements).

To view a detailed summary on the progress of this project since its inception in December 2011 through 2012, refer to "Timeline of Completed Tasks Relating to the Project" in S&T Agenda Item 360-3 in the Committee's 2012 Final Report. Refer to the Committee's 2013 final report for additional background information.

NCWM 2014 Interim Meeting: The WIM Project Leader, Mr. Tom Kearney (USDOT - FHWA) provided an update on the progress of development of the draft code. Mr. Kearney indicated that the WG had planned to convene during the fall of 2013 to address the three concerns raised by NIST, OWM during the 2013 NCWM Annual Meeting, but was unable to do so because of scheduling conflicts. Since the 2013 NCWM Annual Meeting, a WG member from the Netherlands had submitted some new comments concerning the draft code. The purpose of the next WG meeting will be to address the three NIST, OWM concerns and to review the new comments from the Netherlands. That WG meeting would likely take place in April or May 2014. It was hoped that revisions to the draft code could be completed shortly thereafter so that a revised copy of the draft code could be made available to members of the weights and measures community prior to the NCWM Annual Meeting in July 2014. In the meantime, the WG continues to seek input on the current draft from anyone wishing to do so.

The SMA commented that it continues to support the efforts of the WG and looks forward to seeing the next draft of the proposed Code.

Mr. Steve Langford (Cardinal Scale Manufacturing Co. and member of the FHWA's Project Oversight Committee) also voiced his support of the efforts of the WG.

The Committee agreed to maintain the Informational status of the item and looks forward to further development of the draft code by the WG.

During the 2014 NCWM Annual Meeting, Mr. Rick Harshman, NIST Technical Advisor, to the WIM WG provided an update on the progress of the draft code, including changes agreed to by the WG during their most recent meeting held in Washington, D.C. in June 2014. Mr. Harshman thanked the WIM WG for agreeing to meet to consider NIST, OWM's three comments relative to the draft code and that NIST, OWM's concerns relating to those three comments had been satisfied during that meeting. During the meeting, the WG agreed to the following:

- To amend the draft code by specifying that a three independent platform vehicle scale be used to establish the reference test loads for axle, axle-group, and total vehicle weight, which are needed in the testing of a WIM system. NIST, OWM considers the three platform vehicle scale the "best option" to being able to establish accurate reference standards for testing when considering the different scale types available.

- Add a "note" and an additional "table" to the draft code making clear their decision of allowing higher accuracy classes to be added to the code in the future providing it can be demonstrated that WIM systems grouped within those accuracy classes can achieve the higher level of accuracy specified for those classes.

- With respect to NIST, OWM's suggestion to the WG to consider adding approach requirements, the WG didn't believe approach requirements were currently needed based on the large tolerances specified in the draft code for a Class A device. The WG did agree with NIST, OWM's assertion that the introduction of higher accuracy classes in the future would likely dictate the need to include approach requirements.

Mr. Harshman indicated that the next step would be to submit the revised draft code to the regional associations for consideration during their fall meetings.

Mr. Langford provided comment in support of the draft code and reported that it had already been revised to reflect the changes agreed to by the WG. He requested that the regional associations review the draft code at their next meeting.

The SMA reported that it supported the efforts of the work group and looked forward to seeing the next draft of the proposed code.

Mr. Lou Straub (Fairbanks Scales) stated that Fairbanks supplies WIM devices and supports the draft code moving forward.

The Committee agreed to maintain the item as "Informational" based on the comments provided. A copy of the most recent draft code (i.e., Revision 2) is included in Appendix B.

There was one industry position posted on NCWM's 2014 Online Position Forum in support of the proposal.

Regional Association Comments:
The CWMA did not receive any additional comments on this item during their 2013 Interim Meeting and 2014 Annual Meeting and recommended that this item remain as an Informational Item.

WWMA recognizes the efforts by the WIM WG and Mr. Darrell Flocken (Mettler Toledo and Chair of the WG) comments that updated the Conference on the progress of the WG during their 2013 Annual meeting. The WWMA looks forward to hearing the results of the WIM WG meeting. WWMA recommended that this item be an Informational item.

During their 2013 Interim meeting, NEWMA reported that it awaits final language from the Work Group and recommended that the item be an Informational Item. During their 2014 Annual Meeting, NEWMA reported that work on this item is still ongoing and recommended the "Informational" status be maintained pending the outcome of the June 2014 WIM WG Meeting.

SWMA received a Work Group report from Mr. Flocken at their fall 2013 meeting. The Committee did not have a recommendation on this item. Based on comments received, the Committee supported further development of the draft code by the WIM Work Group.

See previous Reports of the National Conference on Weights and Measures for additional history on this item.

321 BELT-CONVEYOR SCALE SYSTEMS

321-1 VC UR.1.2. Conveyor Installation

(This item was Adopted.)

Source:
U.S. National Work Group on Belt-Conveyor Scales (2014)

Purpose:
Simplify the requirement for belt tension by making it consistent regardless of belt length without prescribing the type of device to accomplish this.

Item Under Consideration:
Amend NIST Handbook 44 Belt-Conveyor Scale Systems Code as follows:

UR.1.2. Conveyor Installation

. . . .

(d) Take-up Device. – ~~If the belt length is such that a take-up device is required, this device shall be of the counter weighted type for either vertical or horizontal travel.~~ Any take-up device shall provide constant and consistent tension for the belt under all operating conditions.

(Amended 2014)

Note: No changes are proposed for other subparagraphs under UR.1.2.

Background/Discussion:
During discussions at the 2012 and 2013 meetings of the USNWG on Belt-Conveyor Scales, the WG recognized that there are take-up devices in use on belt-conveyor scale systems that operate favorably that are constructed according to designs other than the "counter weighted" type. One example is a take-up device that is reportedly capable of producing acceptable results and operates by incorporating a hydraulic-operated belt tension adjustment mechanism that responds to input from a load cell, which actively monitors belt tension. The USNWG agrees that the existing requirement of a "counter weighted" type of belt tension device is excessively prescriptive and the work group does not consider it appropriate to mandate design criteria for belt-conveyor systems in the NIST Handbook 44 Belt-Conveyor Scale Systems Code.

Furthermore, the existing language in NIST Handbook 44, (2.21.) paragraph UR.1.2.(d) does not explicitly require the use of a gravity-type (or counter-weighted) tension device unless the conveyor is of sufficient length that a take-up device is needed. The phrase "of sufficient length" does not provide clearly defined parameters regarding belt length in this existing requirement. Thus, the need for a belt tension device is open to interpretation by enforcement officials and the lack of specificity is believed to detract from the uniform application of the requirement. The current language also implies that relatively shorter conveyors may not need any type of belt tensioning device and the validity of that notion is being questioned by some USNWG members.

NCWM 2014 Interim Meeting: Mr. Bill Ripka (Thermo Fisher Scientific), Chair of the USNWG on BCS, spoke on behalf of Thermo Fisher Scientific and the USNWG on BCS in support of the proposal. Mr. Ripka indicated that the views of the USNWG are clear and based on a belief that NIST Handbook 44 is a set of criteria and not intended to be a design manual. There are many ways of addressing belt tension in the marketplace today. To be able to

increase belt speed, some other form of belt tensioning device is needed because a counter weight take-up device can't accommodate higher speeds. NIST Handbook 44 should not prevent technology from moving forward.

The Committee also heard comments from the SMA in support of the item as written, providing the rationale that a specification should not mandate product design.

Hearing no opposition and only comments in support of the proposed changes to UR.1.2. Conveyor Installation, the Committee agreed to recommend the item as shown above in the "Item Under Consideration" for a vote.

2014 NCWM Annual Meeting: The SMA supported the item as written, reiterating comments provided during the 2014 NCWM Interim Meeting.

NIST, OWM provided the following comments with respect to this item:

- The proposed changes will remove prescriptive language that permits only the use of a certain type of device to maintain tension on a conveyor belt that complies with specific design criteria.
- This requirement as it currently exists allows only the type of "take-up" device that utilizes a counter weight and the force of gravity in order to maintain belt tension.
- NIST, OWM expects that replacing this wording with the proposed language result in manufacturers of belt-conveyor scale weighing systems having greater flexibility in the design criteria for their equipment.
- Based on manufacturers and other experts, NIST, OWM understands that alternative designs for devices that provide conveyor belt tension are available and will perform satisfactorily while established criteria for belt-conveyor scale performance are maintained.
- Some types of systems may perform within acceptable limits without the use of a take-up device.
- NIST, OWM expects that the proposed changes will eliminate the need for field inspectors to make a subjective determination whether the length of conveyor belt warrants the use of a take-up device.
- The need for a take-up device will be determined by the system's ability to meet performance requirements.

The Committee heard comments in support of the proposal. Hearing no comments in opposition, the Committee agreed to recommend the item be presented for vote as shown in Item Under Consideration.

At their 2013 Interim Meeting, CWMA recommended the item be forwarded to the NCWM as an Informational Item due to lack of information about available belt tensioning devices and their effect on metrological integrity. In 2014, CWMA reported it believed the item has been sufficiently developed and recommended it move forward as a Voting item.

WWMA heard support and no opposition to the proposal and agreed the current language is open to interpretation during their fall 2013 meeting. The proposed language provides clear, definitive parameters for the take-up device that don't mandate design criteria. WWMA forwarded the item to NCWM, recommending it as a Voting Item.

NEWMA defers to the Work Group and other jurisdictions with more knowledge of these devices. During their 2013 Interim Meeting and 2014 Annual Meeting, NEWMA forwarded the item to NCWM recommending it as a Voting Item.

During their fall 2013 meeting, SWMA received some comments and discussion on providing clarity of the terms "constant" and "consistent" However, based on a recommendation from the Work Group, the SWMA agreed to forward the item to the NCWM S&T Committee for consideration.

330 LIQUID MEASURING DEVICES

330-1 VC S.1.6.7. and S.1.6.8. Recorded Representations and UR.3.3. Computing Device

(This item was Adopted.)

Source:
Liquid Controls (2014)

Purpose:
Address the issue of receipt (printed, electronic, and optional).

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

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

(a) the total volume of the delivery;

(b) the unit price;

(c) the total computed price; and

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

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

and,

S.1.6.8. Recorded Representations for Transactions Where a Post-Delivery Discount(s) is Provided. – Except for fleet sales and other price contract sales, a printed receipt providing the following information shall be available through a built-in or separate recording element that is part of the system for transactions involving a post-delivery discount:

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

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

(1) total volume of the delivery;

(2) unit price; and

(3) total computed price of the fuel sale.

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

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

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

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

and,

UR.3.3. 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.

(Became retroactive in 1999)

(Added 1989) (Amended 1992)

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.)**~~

(Added 2012 **and 2014**)

(Added 1998) (Amended 1992, 1993, ~~**and**~~ 2012**, and 2014**)

Background/Discussion:
The concept of electronic receipts is already incorporated in certain provisions of NIST Handbook 44 Liquid Measuring Device Code. Similar provisions are needed in other codes of NIST Handbook 44. At the 2013 NCWM Annual Meeting, members expressed support for including requirements to address the use of electronic receipts in the General Code rather than in individual device codes. Including requirements in the General Code would eliminate confusion and inconsistency, consolidate provisions from individual codes, and confine future updates to a single code. Item 310-2 on the Committee's agenda includes a proposal to address this issue in the General Code.

Item (330-1) is included as a companion item to Item 310-2 and proposes to change the LMD Code as follows:

- If a receipt is required, allow the customer to decline the option to receive any type of receipt.
- Add an option of electronic receipt as long as the system can generate electronic receipts.
- If a receipt is desired, allow the customer to select between printed and electronic receipt; or both.
- Remove references to electronic receipts from Liquid Measuring Device Code as they will be redundant.

Some concerns have been raised that this could lead to elimination of printed receipts, particularly for customers who have limited access to internet, smart phone, etc. However, the proposal is written to ensure that the printed receipt remain an option for the customer.

See Items 310-2 and 330-5 for related background and discussions.

NCWM 2014 Interim Meeting: NIST, OWM noted in its comments to the S&T Committee that this agenda item is intended as a companion to Agenda Item 310-2. If Item 310-2 is adopted, the proposed struck-out portions of this item (330-1) could be eliminated and consumers would continue to be provided the same privileges with respect to receiving hard-copy or electronic receipts for their transactions. If Item 310-2 is not adopted, it would be inappropriate to delete the sentences as shown in this item.

NIST, OWM also noted should the Committee decide to advance Items 310-2 and 330-1, the Committee should give consideration to consolidating them into a single item for NCWM action. See also Items 331-1 LPG Code Modifications (UR.2.8.) and 332-2 (S.1.5.3. Recorded Representations, Point-of-Sale Systems, LPG Code) that may be impacted by action on 310-2 and 330-1.

The Committee heard comments in support of the proposed changes to paragraphs S.1.6.7. and S.1.6.8. in comments it received for Item 310-2, which it considers a companion item. Hearing no opposition to the proposed changes, the Committee recommended the item for a Vote. The Committee acknowledged that this item is a companion to Item 310-2, and agreed should the changes to paragraph G-S.5.6. Recorded Representations proposed in Item 310-2 fail to be adopted; the statement that refers to electronic receipts in each of the three proposed paragraphs under this item shown struck out should remain. Thus, if Item 310-2 fails to be adopted, the Committee planned to amend the status of this item at the NCWM Annual Meeting and may not offer it for a Vote.

Annual 2014 Meeting: The Committee heard comments in support of the proposal. Ms. Juana Williams (NIST, OWM) reiterated NIST, OWM's comments from the 2014 Interim Meeting. Mr. Tim Chesser (Arkansas) raised a question about NIST, OWM's proposed handling of the companion items, and Ms.Tina Butcher (NIST, OWM) clarified this aspect of the comments. Mr. Gordon Johnson (Gilbarco) indicated support for the proposal provided Item 310-2 is adopted and agreed with NIST, OWM's comments from the Interim Meeting. Hearing no comments in opposition, the Committee agreed this item remain Voting.

Regional Association Comments:
At its 2013 Interim Meeting and 2014 Annual Meeting, the CWMA supported this item and forwarded it to NCWM recommending it as a Voting Item. At its May 2014 meeting, CWMA reported the item was sufficiently developed, and it should move to Voting status unless Item 310-2 is adopted. If Item 310-2 is adopted, the CWMA supports the Withdrawal of this item. NEWMA supported this item at its 2014 Annual Meeting and reported that they believed this new technology is associated with many of the device codes and agreed that acknowledging it in the General Code simplifies the use and updating of the handbook.

330-2 W S.1.6.7. Recorded Representations

(This item was Withdrawn.)

Source:
Illinois Department of Agriculture (2014)

Purpose:
To reduce confusion among the public.

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

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

(a) the total volume of the delivery;

(b) the unit price;

(c) the total computed price; and

(d) the product identity ***matching the identity on the dispenser*** *by name, symbol, abbreviation, or* ~~***code***~~ ***octane*** *number.*

[Nonretroactive January 1,1986]

(Added 1985) (Amended 1987, 1988**,** ~~**and**~~ 2012**, and 20XX**)

Background/Discussion:
The LMD Code currently allows businesses to identify the product being sold on the receipt in a misleading way. For example, many stores in a certain chain have fuel that is labeled "Regular" on the dispenser, but their receipt identifies the product as "BLUE." If a store has Regular 87 octane fuel for $3.699 and Silver 89 octane fuel for $3.599, the customer may select the Regular by mistake based on its lower octane rating and name. If the receipt simply identifies the product as "BLUE," the consumer may not know if they were charged the wrong unit price or if they chose the wrong pump by their own mistake (the Regular nozzle is green).

In another example, a verbal complaint was made to a Weights and Measures Inspector that the receipt was not clear. This customer worked for a company that would reimburse the fuel cost as long as it was "Regular" fuel that was purchased. This customer went to a station and purchased "Regular" fuel, however the receipt had the identity as "Unleaded." This person was not reimbursed because most gas is unleaded, and, thus, the identification of the product as only "Unleaded" does not mean it was "Regular" gas. Adding the phrase "matching the identity on the dispenser" to the requirement makes it clear to the businesses that the product identity on the receipt must agree with the product identity statement on the dispenser. For the same reason, the word "code" should be changed to "octane." A "code" number could be any number and may confuse consumers when it comes to which product they

purchased; however, the "octane" number on the receipt will be understandable to the customer since it matches the octane number displayed on the dispenser.

NCWM 2014 Interim Meeting: There were multiple comments questioning how the proposed language would apply. Of particular concern was how the reference to "matching" would be interpreted and applied.

The Committee heard from Ms. Juana Williams (NIST, OWM) who noted that the provision allowing the use of codes was included at the time the paragraph was added in 1985 to recognize that some systems, both weighing and measuring had limited character capabilities. Mr. Bill Hornbach (Chevron) and Mr. Gordon Johnson (Gilbarco) commented that some systems still have limited character sets and may need to use abbreviations. While the language recognizes the use of "abbreviations," this seems to conflict with the reference to "matching" identity. The Committee heard several suggestions for alternate language, including a suggestion for replacing the term "matching" with "corresponding." However, there wasn't strong support for any specific alternative. Ms. Kristin Macey (California) and Ms. Williams provided suggestions for alternative modifications to the language that might address some of the comments provided.

The Committee heard several comments suggesting that this issue would be better addressed as a User Requirement. The Committee agreed that, while paragraph S.1.6.7. is necessary to specify what information the device must be able to print on the receipt, it is the user's responsibility to maintain this information correctly and to enter accurate identity statements.

The Committee also heard multiple comments indicating that the current language in paragraph S.1.6.7. is adequate to address the scenario outlined in the proposal. If the identity of the product on the receipt is different from that on the dispenser, then the receipt is not correctly recording the identity of the product and the device is not being maintained in compliance with paragraph S.1.6.7.

Based on the lack of support and the questions raised regarding the specific language in the proposal, the Committee decided to Withdraw this item. If the submitter wishes to pursue the item further, the Committee recommends that the submitter consider proposing a User Requirement as an alternative proposal.

Regional Association Comments:
At its 2013 Interim Meeting, the CWMA supported this item and forwarded it to NCWM, recommending that it be a Voting Item.

At its 2013 Annual Meeting, the SWMA received comments from industry and government officials concerned with the intent of the item. The language of the proposed item does not make intent clear. SWMA did not forward this item to NCWM.

330-3 VC N.4.2.4. Wholesale Devices

(This item was Adopted.)

Source:
Flint Hills Resources (2013)

Purpose:
To better align wholesale meter testing with current testing procedures, measuring practices and technology changes while maintaining the integrity of the special test.

Item Under Consideration:
Amend paragraph N.4.2.4. as follows:

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

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

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

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

(Amended 2014)

Background/Discussion:
The Committee originally received a proposal from the submitter that was intended to clarify that conducting a slow flow test to the marked minimum discharge rate is required for type evaluation and testing to the minimum discharge flow rate developed under the conditions of installation for routine field inspections is appropriate. (See the Committee's 2013 Final Report for details.) The original proposal would:

1. Remove the rigidity of the current language and provide for flexibility and efficiency while maintaining the requirement to test at different flow rates to determine the accuracy of a measuring system;

2. Differentiate between testing for type evaluation and field verification;

3. Reflect changes in field testing procedures, technology, and industry practices; and

4. Improve meter performance by establishing a meter factor for the slowest preset flow rate.

The submitter noted that the current language in NIST Handbook 44 is very rigid and does not take field installation conditions into consideration. It may not be possible or practicable to achieve the marked minimum discharge rate during field tests without changes to upstream equipment (valves, pumps, etc.), changing the flow computer programmed presets, or changing the idling of other fueling bays during testing.

The code does not allow for any deviation from the **"**shall**"** test at the marked minimum discharge rate. Current loading rack systems generally do not have a discharge nozzle or other physical means downstream of the meter to control or restrict the flow rate. Today, most rely on pumps and valves upstream of the meter and preprogrammed flow rates for specific products with an assigned meter factor for each flow rate and product. The proposed change would still have allowed for testing at the marked minimum discharge rate when there is a discharge nozzle or other physical means in use downstream of the meter to restrict flow, but would have recognized the need to vary from the marked minimum discharge rate for systems not so equipped.

The submitter notes that it is more productive to verify that the system is operating properly when used in its intended manner and set-up rather than alter the system for test-purposes and then return it to its "as-used condition." Adjusting the system to flow at the marked minimum discharge rate by making changes to the system when that flow rate is not used introduces variables into the system not normally seen and adds little to no value.

Even if the system can achieve the marked minimum discharge rate (for example, through the use of a discharge nozzle), it is not always practical or possible to hit it exactly when testing. The variables involved with proving while multiple bays are operating at a loading rack can make achieving the target flow rate difficult. It is not really necessary to test exactly at the marked minimum flow rate to develop the operating characteristics of a meter. However, NIST Handbook 44 offers no room for deviation. Today, a wholesale meter tested "near," but not exactly "at," the marked minimum discharge rate is not being tested in accordance with the requirements of NIST Handbook 44. This problem may never be an issue, but it might (the history regarding the change to NIST

Handbook 44 Introduction section illustrates why the language in the handbook must match the application of it in the field). Amending the current language as proposed will remove this risk, however, slight.

In the LMD Code, retail motor-fuel devices with a marked minimum flow rate are tested "at or near the marked minimum flow rate," but are not required to be tested at exactly the marked minimum. The proposal would make testing more uniform and consistent among different, but similar device types.

During the 2013 NCWM Interim and Annual Meetings, the Committee considered a number of alternative proposals to amend paragraph N.4.2.4. Wholesale Devices, including proposals that would have had the effect of making the "Special" test optional during field evaluation, or eliminating the "Special" test entirely for field evaluation. Much of the discussion that took place during the Committee's Open Hearings relative to these proposals focused on two main issues:

1. Whether or not it's still necessary, given advances in today's meter technology, to conduct a "Special" test on a wholesale meter during field evaluation; and

2. Whether the conditions for conducting the "Special" test specified in paragraph N.4.2.4.(a) and (b) should be eliminated and language added to the paragraph that would require the test be performed at or near the minimum flow rate developed under the conditions of installation.

The Committee also heard and considered a number of key points during its 2013 Annual Meeting Open Hearings relative to these issues.

Refer to the Committee's 2013 Final Report for additional background information and to view the different proposals that have been submitted relative to this item and a complete summary of the comments heard during the Open Hearings relative to those proposals.

NCWM 2014 Interim Meeting: NIST, OWM questioned whether or not the proposed changes in the most recent version of the proposal are appropriate and is concerned that the language may hamper officials and service personnel from conducting adequate tests. NIST, OWM reiterated the need to conduct a "Special" test at a flow rate appreciably slower than that of a "Normal" test, in order to best determine the condition of the meter. NIST, OWM provided some draft language as shown in Item Under Consideration to address Mr. Cotsoradis' immediate concern of not being able to perform the "Special" test at exactly the flow rates specified in paragraph N.4.2.4. and noted that if this language were adopted there would be no reason to split the requirements for "Special" test into those that apply to type evaluation and those that apply to field evaluation.

The Committee also heard from the submitter of the proposal, Mr. Constantine Cotsoradis (Flint Hills Resources), who recognized in his comments not only the importance of conducting a slow flow test on a wholesale meter during both type evaluation and field evaluation; but also the need to maintain the current "Special" test criteria in NIST Handbook 44. Mr. Cotsoradis suggested that the community move slow on all of the issues that have been brought to light relating to his proposal. He stated that his primary concern and reason for submitting the proposal is that the current language in NIST Handbook 44 does not provide any flexibility concerning how the test is to be conducted and that it is not practical to conduct the test at exactly the flow rates specified by N.4.2.4. Wholesale Devices. He referenced the draft language that NIST, OWM had developed in their analysis of this item and had shared with him, which, if adopted, would allow the test to be performed "at or slightly above" the slower of the flow rates specified in the paragraph. He indicated that this language would provide the kind of flexibility that he's seeking.

Ms. Julie Quinn (Minnesota), Mr. Randy Jennings (Tennessee), Mr. Henry Oppermann (Weights and Measures Consulting, LLC), and Mr. Rich Miller (FMC Technologies Measurement Solutions, Inc.) provided comments in support of Mr. Cotsoradis' suggestion to amend the proposal to reflect NIST, OWM's suggested alternative language in paragraph N.4.2.4. Wholesale Devices, thereby making it permissible to perform the "Special" test at or near the slower of the flow rates specified. Mr. Michael Keilty (Endress + Hauser Flowtec AG USA) noted that Canada requires a program that allows a test at normal and lower flow rates.

The Committee acknowledged the comments in support of maintaining the requirement for conducting "Special" tests during routine field inspections and agrees with the premise that the "Special" test needs to be conducted during both type evaluation and field evaluation. The Committee also acknowledged that it is not practical to conduct "Special" tests at exactly the flow rates specified in the current paragraph. Based on comments heard during the Open Hearings indicating that the key concern of the submitter and others is that the current language does not provide any flexibility with respect to the flow rates specified in the paragraph, the Committee agreed to modify the proposal to read as shown in the "Item Under Consideration." The Committee believes that the item has been adequately reviewed and discussed and recommended that the item be designated as a "Voting" item.

NCWM 2014 Annual Meeting: The Committee heard comments from Ms. William (NIST, OWM) who commented that NIST, OWM believes the proposed changes would maintain the validity of the "Special Test" while providing additional flexibility being sought by the submitter. Mr. Cotsoradis noted that, while he believes the proposed language won't change how meters are tested in the field, it will change the threshold so that it isn't specifying the exact minimum flow rate. The Committee also heard comments from Mr. Dmitri Karimov (Liquid Controls) who noted that the phrase "slightly above" is a somewhat ambiguous term; he suggested the Committee might consider language used in Canadian documents which specifies a value of 10 % above the target value. In its deliberations, the Committee acknowledged that the phrase leaves room for interpretation; however, the Committee believes that the term is adequate and provides for flexibility; yet clarifies that drafts are not to be conducted at flow rates lower than the marked minimum. Hearing no other opposition to the proposal, the Committee agreed to present the proposal for a vote as shown in the "Item Under Consideration."

Regional Association Comments:
At both its fall 2013 Interim Meeting and spring 2014 Annual Meeting, the CWMA agreed the item has been sufficiently developed and recommended that it be a Voting Item. The CWMA also reported there were no comments in opposition to the proposal.

At its fall 2013 meeting, WWMA acknowledged the developing nature of this issue and the factors associated with pumping systems that have an impact on the test result. The WWMA looks forward to hearing input from meter manufacturers and interested parties that have a stake in addressing special tests on wholesale devices. The WWMA also acknowledges the 1949 S&T Report that identifies "Special" tests are to be left to the judgment of the official. WWMA recommended that this item be an Informational Item.

At its fall 2013 meeting, NEWMA recommended keeping this item as Informational until the Measuring Sector has a chance to provide data. At its spring 2014 meeting, NEWMA supported moving the item forward for a Vote.

At its fall 2013 Annual Meeting, SWMA received comments suggesting some of the language regarding wholesale and retail could be better harmonized across different codes. Comments were also received expressing concerns about the wording in regards to operational parameters. Based on comments received, the SWMA recommended the item be further Developed.

There was one position from a "Government" member posted on NCWM's 2014 Online Position Forum in support of the proposal.

330-4 D N.4.2.5. Initial Verification and UR.2.5.1. Initial Verification Proving Reports

Source:
Minnesota Weights and Measures Division (2014)

Purpose:
To update NIST Handbook 44 to reflect the technological changes in registers for liquid measuring devices and to alert weights and 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:
Add the following new paragraphs to NIST Handbook 44, Section 3.30. Liquid-Measuring Devices Code:

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.

(Added 20XX)

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.

(Added 20XX)

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 the 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 that 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 their devices are in tolerance at slow flow start-up and shut-down rates, and the errors are not predominantly in one direction.

See Appendix C, *How Slow Flow Accuracy Affects LMDs.*

2014 NCWM Interim Meeting: The Committee considered a proposal from the submitter to add a new paragraph to the NIST Handbook 44 Liquid Measuring Devices Code as follows:

> **N.4.2.5. Determination of Error on Wholesale Devices with Multiple Flow Rates and Calibration Factors – On wholesale 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 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.**

The Committee acknowledged that, at the heart of this issue is the need to develop guidance for inspectors and service personnel in the proper use and inspection of systems with multiple calibration factors. This work may encompass issues such as how the multiple calibration factor features can be used to adjust meters at different flow rates; to adjust the accuracy of the initial "start-up" and ending "slow-down" portions of a delivery; to adjust the accuracy of a meter when delivering different product types, etc.

During its Open Hearings, the Committee heard questions from Mr. Henry Oppermann (Weights and Measures Consulting) and from Ms. Tina Butcher (NIST, OWM) who questioned how an inspector would analyze the results without conducting accuracy tests at the slower flow rates. Ms. Julie Quinn (Minnesota), the submitter of this proposal, clarified that in order to apply the proposed "Note," an inspector must run tests at these flow rates to be able to determine the magnitude and direction of the error. Ms. Williams raised some additional questions and noted some comments from NIST, OWM (extracted from NIST, OWM's analysis provided to the S&T Committee), including the following.

- How is an inspector to assess the "start-up" and "slow-down" portions of the delivery given that they include quantities delivered at multiple different flow rates and the actual delivery sizes may vary?

- The minimum test draft size requirements may need to be considered and possibly revised to address tests of these systems.

- Caution should be used before making any sort of assessment without conducting any "slow flow" testing as outlined in the example (which assumes that no "slow flow" test was conducted).

- Percentage-based tolerances account and allow for different errors at different delivery sizes.

- If the concern centers on the "start-up" and "slow-down" portions of the delivery, the proposal may need to provide more specific guidance in this regard.

Mr. Constantine Cotsoradis (Flint Hills Resources) recognized the validity of the issue and expressed support for proposals that recognize changing technology, but he also acknowledged the questions that were raised within the regionals and at the Interim Meeting needing to be addressed.

Ms. Quinn clarified the purpose of the item and the circumstances leading to the proposal, noting that she was unable to attend other regional meetings to provide further explanations of this proposal. She noted that, at one time, the amount of product and the flow rate for the start-up and shut-down portions of a delivery were manually controlled. Today's systems tend to use automated, programmed values for these portions of the delivery. Ms. Quinn noted that, frequently, companies are reluctant to spend additional time validating the calibration factors used in the start-up and shut-down portions of the delivery. The "typical delivery" sizes would be determined from examining records at the terminal. The intent of the proposal is to raise awareness of the need for the inspector to consider the effects of these portions of the delivery on its overall accuracy.

After hearing comments during the Open Hearings and discussing the item further in its work sessions, the Committee agreed to designate this as a Developing Item. The Committee believes, at least initially, work needs to be focused on the development of guidelines and test procedures that could be incorporated into examination

procedure outlines. Ms. Quinn agreed to serve as the contact point for the item. The Committee asks that others interested in this work contact Ms. Quinn. The Committee looks forward to updates on this work as it progresses.

Annual 2014 Meeting: The Committee heard comments from Ms. Juana Williams (NIST, OWM) who stated that, like the S&T Committee, NIST, OWM believes that the existing language in the Liquid-Measuring Devices Code allows for any additional testing that is within the usual and customary use of the system and that develops the operating characteristics of that system, and also believes the work should focus on the development of guidelines and test procedures. NIST, OWM looks forward to continued collaboration with the group developing this issue.

The Committee also heard an update from Ms. Quinn, the submitter of this item. Ms. Quinn reported that a group of interested parties has been collaborating on this issue since January 2014. During the NCWM Annual Meeting, this group met and developed suggested language to address the concerns outlined in this item. Ms. Quinn asked that the Committee include the suggested language in this item for further review and comments by the regional associations and others in the fall. The Committee agreed to maintain this item on its agenda to allow for additional development and input as requested by Ms. Quinn and to replace the original recommendation with the revised language provided by Ms. Quinn as shown in the "Item Under Consideration" above along with a change to the title to reflect the revised paragraph number.

Regional Association Comments:
CWMA 2013 Interim Meeting: CWMA believed this item was ready and forwarded it to NCWM, recommending it as a Voting Item. At its 2014 Annual Meeting, the CWMA supported continued development of the item.

WWMA 2013 Annual Meeting: The WWMA did not forward this item to NCWM, because the language is vague and offers no clear solution.

NEWMA 2013 Interim Meeting: NEWMA did not believe this item is necessary and would not dramatically impact the test results of the meters. NEWMA did not forward the item to NCWM. At its 2014 Annual Meeting, NEWMA recommended this item be Withdrawn for lack of merit because the handbook already establishes a tolerance that applies to the full device test from start up to shut down and applying a tolerance to just start up or shut down could have a significant effect on test results.

The SWMA received comments in Open Hearings, and the SWMA S&T Committee's Work Session indicating a strong concern with the wording "typical delivery." The SWMA recommended the item be Withdrawn based upon lack of merit. The SWMA did not forward this item to NCWM.

330-5A VC UR.3.3. Computing Device.

(This item was Adopted.)

Item 330-5 was separated into two parts 330-5A and 330-5B during the 2014 Interim Meeting to facilitate review of the issues involved.

Source:
NCWM Task Group (TG) on Retail Motor Fuel Dispenser Price Posting and Computing Capability (2013)

Purpose:
Refine the criteria in the LMD Code related to price posting and computing capability of RMFDs for post-delivery discounted transactions to more clearly reflect the recommendations of the NCWM Task Group on RMFD Price Posting and Computing Capability for the indication of the highest unit price.

Item Under Consideration:
Amend paragraph UR.3.3.(c)(1) by adding underlined text as follows:

UR.3.3. 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.
(Added 1989) (Amended 1992)

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 **prior to the application of any discount** 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.)
(Added 2012)

(Added 1998) (Amended 1992, 1993, ~~and~~ 2012**, and 2014**)

Background/Discussion:
2013 NCWM Interim Meeting: The NCWM Task Group on RMFD Price Posting and Computing Capability met to review examples of receipts and scenarios for compliance with language adopted into NIST Handbook 44 in 2012 to address systems that are used to offer post-delivery discount pricing in retail motor-fuel dispensing applications.

During that review, the TG noted that the language in paragraph UR.3.3.(c)(1) could be incorrectly interpreted to prohibit the application of both pre- and post-delivery discounts in a single transaction; the TG develop proposed changes to the paragraph to address this concern. The current language in (c)(1) states that, in order to qualify for the exemptions offered for post-delivery discounts, 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. In instances, where a customer elects to receive a discount prior to the delivery (i.e., a "pre-delivery" discount), this might create an unintended conflict. For example, if a customer elects to pay in cash at the start of the transaction, the dispenser might display and compute at a lower, cash unit price. Since UR.3.3.(c)(1) stipulates posting and computing at the highest unit price, some might interpret this to mean that this dispenser may not also participate in post-delivery discount pricing or be entitled to the exemptions in U.R.3.3.(c). The original intent of the changes proposed by the TG and adopted by the NCWM was not to restrict systems from participating in *both* pre- and post-delivery discounting. Consequently, the TG proposes changes as outlined in UR.3.3.(c)(1) in the "Item Under Consideration" above.

The TG also developed proposed changes to UR.3.3.(c)(2) to acknowledge that: (1) the system must be able to provide a receipt to the customer, but the customer can be given an option of receiving the receipt or not; and (2) an electronic receipt is an acceptable alternative to a hard copy receipt if the purchaser agrees to an electronic receipt in lieu of, or in addition to, a hard copy. The Task Group believes that, should a customer prefer not to receive a receipt or prefer to receive it electronically, this should be permissible. The proposed changes to UR.3.3.(c)(2) are shown Item 330-5B.

Lastly, the TG recommended changing the vertical alignment of the statement following UR.3.3.(c)(2) regarding the option of an electronic receipt so that it clearly applies to UR.3.3.(a), (b), and (c) rather than just part (c). As presently shown in NIST Handbook 44, this statement would apply only to UR.3.3.(c). The text shown in the "Item Under Consideration" above aligns that statement such that it would apply to UR.3.3.(a), (b), and (c).

The Committee agreed to add this item to its agenda to address these changes proposed by the TG. The Committee believes the proposed changes have merit and believe they simply clarify the original intent of the language developed by the TG and adopted by the NCWM. However, because the proposed changes were not available for publication and review in NCWM Publication 15, the Committee agreed that the item should be designated as an Informational Item to allow adequate opportunity for the review and comment by all stakeholders potentially affected by the proposed changes. The Committee also believes this will provide an opportunity for input on the specific language to ensure that it clearly and adequately addresses the concerns identified by the TG.

Two government representatives supported the proposed changes and one government representative indicated a neutral position on the item in the 2013 NCWM Online Position Forum.

Annual 2013 Meeting: The Committee heard comments from NIST, OWM suggesting that the proposed modifications to UR.3.3.(c)(2) are unnecessary given that the paragraph already includes the following statement permitting the use of electronic receipts:

> 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.).

Similar provisions are included in paragraphs S.1.6.7. Recorded Representations and S.1.6.8. Recorded Representations for Transactions Where a Post-Delivery Discount(s) is Provided. NIST, OWM also noted that the originally proposed UR.3.3.(c)(2) inadvertently required that the system be capable of providing an electronic receipt upon customer demand, regardless of whether or not the system was capable of providing one.

The Committee heard multiple comments in support of eliminating the proposed revisions to UR.3.3.(c)(2). The Committee also heard comments from multiple weights and measures jurisdictions expressing the need to retain the requirement for a hard copy receipt for those consumers who do not have access to an electronic version. Mr. Ross Andersen (New York, retired) noted the need to consider any requirements at the State level that apply to electronic records.

Comments received during the Open Hearings indicated that, in applications where receipts are required, the following principles should apply:

- A printed receipt must be made available to the customer.
- If a customer doesn't want a receipt, it is not necessary to provide one.
- The customer may be given the option of receiving an electronic receipt in lieu of a printed receipt.

The Committee also heard comments from both weights and measures jurisdictions and industry representatives suggesting that a provision be added to the General Code recognizing the acceptance of electronic receipts. Dr. Matthew Curran (Florida) commented that identifying and defining different types of discounts, such as "rebates," would be helpful for consumers as well as officials in understanding how these requirements apply.

2014 NCWM Interim Meeting: Ms. Fran Elson-Houston (Ohio) provided an update on behalf of the NCWM RMFD Price Posting and Computing Capability Task Group regarding the proposals outlined in Item 330-5. The changes proposed to paragraph UR.3.3. in Item 330-5 are to: (1) clarify the unit price posting requirements to ensure that RMFD systems are permitted to participate in both pre- and post-delivery discounts; and (2) clarify the requirements relative to electronic receipts.

Ms. Elson-Houston reported that the Task Group recognized that Item 310-2 on the S&T Committee's agenda proposes changes to G-S.5.6. Recorded Representations and those proposed changes, if adopted, would affect the Task Group's proposed changes to LMD Code Paragraph UR.3.3.(c)(2) with regard to the recognition of electronic receipts. The Task Group supports the proposed changes in Item 310-2 and, if those changes are adopted, would suggest eliminating corresponding references in LMD Code paragraph UR.3.3.(c)(2). The Task Group is amenable to linking action on Item 310-2 and proposed changes to UR.3.3.(c)(2); however, should there be complications in addressing the requirements relative to electronic receipts, the Task Group did not want the proposed changes to UR.3.3.(1) to be delayed.

Thus, the Task Group recommended splitting Item 330-5 into two parts; one part to address clarifications to unit price posting requirements and one part to address requirements relative to electronic receipts.

Hearing no comments in opposition to the proposal submitted by the Task Group, the S&T Committee agreed to separate the item into two parts. Item 330-5A proposes changes to UR.3.3.(c)(1) as shown in the "Item Under Consideration" above. Item 330-5B proposes changes to UR.3.3.(c)(2). The Committee agreed to designate both items as "Voting" items.

Annual Meeting: The Committee heard comments in support of this item. The Committee heard from Ms. Williams who commented the text proposed for addition to UR.3.3.(c)(1) is for clarification purposes only; that is, to clarify that the exemption is also intended to apply to dispensers in which the customer may select and set them to compute at a discounted unit price prior to delivery (e.g., dispensers equipped with a selectable cash/credit feature). The Committee also heard comments from Ms. Elson-Houston speaking as Chairman of the TG who agreed with NIST, OWM's comments and supports moving the item forward for Voting. Hearing no comments in opposition, the Committee agreed this item remain Voting.

Regional Association Comments:
CWMA 2013 Interim Meeting: The CWMA recommended the item remain as an "Information" item. At its 2014 Annual Meeting, the CWMA reported there was no opposition presented and stated the item has been sufficiently developed and supported moving the item forward as a Voting item.

The WWMA agrees with the proposed language change to UR.3.3.(c)(1). WWMA finds the proposed language in UR.3.3.(c)(2) is not clear and may be interpreted to allow a purchaser to demand an electronic receipt despite the capability of the device. WWMA agrees the existing language in UR.3.3.(c)(2) is adequate. WWMA recommended that this item be a Developing item.

NEWMA 2013 Interim Meeting: NEWMA recommended this item be designated as a Voting Item and commented that the proposed changes will help clarify the intent of the WG's original suggestion. At its 2014 Annual Meeting, NEWMA supported moving the item forward as a Voting item.

The SWMA did not receive any comments opposing the item. There were comments that the electronic receipt recommendation may also be suited to the General Code as well. The SWMA supported this item as written.

See previous Reports of the National Conference on Weights and Measures for additional history on this item.

330-5B VC UR.3.3. Computing Device.

(This item was Adopted.)

Source:
NCWM Task Group on Retail Motor Fuel Dispenser Price Posting and Computing Capability (2013)

Purpose:
Refine the criteria in the LMD Code related to price posting and computing capability of RMFDs for post-delivery discounted transactions to more clearly reflect the recommendations of the NCWM Task Group on RMFD Price Posting and Computing Capability for the indication of the highest unit price.

Item Under Consideration:
Amend paragraph UR.3.3.(c)(2) to recognize electronic receipts as follows:

(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:**~~ **The receipt shall contain:**

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.)**~~

(Added 2012)

(Added 1998) (Amended 1992, 1993, ~~**and**~~ 2012**, and 2014**)

Background/Discussion:
Based upon input from the RMFD Price Posting and Computing Capability Task Group, the Committee agreed during the 2014 NCWM Interim Meeting to separate Item 330-5 into two parts. Item 330-5A proposes changes to UR.3.3.(c)(1). Item 330-5B proposes changes to UR.3.3.(c)(2).

The Task Group offered two options for the Committee to consider with respect to proposed changes to paragraph UR.3.3.(c)(2); Option 1 was intended to apply if the Committee agreed not to recommend Item 310-2 for vote; Option 2 was intended to apply if the Committee agreed to recommend Item 310-2 for vote. Since the Committee agreed during the 2014 NCWM Interim Meeting to recommend Item 310-2 for vote, the Task Group's Option 2 is shown above in the "Item Under Consideration" for Item 330-5B. The Committee agreed to designate both items (330-5A and 330-5B) as "Voting" items. Refer to Item 330-5A for additional background information pertaining to this item.

The Committee acknowledged that Item 330-5B is a companion to Item 310-2. Should the changes to G-S.5.6. Recorded Representations proposed in Item 310-2 fail to be adopted, the Committee plans to amend Item 330-5B by retaining all the struck out portions of proposed paragraph UR.3.3.(c)(2) prior to vote or may withdraw Item 330-5B completely.

2014 Annual Meeting: The Committee heard comments in support of this item. Ms. Fran Elson-Houston (OH) speaking as Chairman of the TG acknowledged the need to strike the last line in this paragraph should Item 310-2 be adopted. Ms. Juana Williams (NIST, OWM) stated that NIST, OWM's comments for Agenda Item 330-1 also apply to this item. Additionally, NIST, OWM agrees with the Committee's plan to address this item based on action taken on Agenda Item 310-2. Hearing no comments in opposition, the Committee agreed this item remain Voting.

2014 Annual Meetings: Both the CWMA and NEWMA supported item moving the item forward as a Voting item.

See previous Reports of the National Conference on Weights and Measures for additional history on this item.

330-6 W UR.4. Maintenance Requirements

(This item was Withdrawn.)

Source:
Minnesota Weights and Measures Division (2014)

Purpose:
To clarify the application of G-UR.4.1. to liquid measuring devices at a single place of business.

Item Under Consideration:
Add a new User Requirement to the NIST Handbook 44 Liquid Measuring Devices Code as follows:

UR.4. Maintenance Requirements

UR.4.1. Maintenance of Equipment. – All liquid measuring devices in service and all mechanisms and devices attached thereto or used in connection therewith shall be maintained in proper operating condition throughout the period of such service. All liquid measuring devices in service at a single place of business shall be evaluated by product and grade. Equipment in service associated with a single product and grade at a single place of business which is found to be in error predominantly in

a direction favorable to the device user shall not be considered "maintained in a proper operating condition."

Background/Discussion:
This proposal is meant to limit the opportunity to use tolerances as a way to gain advantage for the user over the consumer. Without this clarification, General Code paragraph G-UR.4.1. might be interpreted to mean that locations would be in compliance if all the devices measuring product with the lowest sales were set to deliver with errors in tolerance in favor of the consumer, and an equal number of devices measuring product with the highest sales were set to delivery with errors in tolerance in favor of the device user. This proposal would not allow that practice. For example, a gas station could not set all their "premium" gas dispensers (for which sales are typically lower) to underregister within tolerance and all their "regular" gas dispenser (for which sales are typically higher) to overregister within tolerance. Instead, approximately half of each grade should be short within tolerance and an equal number long within tolerance.

2014 NCWM Interim Meeting: Ms. Julie Quinn (Minnesota), submitter of this item, explained that her jurisdiction is finding companies taking advantage of the applicable tolerances. She noted that Minnesota has been evaluating the results of inspections based on product and grade and believes there is benefit to other jurisdictions using the same approach. She also noted that paragraph G-UR.4.1. uses the phrase "all equipment" at the beginning of the paragraph, which may be interpreted to mean that the paragraph cannot be applied unless *all* equipment at a given location is found to be in favor of the business. Ms. Quinn acknowledged comments from NIST, OWM and others that previous proposals have been made to include more specific guidance in paragraph G-UR.4.1.; however, unlike those proposals, the current proposal isn't intended to stipulate a formula or be overly specific, just to emphasize the need to evaluate by product and grade rather than look at *all* devices at a site.

The Committee heard multiple comments that this issue is better addressed in the General Code. Mr. Gordon Johnson (Gilbarco) commented that, while this is directed more to device owners, Gilbarco has been getting calls from their customers who are expressing concern about the application of requirements such as site averages. There are instances where the average error for a site is minus one cubic inch and the locations are being rejected; however, this is within the limits of readability and uncertainty using a test measure or prover. Mr. Johnson also expressed concern about the reference to the expectation that fifty percent of each grade should have plus errors and fifty percent should have minus errors. Mr. Ross Andersen (New York-retired) noted while he doesn't disagree with the concept of evaluating by grade, caution needs to be exercised because of variability that can occur with influences of product viscosity and temperature over time. Even if a device were adjusted as close to zero as practical, one could see drift in the results as conditions varied.

The Committee also heard concerns from NIST, OWM that the language might limit jurisdictions from considering other factors that might indicate noncompliance with maintenance and adjustment requirements (for example, device location, full-serve vs. self-serve, etc.). NIST, OWM suggested, if the proposed language is to be considered further, it should be modified to allow more flexibility; NIST, OWM provided suggested modifications to the proposal. NIST, OWM also questioned whether or not specific guidance for analyzing results should be included in a User Requirement; a Notes paragraph might be more appropriate. While many of the factors discussed are appropriate for inspectors to consider in analyzing maintenance of equipment, device owners are required to adjust devices as close to zero as practical. The Committee also heard comments indicating that there may be other factors that affect test results that need to be considered in making an assessment of compliance with G-UR.4.1.

Based upon the general lack of support for adding a new requirement to the LMD Code, the Committee decided to withdraw this item from its agenda. After hearing an explanation from the submitter and others regarding the difficulties that have been encountered in applying General Code paragraph G-UR.4.1., the Committee believes that it might be more appropriate to consider modifications to the General Code to address the concerns and would encourage the submitter and others to consider pursuing this option as an alternative future proposal.

Those commenting on this item during the Open Hearings noted that their comments also applied to Item 331-2, which proposes a corresponding requirement be added to the Vehicle-Tank Meters Code.

Regional Association Comments:
CWMA 2013 Interim Meeting: CWMA supported the item and forwarded it to NCWM recommending it as a Voting Item because it provides specific guidance in the LMD Code and helps support G-UR.4.1.

WWMA 2013 Annual Meeting: WWMA did not forward this item to NCWM because there was no support. The WWMA believes the current language in G-UR.4.1. is adequate and provides jurisdictions the ability to make determinations for predominance of error.

NEWMA 2013 Interim Meeting: NEWMA forwarded the item to NCWM and recommended that it be a Developing Item and be assigned to the submitter for development.

SWMA 2013 Annual Meeting: SWMA heard several comments during Open Hearings and in the Committee Work Session in opposition to this item. The Committee recommended the item be withdrawn. The Committee believed this item has been sufficiently addressed in the General Code of NIST Handbook 44. SWMA did not forward this item to NCWM.

See previous Reports of the National Conference on Weights and Measures for additional history on this item.

330-7 D Part 3.30. Price Posting and Computing Capability and Requirements for a Retail Motor-Fuel Dispenser (RMFD)

Source:
NIST, OWM and the Regional Weights and Measures Associations (2008)

Purpose:
Review new criteria in the LMD Code related to price posting and computing capability of RMFDs and provide guidance on the application of these requirements.

Item Under Consideration:
The NCWM Task Group (TG) on RMFD Price Posting and Computing Capability developed specific proposals for modifying the LMD Code to address price posting and computing requirements for RMFDs. These proposals were adopted by the NCWM in 2012 and published in the 2013 NIST Handbook 44; they are being revisited at the request of the NCWM S&T Committee who has asked the Task Group (TG) to complete its review of sample receipts and provide guidance on applying the new criteria. This Item, 360-3, is being retained as a Developing Item pending any additional assignments that may be given by the Committee to the Task Group relative to the implementation of new code requirements that may be adopted. Comments or inquiries may be directed to NIST Technical Advisor, Ms. Juana Williams, at (301) 975-3989 or juana.williams@nist.gov.

Background/Discussion:
In the early 1990s, various sections of the LMD Code in NIST Handbook 44 were modified to address multi-tier pricing applications in instances where the same product is offered at different unit prices based on the method of payment (such as cash or credit) or other conditions of the sale. Since that time, marketing practices have evolved to include the addition of new practices, such as frequent shopper discounts and club member discounts. Numerous questions have been posed to NIST, OWM and weights and measures officials regarding the requirements for posting unit prices, calculation of total price, customer-operated controls, and other related topics, such as definitions for associated terminology. In 2010, the Committee established a task group to further develop this issue. The Task Group proposed a number of changes to the LMD Code to address these issues and those changes were adopted in July 2012.

Additional details on this item can be found in the Committee's 2008-2012 Final Reports.

NCWM 2013 Interim Meeting Open Hearing: The Committee heard a suggestion from Ms. Elson-Houston, speaking as Chair of the TG on RMFD Price Posting and Computing Capability on a TG proposal, to further modify paragraph UR.3.3. Computing Device. Ms. Elson-Houston reported that the TG had met and agreed: (1) to develop sample receipts for transactions where motor fuel pricing is discounted after the delivery; (2) the Chair would

provide input on the "Dos and Don'ts" for complying with the requirements that went into effect January 2013 for posting on "The Oil Express" web newsletter; and (3) to recommend additional amendments to paragraph UR.3.3., which were provided to the Committee. The Committee established a new "Informational" item (See Item 330-4 on the Committee's 2014 Agenda) to address those modifications and agreed to retain Developing Item 360-3 while the TG continues work to develop guidelines and examples on how the changes made last year to the LMD Code will apply to receipts for post-delivery discounted transactions.

On the 2013 NCWM Online Position Forum, one Government representative indicated support for this item with no additional comments.

NCWM 2013 Annual Meeting: The Committee heard comments from Ms. Juana Williams (NIST, OWM) who emphasized the importance of continuing to develop guidelines and information to assist regulatory officials and industry in interpreting and applying requirements relative to pre- and post-delivery discounts. NIST, OWM is working on the development of guidelines and examples that could be included in NIST EPOs and training materials and has already received positive feedback from members of the Task Group on the examples developed thus far. This information may also be of use to NTEP in the further development of checklist criteria for inclusion in NCWM Publication 14. NIST, OWM will continue to develop this information and make it available in updates to EPOs and course materials and would appreciate additional input from the community.

Ms. Beth Treseder (API) indicated that API and others within industry would appreciate copies of acceptable receipts as they become available.

The Committee believes that additional work is needed to develop examples and information that will enable consistent and uniform application of the requirements adopted in 2012 and encourages NIST, OWM's continued work on such examples. The Committee asks that the TG continue its work by developing and providing additional examples of acceptable receipts to assist regulatory officials and industry in interpreting and applying these requirements. The Committee believes that examples of receipts from deliveries that include both pre- and post-delivery discounts in a single transaction are needed.

NCWM 2014 Interim Meeting: Ms**.** Elson-Houston (Ohio) spoke as Chair of the RMFD Price Posting and Computing Capability TG regarding a meeting of the TG, which occurred at the 2014 Interim Meeting. Ms. Elson-Houston advised the Committee that she will work with NIST to develop additional examples of receipts to illustrate both compliant and non-compliant receipts that could be included in the NIST Examination Procedure Outlines (EPOs) for RMFDs. The examples will be vetted with the TG and TG members agreed to provide input on the examples. Ms. Elson-Houston indicated that the TG believes this task would complete its work, unless the Committee has additional tasks to assign. During the Open Hearings, Ms. Elson-Houston encouraged members working with the post-delivery discount requirements, who might encounter problems or issues with the language that has been adopted, to forward their concerns to a member of the TG.

The Committee expressed appreciation for the TG's hard work. The Committee supports the development of examples that can be included in the NIST EPOs and recognized these as essential to help ensure consistent interpretation of the NIST Handbook 44 provisions and requirements for post-delivery discounts. The Committee agreed that, once completed, this last task completes the work of the TG. Barring any new issues between now and the NCWM Annual Meeting, this item will be dropped from the Committee's agenda in July. The Committee acknowledged that should future issues arise regarding the provisions for post-delivery discounts, the Committee may need to request that the TG be resurrected or reconstituted.

Following the 2014 Interim Meeting, the Committee received an excerpt from the TG's January 2014 Meeting Summary. At the TG's January 2014 meeting, the TG indicated its willingness to provide input on receipt examples. Chairperson Elson-Houston agreed to work with NIST to develop additional examples of receipts to illustrate both compliant and non-compliant receipts that might be included in future versions of NIST EPOs and training materials. The examples will be vetted with the TG and TG members agreed to provide input on the examples. The TG believes this final task would complete its work, unless the S&T Committee has additional tasks to assign.

2014 Annual Meeting: The Committee heard comments from Ms. Elson-Houston (Ohio, Chair of the RMFD Price Posting and Computing Capability TG). Ms. Elson-Houston reported that Mr. Dick Suiter (Richard Suiter Consulting) will be providing training to the State of Ohio on this topic and that he would be willing to provide similar training regional association meetings. The Committee also heard comments from Ms. Juana Williams (NIST, OWM) who indicated that NIST, OWM continues to note the importance of further development of guidelines and examples to assist in the uniform interpreting and applying of requirements for post-delivery discounts. NIST, OWM reiterates the need for additional sample receipts. NIST, OWM plans to continue developing the information on the receipt template previously made available and include the information in EPOs and course materials are updated. NIST, OWM appreciates the willingness of members of the NCWM RMFD Price Posting TG to assist in the review and vetting of these examples.

The Committee heard no additional comments on this item. The Committee agreed that the work of the Task Group is completed, and plans to remove this item from its agenda following the 2014 Annual Meeting.

Regional Association Comments:
At its 2013 Interim Meeting and its 2014 Annual Meeting, the CWMA believes this item should remain as a Developing item until the request for clarification is received from the Work Group.

WWMA recommended that this item remain as a Developing item and looks forward to seeing specific receipt examples from the TG on RMFD Price Posting and Computing Capability.

At its 2013 Interim Meeting and 2014 Annual Meeting, NEWMA recommended this item remain as a Developing Item and looks forward to additional data from the TG, including examples of both compliant and non-compliant receipts.

The SWMA did not receive any comments on this item. However, the Committee continues to support the work of the Task Group and recommends the item continue to be further developed.

See previous Reports of the National Conference on Weights and Measures for additional history on this item.

331 VEHICLE-TANK METERS

331-1 D N.4.6. Initial Verification and UR.1.5. Initial Verification Proving Reports

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 and 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:
Add the following new paragraphs to NIST Handbook 44, Section 3.31. Vehicle-Tank Meters Code:

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 that 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 D, *How Slow Flow Errors Affect VTMs.*

See comments Item 330-4 for details of comments from the 2014 NCWM Interim Meeting.

2014 NCWM Interim Meeting: The Committee considered a proposal from the submitter to amend NIST Handbook 44 Vehicle Tank Meter Code as follows:

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

After hearing comments during the Open Hearings and discussing the item further in its work sessions, the Committee agreed to designate this as a Developing Item. The Committee believes, at least initially, work needs to focus on the development of guidelines and test procedures that could be incorporated into examination procedure outlines. The Committee Chairman noted that the submitter, Ms. Julie Quinn (Minnesota), agreed to serve as the contact point for the item, and will be working with others to further develop guidelines for systems with multiple-point calibration capability. Ms. Quinn thanked those who have offered to help and noted that, although the specific issue presented to the Committee dealt with predominance of errors in certain portions of the delivery, she agreed the issue is really dealing with metering systems with multiple-point calibration capability. The Committee asks that others interested in this work contact Ms. Quinn. The Committee looks forward to updates on this work as it progresses.

NCWM 2014 Annual Meeting: The Committee heard comments from Ms. Juana Williams (NIST, OWM) who commented that like the S&T Committee, NIST, OWM believes the existing language in the Vehicle-Tank Meters code allows for any additional testing that is within the usual and customary use of the system and that develops the operating characteristics of that system, and also believes the work should focus on the development of guidelines and test procedures. NIST, OWM looks forward to continued collaboration with the group developing this issue.

The Committee also heard an update from Ms. Quinn, the submitter of this item. Ms. Quinn reported that a group of interested parties has been collaborating on this issue since January 2014. During the NCWM Annual Meeting, this group met and developed suggested language to address the concerns outlined in this item. Ms. Quinn asked that the Committee include the suggested language in this item for further review and comments by the regional associations and others in the fall. The Committee agreed to maintain this item on its agenda to allow for additional development and input as requested by Ms. Quinn, and to replace the original recommendation with the revised language provided by her as shown in the "Item Under Consideration" above, along with a change to the title to reflect the revised paragraph number.

Regional Association Comments:
CWMA 2013 Interim Meeting: CWMA heard no opposition on this item and based on testimony received from the floor, believes it is ready for a vote. CWMA forwarded the item to NCWM, recommending it as a Voting item. At its 2014 Annual Meeting, CWMA supported continued development of this item.

WWMA 2013 Annual Meeting: WWMA agrees the proposed language is confusing and no support for this item was conveyed. The WWMA agrees the language in the proposal is vague and offers no clear solution. This item was not forward to NCWM.

NEWMA 2013 Interim Meeting: NEWMA found this item confusing and believes that it lacks merit to move forward. NEWMA did not forward the item to NCWM. At its 2014 Annual Meeting, NEWMA reported that they revisited their position on this item from their 2013 Interim Meeting. NEWMA recommended the item be withdrawn for lack of merit, noting that NIST Handbook 44 already establishes a tolerance that applies to the full device test from start up to shut down and applying a tolerance to just start up or shut down could have a significant effect on test results.

SWMA 2013 Annual Meeting: SWMA again heard comments concerning the wording "typical delivery." Based on comments received in Open Hearings and the SWMA S&T Committee's Work Session, the SWMA agreed to withdraw based on lack of merit. SWMA did not forward this item to NCWM.

331-2 W UR.3. Maintenance Requirements

(This item was Withdrawn.)

Source:
Minnesota Weights and Measures Division (2014)

Purpose:
To clarify the application of G-UR.4.1. to liquid measuring devices at a single place of business.

Item Under Consideration:
Add a new User Requirement to the NIST Handbook 44 Vehicle-Tank Meters Code as follows:

U.R.3. Maintenance Requirements.

UR.3.1. Maintenance of Equipment. – All vehicle-mounted measuring systems in service and all mechanisms and devices attached thereto or used in connection therewith shall be maintained in proper operating condition throughout the period of such service. All vehicle-mounted measuring systems in service at a single place of business shall be evaluated by product and grade. Equipment in service associated with a single product and grade at a single place of business which is found to be in error predominantly in a direction favorable to the device user shall not be considered "maintained in a proper operating condition."

Background/Discussion:
This proposal is meant to limit the opportunity to use tolerances as a way to gain advantage for the user over the consumer. Without this clarification, paragraph G-UR.4.1. might be interpreted to mean that locations would be in compliance if all the devices measuring product with the lowest sales were in tolerance in favor of the consumer, and an equal number of devices measuring product with the highest sales were in tolerance in favor of the device user. This proposal would not allow that practice. For example, a bulk delivery service could not set all their diesel fuel long within tolerance and all their gasoline short within tolerance. Instead, approximately half of each grade should be short within tolerance and an equal number long within tolerance.

Although jurisdictions have not yet come to an agreement as to a mathematical formula for calculating predominance of error, there seems to be general agreement on the principle that tolerances should not be applied to allow most devices of one grade to be short and most of another grade to be long. Many jurisdictions are already applying this interpretation to their application of G-UR.4.1. If adopted, this proposal will promote uniformity by standardizing enforcement across jurisdictions.

2014 NCWM Interim Meeting: Ms. Julie Quinn (Minnesota), submitter of this item, noted that the rationale for this proposal is the same as for Item 330-6 on the Committee's Agenda. During its review of Item 330-6, the Committee heard comments from others, who also stated that their comments applied to Items 330-6 and 331-2. See that item for comments and details.

The Committee heard multiple comments that this issue is better addressed in the General Code. The Committee also heard concerns from NIST, OWM that the language might limit jurisdictions from considering other factors that might indicate noncompliance with maintenance and adjustment requirements and suggesting that if the proposed language is to be considered further, it should be modified to allow more flexibility. NIST, OWM also questioned whether or not specific guidance for analyzing results should be included in a User Requirement. While many of the factors discussed are appropriate for inspectors to consider in analyzing maintenance of equipment, device owners are required to adjust devices as close to zero as practical. The Committee also heard comments indicating that there may be other factors that affect test results that need to be considered in making an assessment of compliance with G-UR.4.1. The Committee also heard concerns expressed about the need to consider the limits of readability and uncertainty of current test equipment.

Based upon the general lack of support for adding a new requirement to the VTM Code, the Committee decided to withdraw this item from its Agenda.

After hearing an explanation from the submitter and others regarding the difficulties that have been encountered in applying General Code paragraph G-UR.4.1., the Committee believes it might be more appropriate to consider modifications to the General Code to address the concerns and would encourage the submitter and others to consider pursuing this option as an alternative future proposal.

Regional Association Comments:
CWMA supported the item and forwarded it to NCWM, recommending it as a Voting item because it provides specific guidance in the VTM Code and helps support G-UR.4.1.

WWMA did not hear support for the item and the current language in G-UR.4.1. is adequate and provides jurisdictions the ability to make determinations for predominance of error. The WWMA did not forward this item to NCWM.

NEWMA believed this item is covered in the General Code. NEWMA did not forward this item to NCWM.

SWMA heard comments during the Open Hearings in opposition to the item. The SWMA believes this item is sufficiently addressed in the General Code of NIST Handbook 44 and recommended the item be Withdrawn. SWMA did not forward this item to NCWM.

332 LPG AND ANHYDROUS AMMONIA LIQUID-MEASURING DEVICES

332-1 D S.1.4.3. Provisions for Power Loss, S.1.5.1.1. Unit Price, S.1.5.1.2. Product Identity, S.1.6. For Retail Motor Vehicle Fuel Devices Only, S.1.7. For Wholesale Devices Only, UR.2.7. Unit Price and Product Identity, and UR.2..8 Computing Device.

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

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

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 min at the dispenser or at the console if the console is accessible to the customer.

(a) 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 min at the dispenser or at the console if the console is accessible to the customer.

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

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

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

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

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

UR.2.7. Unit Price and Product Identity.

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

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

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

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

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

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

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

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

The following exceptions apply:

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

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

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

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

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

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

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

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

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

1. total volume of the delivery;

2. unit price; and

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

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

d. the final total price of the fuel sale.

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

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

There are LPG devices with NTEP Certificates of Conformance that meet current "power loss" and "zero-setback interlock" requirements. However, there are other LPG retail motor-fuel devices in the field that consist of an

assembly of separable, compatible, and type-certified LPG measuring and indicating elements, key/card lock systems that do not meet the power loss and interlock requirements because those requirements are not within the LPG Code and have not been submitted for type evaluation. This creates unfair competition with holders of type certifications for LPG retail dispensers.

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

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

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

Nonretroactive Status:

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

S.1.4.3. Provisions for Power Loss:

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

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

S.1.4.3. Provisions for Power Loss.

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

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

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

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

S.1.4.1. Indication of Delivery: NIST, OWM suggests that the Committee consider modifying paragraph S.1.4.1. Indication of Delivery as follows so that it mirrors the corresponding paragraph (S.1.6.1. Indication of Delivery) in the LMD Code, both in language and in the requirement for electronic devices to inhibit indications until fueling conditions ensure that the delivery starts on zero.

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

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

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

(Amended 2014)

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

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

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

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

UR.2.8. Computing Device: Delete "Added" dates from parts (b)(1) and (b)(2).

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

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

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

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

The Committee supports the objective of making changes to align the LPG and the LMD Code with respect to requirements for retail motor-fuel dispensing applications. Based on the comments received, the Committee

believes that additional work is needed before considering the proposal for voting and decided to designate the item as a "Developing" Item to allow the submitter to address the raised points.

2014 Annual Meeting: The Committee heard from Ms. Juana Williams (NIST, OWM) who noted that additional work needs to be done to develop the proposed changes to Section 3.32. NIST, OWM reiterates the comments and suggestions it provided during the 2014 NCWM Interim Meeting and as shown in the report above. Ms. Kristin Macey (California) thanked the Committee and the NCWM for consideration of the item, input received, and noted that California will be tweaking the item and resubmitting it to the regional weights and measures association. Ms. Angela Godwin (Ventura County, California) supported Ms. Macey's comments and agree that changes are needed to better address LPG motor fuel applications. Mr. Mike Keilty (Endress + Hauser), Chairman of the NTEP Measuring Sector, agreed with the recommendation that the proposal be maintained in a Developing status and indicated that the Measuring Sector will review and provide input on the proposal during its meeting in October 2014.

Regional Association Comments:
CWMA 2013 Interim Meeting: The CWMA believed this item was sufficiently developed and forwarded it to NCWM, recommending that it be a Voting item. At its 2014 Annual Meeting, the CWMA supported continued development of the item.

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

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

NEWMA 2014 Annual Meeting: NEWMA supported continued development of this item.

Additional letters, presentations, and data may have been part of the Committee's consideration. Please refer to http://ncwm.net/meetings/annual/publication-16 to review these documents.

332-2 VC S.1.5.3. Recorded Representations, Point-of-Sale Systems

(This item was Adopted.)

Source:
Tennessee Department of Agriculture (2014)

Purpose:
Update the LPG Code in NIST Handbook 44 to include requirements for Retail Dispensers of LPG that are consistent with retail LMD and Mass Flow Meters Code.

Item Under Consideration:
Add the following new paragraph to Section 3.32. LPG and Anhydrous Ammonia Liquid-Measuring Devices Code of NIST Handbook 44 as follows:

S.1.5.3. Recorded Representations, Point-of-Sale Systems. – Except for fleet sales and other price contract sales, a printed receipt providing the following information shall be available through a built-in or separate recording element for all transactions conducted with point-of-sale systems or devices activated by debit cards, credit cards, and/or cash:

(a) the total volume of the delivery;

(b) the unit price;

(c) the total computed price; and

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

(Added 2014)

Background/Discussion:
Alternative Fuels continue to develop market shares. Government programs are sponsoring the installation of alternative fuel dispensing devices in order to assist in developing an infrastructure. It has come to the submitter's attention that the LPG Code has never been updated to be consistent with LMD Code and Mass Flow Meters Code requirements for retail dispensers. We should seek consistency across all device types that are used for the same application; in this case, the application of "retail vehicle fueling." With regard to certain requirements such as displaying information and providing receipts, it shouldn't matter what type of fuel or type of metering technology is used; the basic application is the same.

This proposal is consistent with Mass Flow Meters Code paragraph S.2.7. Recorded Representations, Point-of-Sale Systems, and LMD Code paragraph S.1.6.7. Recorded Representations. There are relatively few LPG dispensers in the U.S. retail market at this time. It is prudent to add this requirement before the market grows and the changes would potentially have a more burdensome impact on existing industry.

NCWM 2014 Interim Meeting: Ms. Juana Williams (NIST, OWM) commented that NIST, OWM believes the proposed change will improve consistency between the LMD Code and the LPG Code. Since the corresponding paragraph in the LMD Code (paragraph S.1.6.7.) is nonretroactive as of January 1, 1986, the Committee may wish to ask for input regarding the retroactive status of the proposed paragraph and even consider whether or not the status of the corresponding LMD Code paragraph might need to be reviewed as a future item.

The Committee heard no objections to the addition of the proposed paragraph or its proposed retroactive status. The Committee believes that the addition of this paragraph will further align the LPG and LMD Codes. Consequently, the Committee recommends this item as a Voting Item.

NCWM 2014 Annual Meeting: The Committee heard comments from Ms. Juana Williams (NIST, OWM) who noted that this item may also be impacted by action on Items 310-2, 330-1, and 330-5B, which address requirements for recorded representations in the General and LMD Codes and recognize the use of electronic receipts. Should the proposal in Item 310-2 be adopted, the Committee may wish to delete the last sentence in this proposal (referencing electronic receipts) prior to presenting the item for a Vote. Based on this suggestion the Committee modified the proposal, eliminating the last sentence so that the proposed paragraph now reads as shown in the "Item Under Consideration."

Regional Association Comments:
SWMA did not hear any comments opposing the item. The Committee supports the proposal as written and agrees with the submitter. SWMA forwarded the item to the NCWM.

336 WATER METERS

336-1 W UR.3. Installation Requirements

(This item was Withdrawn.)

Source:
Neptune Technology Group Inc. (2013)

Purpose:
Establish installation requirements in the Water Meters Code.

Item Under Consideration:
Add a new paragraph UR.3. as follows:

UR.3. Installation Requirements.

UR.3.1. Manufacturer's Instructions. – A water meter shall be installed in accordance with the manufacturer's instructions. For utility-type water meters, the installation shall be sufficiently secure and rigid to maintain this condition.

Background/Discussion:
There are no installation requirements for utility type meters in the Water Meters Code of NIST Handbook 44. The submitter proposed the following new paragraph be added to Section 3.36.:

UR.3. Installation Requirements.

UR.3.1. Manufacturer's Instructions. – A utility-type water meter shall be installed in accordance with the manufacturer's instructions, and the installation shall be sufficiently secure and rigid to maintain this condition.

2013 NCWM Interim Meeting: The Committee heard comments in support of the proposal from Mr. Noel, who indicated that he also spoke on behalf of Badger, Sensus, Elster-AMCO, and Master Meter and noted that the proposed change would mirror similar paragraphs in other NIST Handbook 44 measuring device codes. Mr. Jim Byers (San Diego County, California) stated that he agreed with the proposed requirement, but notes that the General Code already addresses these requirements. He suggested that, if the language in the General Code is not sufficient, then that language should be reviewed and revised rather than including additional language in the specific code. Ms. Kristin Macy (California) stated that California agrees with Mr. Byers and believes that the language in the General Code is sufficient. Mrs. Juana Williams (NIST, OWM) also acknowledged the similarity with language in other codes.

While the Committee acknowledged comments regarding the redundancy of the proposed paragraph with current General Code requirements, the Committee believes the proposal has merit in helping to ensure proper installation of water meters. The Committee believes the requirement in the first sentence of the proposed paragraph regarding compliance with the manufacturer's instructions should apply to all water meters, not just utility-type meters. Consequently, the Committee modified the language to restrict only the second sentence to utility-type water meters and agreed to propose the modified paragraph (as shown in the "Item Under Consideration" above) for a vote.

One Government representative indicated support; one Government representative indicated a neutral position; and one Government representative indicated opposition for this item on the NCWM Online Position Forum. The opposing comment was accompanied by a statement indicating that paragraph G-UR.2.1. is adequate to address this concern and that paragraph is also more complete and better articulates the requirements.

During its 2013 Annual Meeting Open Hearings, the Committee heard comments in opposition to this item from Mr. Michael Keilty (Endress + Hauser Flowtec AG, USA) and Ms. Macey suggesting that the addition of requirements to address meter installation would be redundant. Mr. Keilty expressed concern that the absence of specific requirements such as these in *all* specific device codes might cause confusion about how or if the General Code paragraph would apply in other cases. Ms. Macey also expressed opposition to distinguishing between non-utility type and utility type water meters. NIST, OWM commented that the proposed language is consistent with that appearing in other device codes in NIST Handbook 44 and intended for the same purpose. The Committee received letters of support from Badger Meter; Elster AMCO Water, LLC; Sensus; Master Meter, Inc.; and Neptune Technology Group. Mr. Dmitri Karimov (Liquid Controls Corporation), speaking on behalf of the companies who were unable to attend this meeting and the Meter Manufacturers Association, also expressed support for this item.

NCWM 2014 Interim Meeting: The Committee heard comments opposing the addition of the proposed paragraph. Comments indicated that the language is redundant with corresponding General Code requirements. Based on these comments, the Committee decided to withdraw the item from its agenda.

Regional Association Comments:
The CWMA believes this item needs no further development and recommended that it be a Voting Item.

The WWMA recognized the redundancy of the proposed language and believes it is sufficiently addressed in G-UR.2.1. The WWMA recommended that this item be Withdrawn.

NEWMA had previously recommended this as a Voting Item. However, based on new information offered by Ms. Macey at the 2013 NCWM Annual Meeting, NEWMA now agreed that the item should be Withdrawn.

SWMA heard comments on behalf of the manufactures in favor of the item. However the SWMA believes the proposed language is already addressed in the General Code. The SWMA recommends this item be Withdrawn.

337 MASS FLOW METERS

S&T Committee Note: Proposals under the Committee's 2014 Interim Agenda Items 337-1 and 337-4 were withdrawn from the agenda in response to comments from the NGSC and the submitter (also a member of the NGSC) who suggested this action because alternative proposals developed by the submitter are intended to replace both items. The alternative proposals (definitions, requirements for quantity indications and markings for the conversion factor to equivalent volume units) and related background information appear under Item 337-2. The Committee also agreed with the NGSC's recommendation to consolidate the proposals under Items 337-2, 337-3, and 337-5 into a single Item 337-2 with Voting status.

337-1 W Appendix D – Definitions: Diesel Liter Equivalent (DLE) and Diesel Gallon Equivalents (DGE); Natural Gas

(This item was Withdrawn.)

Source:
Clean Vehicle Education Foundation (2013)

Purpose:
Enable consumers to make cost and fuel economy comparisons between diesel fuel and natural gas.

Item Under Consideration:
Amend NIST Handbook 44, Appendix D – Definitions as follows:

Diesel Liter Equivalent (DLE). – means 0.756 kg of natural gas.

Diesel Gallon Equivalent (DGE). – means 2.863 kg (6.312 lb) of natural gas.

Background/Discussion:
The gasoline gallon equivalent (GGE) unit was defined by NIST/NCWM in 1994 (See Appendix E) to allow users of natural gas vehicles to readily compare costs and fuel economy of light-duty natural gas vehicles with equivalent gasoline powered vehicles. For the medium and heavy duty natural gas vehicles in widespread use today, there is a need to officially define a unit (already in widespread use) allowing a comparison of cost and fuel economy with diesel powered vehicles. Also natural gas is sold as a vehicle fuel as either Compressed Natural Gas (CNG) or Liqufied Natural Gas (LNG) and each method of sale is measured in mass. Therefore, the generic term natural gas is proposed to be used in NIST Handbooks 44 and 130 without the existing term "compressed." The mathematics justifying the specific quantity (mass) of natural gas in a DLE and DGE is included in Appendix E.

The official definition of a DLE and a DGE will likely provide justification for California, Wisconson, and any other state to permit retail sales of LNG for heavy-duty vehicles in these convenient units.

NCWM 2013 Interim Meeting: The Committee heard multiple comments in opposition to the proposal. Mr. Keilty opposed the proposal, noting that a truck running on LNG would be dedicated to that type of fuel; thus, there is no need to make comparisons with diesel fuel on an ongoing basis. He stated that he believes natural gas should be sold in units of mass. Ms. Williams reviewed the following points prepared by NIST, OWM and suggested that the Committee consider these points in its deliberations on the proposals for this Item and Item 337-2. A copy of these points was also provided to the S&T Committee and the L&R Committee in writing in advance of the Interim Meeting.

Collaborative Work Effort
Work in joint session with the NCWM L&R Committee on corresponding L&R Agenda Items 232-1 (a proposal to recognize the diesel volume equivalent MOS for vehicle fuel) and 237-1 (a proposal to define the diesel volume equivalent unit in relation to mass), which specify the allowable unit of measurement for advertising and sale of natural gas. This collaboration between Committees will ensure that the proposed volume equivalent unit for a delivery is properly indicated and calculated by a natural gas dispenser.

Facilitate Marketplace-Value Comparisons
A dispenser might serve vehicles that are powered by diesel or gasoline fuel. Therefore, which volume equivalent unit (the DGE or GGE) is appropriate to avoid confusing the consumer? What is the most appropriate means to provide sufficient information to customers attempting to make a comparison of fuel offered by the DGE and GGE, whether at the same station or stations on adjacent street corners? Today's value comparisons are made to petroleum products, but as other alternative fuels proliferate how easy will it be for consumers to make comparisons to other fuels such as electricity or hydrogen?

An alternative that would provide more flexibility for comparison with other fuels and which would potentially create less confusion than permitting multiple different "equivalent" values as "units" of measure is to require the sale of all natural gas in mass units (kg or lb) as suggested by the SWMA. With this approach, customers could still be provided with supplemental information through mechanisms such as pump toppers that provide information about estimated equivalent units of measurement for deliveries indicated in mass as well as information on web sites such as those that already provide information about fuel economy. This approach might also reduce complaints from some suppliers about the accuracy of equivalent values relative to their product.

Another point that has been raised by some in the community and should be considered by the Committee is whether or not "equivalent values" are as necessary as they might have been at one time to encourage consumer acceptance of natural gas as an alternative fuel. For example, the SWMA questioned whether, once a consumer has purchased a vehicle he or she has the need to make ongoing value comparisons or whether this information is more useful prior to purchasing a vehicle. Given the concerns about consumer confusion with a potential proliferation of "equivalent" values at the dispenser, perhaps requiring mass units on the dispenser (with supplemental information about equivalents) is a more appropriate approach.

Compliance of Existing Approved Equipment-Indications
As noted above, NIST, OWM suggests the Committee consider SWMA's recommendation for equipment to indicate in a mass unit of measurement. Currently, there are two LNG dispensers with NCWM NTEP Certificates of Conformance (CC). They are NCWM CC 02-075A2* (Chart Industries) and NCWM CC 04-073A1 (NorthStar, Inc.), which specify these dispensers display in mass. How will the proposal apply to this equipment which may not have the capability to display in units other than mass?

Earlier S&T Committee Positions
Does the S&T Committee plan to revisit its 1999 recommendation where it requested data on LNG be submitted prior to the recognition of this product in a metering application? The Committee might also recall that the S&T Committee took a position in 2008 on a related proposal to recognize the "DGE" recommending that a consensus between stakeholders exist on any single energy value used as a conversion factor. NIST, OWM notes that several CNG suppliers have raised concerns about the use of 5.660 lb of CNG for each GGE commenting that this value is too low for the fuel they are providing to customers. NIST, OWM asks are other ectors, which rely on the accurate accounting of vehicle motor fuel sales, aware of and in agreement with the

proposed mass to volume equivalent unit being proposed as a conversion factor value for natural gas (CNG and LNG)?

The data for the heating values cited in Table B.4. "Heat Content for Various Fuels" in the Transportation Energy Data Book Edition 30 (June 2011) was not developed as part of an NCWM study, but represents an account of work by a government sponsored agency to characterize transportation activity and other factors that influence transportation energy use. The book includes a disclaimer which states "in any attempt to compile a comprehensive set of statistics on transportation activity, numerous instances of inadequacies and inaccuracies in the basic data are encountered;" points out that "an appendix is included to document the estimation procedures;" and notes that "neither ORNL nor DOE endorses the validity of these data."

Ms. Macey opposed the proposal and urged the Committee to stop the proliferation of "equivalent units." She noted that mass units are perfectly good for routine transactions and echoed comments that comparisons with other fuels are only relevant when making a purchase decision. Ms. Carol Hockert (NIST, OWM) further suggested that during its deliberations, the Committee should consider how the establishment of artificial units would affect metrological traceability. Mr. Dmitri Karimov (Liquid Controls Corporation, LLC), speaking on behalf of MMA, agreed with Ms. Hockert, noting that extensive work is done by companies to establish and maintain metrological traceability and the establishment of what amounts to arbitrary values is counterproductive. Mr. Dan Peterson (Yokogawa Corporation of America) echoed all of the statements made in opposition to the proposal.

Mr. Curtis Williams (CP Williams Energy Consulting) stated that he has had concerns about the use of the GGE and GLE for some years and he is glad that some are questioning the need to reconsider the use of equivalent units. As a participant in the U.S. National Working Group on Hydrogen, he was grateful that the associated code for that alternative fuel established requirements for mass units. He suggested that the Committee also consider examining the potential use of mass units for other fuels and noted that the use of mass units also eliminates questions about temperature compensation.

Ms. Cardin acknowledged the need for the L&R Committee and the S&T Committee to work together on this and related items. She cited two main tasks to be addressed as: 1) What is the right conversion value for the proposed units? and 2) Should units for the sale of natural gas be in "equivalent" units or mass units?

The Committee heard no comments in support of the proposal during its Open Hearings.

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 definition, 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 the 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 the 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.

On the NCWM Online Position Forum One Government representative indicated support; one Government representative indicated a neutral position; and one Government representative indicated opposition for this item. The neutral position was accompanied by a comment suggesting the establishment of a joint Task Group and encouraging a final recommendation that would clarify whether the proposed units are or are not permitted. The opposing position was accompanied by a comment indicating opposition to artificial units of measure.

Prior to the 2013 Annual Meeting, NCWM Chairman, Mr. Steve Benjamin, appointed the "NCWM Natural Gas Steering Committee," which will be chaired by Mr. Mahesh Albuquerque (Colorado). 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 will be 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.

During its 2013 Annual Meeting Open Hearings, the Committee heard an update from Steering Committee Chairman, Mr. Albuquerque. He reported that the Steering Committee 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.

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. Macey 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. Keilty commented that sale of natural gas as a vehicle fuel has proliferated globally and those sales are based on mass units.

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

> In addition to discussing the proposals in Items 337-1 and 337-2, NIST, OWM requests that the Task Group specifically discuss and consider whether or not the continued use of the terms "GLE" and "GGE" are appropriate for commercial CNG metering applications. NIST, OWM makes this request based on many of the same points made by NIST, 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 is not contingent upon continued comparisons with gasoline;
>
> 2. there are other methods for comparing relatively 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, NIST, 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 measure; 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.

Additional Contacts: Clean Energy, Seal Beach, California, NGVAmerica, Washington, DC, Clean Vehicle Education Foundation, Acworth, Georgua.

NCWM 2014 Interim Meeting: The NGSC suggested that the Committee withdraw this item. The submitter of this item (who is also a member of the NGSC) submitted an alternative item in 2014 that was intended to replace this item. Consequently, the Committee decided to withdraw this item from its agenda.

Regional Association Comments:
CWMA does not support the item as written and recommends that the status remain as Developing. This is based on the lack of traceability for the conversion units proposed. It is suggested that the conversion units if accepted could be supplemental information. The majority of comments heard were in support of selling this product by a known mass (i.e., pounds or kilograms). In addition there was concern raised regarding the validity of the current CNG conversion units (GLE & GGE).

WWMA heard support from the LNG industry; however, the conversions within their proposals need to be developed. WWMA believes there may be a purpose to the proposal; however, opposition exists between some regulators and stakeholders regarding the use of the volume equivalent unit of measure. WWMA requests the submitter work through the NCWM Natural Gas Steering Committee to refine the proposal. WWMA also has concerns about the source of the conversion factors used in determining the DGE/DLE. The source being the entities sited for establishing the BTU heating value for diesel. The WWMA believes more data is needed to establish densities to LNG. WWMA also believes consideration should be given to neighboring countries' established methods of sale and the units of measure for LNG. WWMA believes this item may be better served as a supplementary advertisement and used for customer information and not for a traceable method of sale. The S&T/L&R Committee's should work together as this item develops. WWMA recommended that the item remain as a Developing Item.

NEWMA recommended that the item remain Informational to give the Steering Committee time to work the items and make suggestions.

SWMA received comments in the Open Hearings indicating that Items 337-2 and 337-3 were proposed to provide clarity. The Committee recommended Items 337-2 and 337-3 replace Item 337-1. The SWMA S&T and L&R Committees met jointly to discuss CNG and LNG items on both agendas. The Committee recommended that this item be withdrawn.

See previous Reports of the National Conference on Weights and Measures for additional history on this item.

337-2 V 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.)

In June 2014, the S&T Committee modified its online version of this proposal in NCWM Publication 16 in response to a June 10, 2014, request from the NGSC to change the NGSC's March 2014 recommendation for DGE units. Consequently, the S&T Committee agreed that the CNG and LNG conversion factors proposed for use in converting these gases to DGE units should be revised in the Interim Report so that their numerical values are expressed to three decimal places rather than two decimal places.

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 NIST Handbook 44 will provide definitions for volume units of CNG and LNG that are the energy equivalents for diesel liters and 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 modification to definitions for gasoline volume equivalents to clarify those terms apply to CNG.

Item Under Consideration:
Amend NIST Handbook 44 Appendix D to include new definitions as follows:

diesel gallon equivalent (DGE). – means 6.384 lb of compressed natural gas or 6.059 lb of liquefied natural gas. [3.37]
(Added 20XX)

diesel liter equivalent (DLE). – means 0.765 kg of compressed natural gas or 0.726 kg of liquefied natural gas. [3.37]
(Added 20XX)

Amend NIST Handbook 44, Appendix D definitions as follows:

gasoline gallon equivalent (GGE). – Gasoline gallon equivalent (GGE) means 5.660 lb of **compressed** natural gas.[3.37]
(Added 1994) **(Amended 20XX)**

gasoline liter equivalent (GLE). – Gasoline liter equivalent (GLE) means 0.678 kg of **compressed** natural gas.[3.37]
(Added 1994) **(Amended 20XX)**

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

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

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

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 20XX)**

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 20XX)

~~**S.5.2. Marking of Gasoline Volume Equivalent Conversion Factor. – A device dispensing compressed natural gas shall have either the statement "1 Gasoline Liter Equivalent (GLE) is Equal to 0.678 kg of Natural Gas" or "1 Gasoline Gallon Equivalent (GGE) is Equal to 5.660 lb of Natural Gas" permanently and conspicuously marked on the face of the dispenser according to the method of sale used.**~~
~~**(Added 1994)**~~

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

(Added 1998) (Amended 20XX)

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 the efforts of NIST/NCWM is available in the Reports of the 78th and 79th NCWM in NIST Special Publication 854 and 870 (see pages 322 and 327, respectively). Natural gas is sold as a vehicle fuel as either compressed natural gas (CNG) or liqufied natural gas (LNG). For medium and heavy duty natural gas vehicles in widespread use today, there is a need to officially define a unit allowing a comparison of cost and fuel economy with diesel powered vehicles. The submitter stated that the official definition of a DLE and a DGE will likely provide justification for California, Wisconsin, and many other states to permit retail sales of CNG for heavy-duty vehicles in these convenient units. The submitter has provided a mathematical justification for the specific quantity (mass) of compressed natural gas in a DLE and DGE which is included in Appendix E.

January 2013 NCWM Interim Meeting
2013 NCWM Interim Meeting: The Committee heard multiple comments in opposition to the proposal. Mr. Michael Keilty (Endress + Hauser Flowtec AG, USA) opposed the proposal, noting that a truck running on LNG would be dedicated to that type of fuel; thus, there is no need to make comparisons with diesel fuel on an ongoing basis. He stated that he believes natural gas should be sold in units of mass.

Ms. Williams (NIST, OWM) reviewed the following points prepared by NIST, OWM and suggested that the

Committee consider these points in its deliberations on the proposals for this item and Item 337-2 (a proposal to recognize a gasoline and diesel volume equivalent unit for CNG, a diesel volume equivalent for LNG engine fuel and for marking the fuel dispenser). A copy of these points was also provided to the S&T Committee and the L&R Committee in writing in advance of the Interim Meeting.

Collaborative Work Effort

Work in joint session with the NCWM L&R Committee on corresponding L&R Agenda Items 232-1 (a proposal to recognize the diesel volume equivalent MOS for vehicle fuel) and 237-1 (a proposal to define the diesel volume equivalent unit in relation to mass) which specify the allowable unit of measurement for advertising and sale of natural gas. This collaboration between committees will ensure that the proposed volume equivalent unit for a delivery is properly indicated and calculated by a natural gas dispenser.

Facilitate Marketplace-Value Comparisons

A dispenser might serve vehicles that are powered by diesel or gasoline fuel. Therefore, which volume equivalent unit (the DGE or GGE) is appropriate to avoid confusing the consumer? What is the most appropriate means to provide sufficient information to customers attempting to make a comparison of fuel offered by the DGE and GGE, whether at the same station or stations on adjacent street corners? Today's value comparisons are made to petroleum products, but as other alternative fuels proliferate how easy will it be for consumers to make comparisons to other fuels such as electricity or hydrogen?

An alternative that would provide more flexibility for comparison with other fuels and which would potentially create less confusion than permitting multiple different "equivalent" values as "units" of measure is to require the sale of all natural gas in mass units (kg or lb) as suggested by the SWMA. With this approach, customers could still be provided with supplemental information through mechanisms such as pump toppers that provide information about estimated equivalent units of measurement for deliveries indicated in mass as well as information on web sites such as those that already provide information about fuel economy. This approach might also reduce complaints from some suppliers about the accuracy of equivalent values relative to their product.

Another point that has been raised by some in the community and should be considered by the Committee is whether or not "equivalent values" are as necessary as they might have been at one time to encourage consumer acceptance of natural gas as an alternative fuel. For example, the SWMA questioned whether, once a consumer has purchased a vehicle he or she has the need to make ongoing value comparisons or whether this information is more useful prior to purchasing a vehicle. Given the concerns about consumer confusion with a potential proliferation of "equivalent" values at the dispenser, perhaps requiring mass units on the dispenser (with supplemental information about equivalents) is a more appropriate approach.

Compliance of Existing Approved Equipment-Indications

As noted above, NIST, OWM suggests the Committee consider SWMA's recommendation for equipment to indicate in a mass unit of measurement. Currently, there are two LNG dispensers with NCWM NTEP Certificates of Conformance (CC). They are NCWM CC 02-075A2* (Chart Industries) and NCWM CC 04-073A1 (NorthStar, Inc.), which specify these dispensers display in mass. How will the proposal apply to this equipment which may not have the capability to display in units other than mass?

Earlier S&T Committee Positions

Does the S&T Committee plan to revisit its 1999 recommendation where it requested data on LNG be submitted prior to the recognition of this product in a metering application? The Committee might also recall that the S&T Committee took a position in 2008 on a related proposal to recognize the "DGE" recommending that a consensus between stakeholders exist on any single energy value used as a conversion factor. NIST, OWM notes that several CNG suppliers have raised concerns about the use of 5.660 lb of CNG for each GGE commenting that this value is too low for the fuel they are providing to customers. NIST, OWM asks are other sectors, which rely on the accurate accounting of vehicle motor fuel sales, aware of and in agreement with the proposed mass to volume equivalent unit being proposed as a conversion factor value for natural gas (CNG and LNG)?

The data for the heating values cited in Table B.4. "Heat Content for Various Fuels" in the Transportation Energy Data Book Edition 30 (June 2011) and used to justify the factors for the conversion of mass to "equivalent volume units" was not developed as part of an NCWM study, but represents an account of work by a government sponsored agency to characterize transportation activity and other factors that influence transportation energy use. The book includes a disclaimer which states "in any attempt to compile a comprehensive set of statistics on transportation activity, numerous instances of inadequacies and inaccuracies in the basic data are encountered;" points out that "an appendix is included to document the estimation procedures;" and notes that "neither ORNL nor DOE endorses the validity of these data."

Ms. Kristin Macey (California) opposed the proposal and urged the Committee to stop the proliferation of "equivalent units." She noted that mass units are perfectly good for routine transactions and echoed comments that comparisons with other fuels are only relevant when making a vehicle purchase decision. Ms. Carol Hockert (NIST, OWM) further suggested that, during its deliberations, the Committee should consider how the establishment of artificial units would affect metrological traceability. Mr. Dmitri Karimov (Liquid Controls Corporation, LLC), speaking on behalf of MMA, agreed with Ms. Hockert, noting that extensive work is done by companies to establish and maintain metrological traceability and the establishment of what amounts to arbitrary values is counterproductive. Mr. Dan Peterson (Yokogawa Corporation of America) echoed all of the statements made in opposition to the proposal.

Mr. Curtis Williams (CP Williams Energy Consulting) stated that he has had concerns about the use of the GGE and GLE for some years and he is glad that some are questioning the need to reconsider the use of equivalent units. As a participant in the U.S. National Working Group on Hydrogen, he was grateful that the associated code for that alternative fuel established requirements for mass units. He suggested that the Committee also consider examining the potential use of mass units for other fuels and noted that the use of mass units also eliminates questions about temperature compensation.

Ms. Judy Cardin (Wisconsin) acknowledged the need for the L&R Committee and the S&T Committee to work together on this and related items. She cited two main tasks to be addressed as: What is the right conversion value for the proposed units and should units for the sale of natural gas be in "equivalent" units or mass units?

The Committee heard no comments in support of the proposal during its Open Hearings.

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.

On the NCWM Online Position Forum one Government representative indicated support; one Government representative indicated a neutral position; and one Government representative indicated opposition for this item. The neutral position was accompanied by a comment suggesting the establishment of a joint Task Group and encouraging a final recommendation that would clarify whether the proposed units are or are not permitted. The opposing position was accompanied by a comment indicating opposition to artificial units of measure.

Prior to the 2013 Annual Meeting, NCWM Chairman, Steve Benjamin, appointed the "NCWM Natural Gas Steering Committee," which will be chaired by Mr. Mahesh Albuquerque (Colorado). 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 (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 Steering Committee Chairman, Mr. Albuquerque. He reported that the Steering Committee met for the first time on Sunday, July 14 at the beginning of the Annual Meeting and gathered input from 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.

2013 NCWM Annual Meeting: The Committee heard comments on Item 337-1 and Item 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. Macey 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. Keilty commented that sale of natural gas as a vehicle fuel has proliferated globally and those sales are based on mass units.

NIST, OWM acknowledged appreciation of the establishment of the Steering Committee to further study this issue. NIST, OWM encourages the S&T Committee, the Steering Committee, and the weights and measures community to consider the points raised by NIST, 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, NIST, OWM requests 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. NIST, OWM makes this request based on many of the same points made by NIST, 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 is 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, NIST, 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 (Liquid Controls) 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 are 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. Mahesh Albuquerque (Colorado) speaking as Chairman of the NCWM Natural Gas Steering Committee (NGSC).

Ms. Williams reviewed the following points prepared by NIST, OWM and suggested that the Committees consider these points in their deliberations on the proposals:

- NIST, OWM encourages the:
    - Efforts of the NCWM Natural Gas Steering Committee 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
- NIST, 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.
- NIST, 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.

- NIST, OWM suggests 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:

- Withdraw Items 337-1 and 337-4 and consolidate the remaining three items (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 Natural Gas Steering Committee Report to the L&R and S&T Committees

The Natural Gas Steering Committee (NGSC) was formed in July 2013 to help understand and educate the NCWM membership regarding the technical issues surrounding the proposed changes to NIST Handbook 44 and NIST Handbook 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 Committees 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.

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; while one OEM indicated use of their LNG RMFD in a fleet operation where indications are only in the DGE; and

- feedback from 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, NIST Handbooks 44 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 the 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 and the primary focus of the driving public and fleets 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 NIST Handbook 130;

- differences in the measurement of the gallon and kilogram – since the gallon is a volume measurement and not an energy measurement, and the NIST Handbook 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 device 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 United States 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 (NIST Handbook 44 paragraphs S.1.3.1.1. and S.1.3.1.2.; and NIST Handbook 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 (NIST Handbook 44 paragraphs S.5.2., S.5.3., UR.3.1.1., and UR.3.1.2; and NIST Handbook 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 three significant places beyond the decimal point for consistency (NIST Handbook 44 paragraphs S.5.2., S.5.3., UR.3.1.1., and UR.3.1.2. and Appendix D and NIST Handbook 130 Section 1, paragraphs 3.11.2.2.2. and 3.12.2.2.2.);

(4) correction of the temperatures in the LNG definition (NIST Handbook 130 Section 1);

(5) addition of 16 CFR Part 309 for CNG automotive fuel rating (NIST Handbook 130 paragraph 3.11.2.2.5.); and

(6) reference to NFPA 52 labeling requirements (NIST Handbook 130 paragraph 3.12.2.2.4.)

With regards to NIST 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 Item 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 NIST Handbook 44.

With regards to NIST 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 their 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, California; NGVAmerica, Washington, DC; Clean Vehicle Education Foundation, Acworth, Georgia. Regional Association Comments: (Fall 2013 Input on the Committee's 2014 Interim Agenda Items 337-1 through 337-5)

There was one neutral position posted on NCWM's 2014 Online Position Forum by NIST, OWM. NIST, OWM offered an alternative proposal as a compromise that would phase in requirements for natural gas vehicle dispensers to measure, indicate, and calculate the total selling price based on mass units (pounds or kilograms), but permit the posting of supplemental information regarding approximate equivalents to other fuels for use by consumers in making value comparisons or by tax agencies. An earlier version was provided to the NCWM Natural Gas Steering Committee. NIST, OWM posted its proposal on the Online Forum so that it could be shared more broadly, and others in the community would have the opportunity to consider alternative solutions and be better able to make informed decisions that meet the needs of the community while preserving the integrity of the measurement process. NIST, OWM provided a copy of the proposal to the S&T Committee and made hard copies available during the open hearings. With this approach, customers could still be provided with supplemental information through mechanisms such as pump toppers and other displays providing information about estimated equivalent units of measurement for deliveries indicated in mass as well as information on web sites such as those that already provide information about fuel economy. This approach might also reduce complaints from some suppliers about the accuracy of equivalent values relative to their product.

2014 NCWM Annual Meeting

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

Support:

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

- Natural gas retail dispensers measure in mass, and are inspected and tested using mass units.

Opposition:

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

Other technical points that were raised include the following:

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

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

Summary of Alternative Proposal from NIST:

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

equivalent values relative to their product.

S.1. Indicating and Recording Elements.

…

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

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

S.1.3. Units.

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

(Amended 1993 and 1997)

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

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

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

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

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

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

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

commercial transactions."

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

For compressed natural gas:

1 kg of Compressed Natural Gas is Equal to 1.4749 Gasoline Liter Equivalent (GLE)

1 kg of Compressed Natural Gas is Equal to 0.3896 Gasoline Gallon Equivalent (GGE)

1 kg of Compressed Natural Gas is Equal to 1.3072 Diesel Liter Equivalent (DLE)

1 kg of Compressed Natural Gas is Equal to 0.3455 Diesel Gallon Equivalent (DGE)

1 lb of Compressed Natural Gas is Equal to 0.669 Gasoline Liter Equivalent (GLE)

1 lb of Compressed Natural Gas is Equal to 0.177 Gasoline Gallon Equivalent (GGE)

1 lb of Compressed Natural Gas is Equal to 0.593 Diesel Liter Equivalent (DLE)

1 lb of Compressed Natural Gas is Equal to 0.157 Diesel Gallon Equivalent (DGE)

For liquefied natural gas:

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

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

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

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

…

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

(a) The maximum value of the quantity-value division for liquids shall not be greater than 0.2 % of the minimum measured quantity.

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

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

(c) For dispensers of ~~**compressed**~~ natural gas used to refuel vehicles **and manufactured prior to January 1, 2016**, the value of the division for the gasoline liter equivalent shall not exceed 0.01 GLE; the division for gasoline gallon equivalent (GGE) shall not exceed 0.001 GGE. The maximum value of the mass division shall not exceed 0.001 kg or 0.001 lb.

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

(Amended 1994 **and 20XX**)

S.5. Markings.

…

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

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

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

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

UR.3. Use of Device.

…

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

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

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

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

- Delete existing paragraph S.5.2. Marking of Equivalent Conversion Factor for Compressed Natural Gas in Section 3.37. Mass Flow Meters Code.

- Delete paragraph S.5.2., including the following proposed changes from the Item Under Consideration shown in Publication 16:

  S.5.2. Marking of Equivalent Conversion Factor for Compressed Natural Gas. – A device dispensing compressed natural gas shall have either the statement**s** "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 20XX)**

- Delete the following new paragraphs from the Item Under Consideration shown in Publication 16:

  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 20XX)

  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 20XX)

  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 20XX)

The Item Under Consideration *above* reflects these modifications.

Regional Association Comments:
General Comments following the 2014 NCWM Interim Meeting:
At its 2014 Annual Meeting, the CWMA recommended that the status of this item be changed from Voting to Informational based on discussion heard during the joint meeting of the L&R and S&T Committees. At that joint meeting, the two Committees concurred the items have merit, but questions and concerns over accuracy of this final proposal still remain. Both Committees agreed to move the item forward as an Information item. During the L&R Committee's work session, discussion took place regarding the inconsistency in language in the method of sale in L&R Item 232-3, Section 2.27.2. compared to the method of sale with L&R Item 237-2, Section 3.11.2.1. Additionally, the Committee discussed including the same number of significant digits in the conversions specified in the DGE and DLE equivalent values. The Chairman of the CWMA L&R Committee communicated these two concerns to the Chairman of the NCWM Natural Gas Steering Committee.

NEWMA 2014 Annual Meeting: NEWMA recommended the status of this item be changed from Voting to Informational after the item failed to receive a motion to move it forward as a Voting item on the National S&T agenda. The Informational status was assigned to address the continued debate on marketing, tax issues, conversion values, testing, and method of sale requirements.

Amend NIST Handbook 44, Appendix D – New Definitions for Diesel Volume Equivalents for Natural Gas (this approach established a single factor for both CNG and LNG)[submitted 2013, formerly Item 337-1]

CWMA 2013 Interim Meeting: The CWMA did not support the item as written and recommended that the status remains as Developing. This was based on the lack of traceability for the conversion units proposed. The CWMA suggested that the conversion units if accepted could be supplemental information. The majority of comments heard were in support of selling this product by a known mass (i.e., pounds or kilograms). In addition there was concern raised regarding the validity of the current CNG conversion units (GLE and GGE).

WWM fall 2013 meeting: The WWMA heard support from the LNG industry however the conversions within their proposals need to be developed. WWMA believes there may be a purpose to the proposal; however opposition exists between some regulators and stakeholders regarding the use of the volume equivalent unit of measure. WWMA requests the submitter work through the NCWM Natural Gas Steering Committee to refine the proposal. WWMA also has concerns about the source of the conversion factors used in determining the DGE/DLE. The source being the entities sited for establishing the BTU heating value for diesel. The WWMA believes more data is needed to establish densities for LNG. WWMA also believes consideration should be given to neighboring countries' established methods of sale and the units of measure for LNG. WWMA believes this item may be better served as a supplementary advertisement and used for customer information and not for a traceable method of sale. The S&T/L&R Committee's should work together as this item develops. WWMA recommended that the item remain as a Developing item.

NEWMA 2013 Interim Meeting: NEWMA recommended the item remain Informational to give the Steering Committee time to work the items and make suggestions.

SWMA received comments in the Open Hearings indicating that Items 337-2 and 337-3 were proposed to provide clarity. The Committee recommended Items 337-2 and 337-3 replace Item 337-1. The SWMA S&T and L&R Committees met jointly to discuss CNG and LNG items on both agendas. The Committee recommended that this item be Withdrawn.

Amend NIST Handbook 44, Appendix D – New Definitions for Diesel Volume Equivalents for Compressed Natural Gas [formerly Item 337-2]

CWMA did not forward this item to NCWM, stating it is a duplicate to correct the conversion factor.

WWMA did not forward this item to NCWM and recommends that the submitter incorporate the pertinent information into Item 337-1.

NEWMA forwarded the item to NCWM and recommended the item be designated as Informational to give the Steering Committee time to work the items and make suggestions.

SWMA received comments in the Open Hearing indicating that Items 337-2 and 337-3 were proposed to provide clarity. The Committee recommends Items 337-2 and 337-3 replace Item 337-1. The SWMA S&T and L&R Committees met jointly to discuss CNG and LNG items on both agendas. SWMA forwarded this item to NCWM recommending it as a Developing item.

Amend NIST Handbook 44, Appendix D – New Definitions for Diesel Volume Equivalents for Liquefied Natural Gas [submitted 2014, formerly Item 337-3]

CWMA did not support the item as written and recommends that the status remain as Developing. This is based on the lack of traceability for the conversion units proposed. It is suggested that the conversion units if accepted could be supplemental information. The majority of comments heard were in support of selling this product by a known mass (i.e., pounds or kilograms). In addition there was concern raised regarding the validity of the current CNG conversion units (GLE and GGE).

WWMA did not forward this item to NCWM and recommends that the submitter incorporate the pertinent information into Item 337-1.

NEWMA forwarded the item to NCWM and recommended the item be designated as Informational to give the Steering Committee time to work the items and make suggestions.

SWMA received comments in the Open Hearing indicating that Items 337-2 and 337-3 were proposed to provide clarity. The Committee recommends Items 337-2 and 337-3 replace Item 337-1. The SWMA S&T and L&R Committees met jointly to discuss CNG and LNG items on both agendas. SWMA forwarded this item to NCWM recommending it as a Developing item.

Amend paragraphs S.1.2., S.1.3.1.1., and S.5.2. [submitted 2013, formerly Item 337-4]

CWMA did not support the item as written and recommends that the status remain as Developing. This is based on the lack of traceability for the conversion units proposed. It is suggested that the conversion units, if accepted, could be supplemental information. The majority of comments heard were in support of selling this product by a known mass, (i.e., pounds or kilograms). In addition there was concern raised regarding the validity of the current CNG conversion units (GLE and GGE).

The WWMA heard no support on this item and recommended that it be Withdrawn. The intent of the proposal is to make cost comparisons between diesel fuel and natural gas. The WWMA believes this proposal doesn't meet the historic definition of "Cost Comparison" and shouldn't be a specification item in NIST Handbook 44. The WWMA believes Natural Gas should be sold in traceable units and not artificial equivalent units. The NCWM Natural Gas Steering Committee should take into consideration global method of sale and advertising of LNG/CNG. The WWMA believes the urgency of this issue demands quick action by the NCWM because these devices are growing quickly in the market place.

NEWMA forwarded the item to NCWM and recommended the item be designated as Informational to give the Steering Committee time to work the items and make suggestions.

SWMA heard comments in open hearing indicating that Item 337-5 was proposed to further clarify Item 337-4. The Committee agreed with comments heard that Item 337-4 continue to be a Developing item. Based on the comments received the Committee believed this item may be more appropriate as a user requirement and should be kept as developmental status with review by Steering Committee. The Committee believed that the identity should be indicated in a single unit. The SWMA, the S&T and L&R Committees met jointly to discuss CNG and LNG items on both agendas.

Amend paragraphs S.1.2., S.1.3.1.1., and S.5.2., and add new paragraphs S.1.3.1.2., and S.5.3. [submitted 2014, formerly 337-5]

CWMA did not support the item as written and recommends that the status remain as Developing. This is based on the lack of traceability for the conversion units proposed. It is suggested that the conversion units if accepted could be supplemental information. The majority of comments heard were in support of selling this product by a known mass (i.e., pounds or kilograms). In addition there was concern raised regarding the validity of the current CNG conversion units (GLE and GGE).

The WWMA heard no support on this item and recommended that it be Withdrawn. The intent of the proposal is to make cost comparisons between diesel fuel and natural gas. The WWMA believes this proposal doesn't meet the historic definition of "Cost Comparison" and shouldn't be a specification item in NIST Handbook 44. The WWMA believes natural gas should be sold in traceable units and not artificial equivalent units. The NCWM Natural Gas Steering Committee should take into consideration global method of sale and advertising of LNG/CNG. The WWMA believes the urgency of this issue demands quick action by the NCWM because these devices are growing quickly in the market place.

NEWMA forwarded the item to NCWM and recommended the item be designated as Informational to give the Steering Committee time to work the items and make suggestions.

SWMA heard comments in the open hearing indicating that Item 337-5 was proposed to further clarify Item 337-4. The Committee agreed with comments heard that Item 337-4 continue to be a developing item. Based on the comments received the Committee believed this item may be more appropriate as a user requirement and should be kept as Developmental status with review by the Steering Committee. The Committee believed that the identity should be indicated in a single unit. The SWMA, S&T Committee, and L&R Committee met jointly to discuss CNG and LNG items on both agendas

With respect to the Item Under Consideration, the Committee received additional letters of support from:

- ANGI Energy Systems;
- California Natural Gas Vehicle Coalition;
- Maine Clean Communities = MC^2;
- Sacramento Clean Cities Coalition,; and
- Questar Gas Company.

337-3 Appendix D – Definitions: Diesel Liter Equivalent (DLE) and Diesel Gallon Equivalents (DGE) for Liquefied Natural Gas

The Committee considered the following proposal to establish definitions in Appendix D for "Diesel Liter Equivalent (DLE)" and "Diesel Gallon Equivalent (DGE)." This item (along with accompanying recommendations and background information) was consolidated with Item 337-2 as a result of action by the Committee at the 2014 NCWM Interim Meeting. See Item 337-2 for additional details.

As a result of the June 12, 2014, discussions of the S&T Committee, in conjunction with NGSC recommendations, it became necessary to further clarify the status of Agenda Items 337-3 and 337-5. In March 2014, the Committee agreed with the NGSC's recommendation for modifications of the proposed NIST Handbook 44 requirements in these agenda items and their consolidation into a single voting item under Agenda Item 337-2. Consequently, the "V" (Voting) designation was removed from Agenda Items 337-3 and 337-5.

Source:
Clean Vehicle Education Foundation (2014)

Purpose:
Since liquefied natural gas (LNG) is sold in the retail market place as an alternative fuel to diesel fuel, the proposed additions and edits to NIST Handbook 44 will provide definitions for liquefied natural gas (LNG) equivalents for diesel liters and gallons so that end users can radially compare cost and fuel economy. At present no LNG equivalents for diesel are included in the handbooks.

Item under Consideration:
Amend NIST Handbook 44, Appendix D as follows:

Diesel Liter Equivalent (DLE). – Means 0.7263 kg of liquefied natural gas.

Diesel Gallon Equivalent (DGE). – Means 2.749 kg (6.06 lb) of liquefied natural gas.

337-4 W S.1.2. Compressed Natural Gas Dispensers, S.1.3.1.1. Compressed Natural Gas Used as an Engine Fuel, S.5.2. Marking of Gasoline Volume Equivalent Conversion Factor; Natural Gas

(This item was Withdrawn.)

Source:
Clean Vehicle Education Foundation (2013)

Purpose:
Enable consumers to make cost and fuel economy comparisons between diesel fuel and natural gas.

Item Under Consideration:
Amend paragraphs S.1.2., S.1.3.1.1., and S.5.2. as follows:

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

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

S.1.3.1.1. ~~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" (see definitions).~~**

(a) "gasoline liter equivalent (GLE) units" or gasoline gallon equivalent (GGE) units",

(b) "diesel liter equivalent (DLE) units" or "diesel gallon equivalent (DGE) units" (see definitions).

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

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

(a) 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",

(b) either the statement "1 Diesel Liter Equivalent (DLE) is Equal to 0.756 kg of Natural Gas" or "1 Diesel Gallon Equivalent (DGE) is Equal to 6.312 lb of Natural Gas" permanently and conspicuously marked on the face of the dispenser according to the method of sale used.

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

Background/Discussion:
The gasoline gallon equivalent (GGE) unit was defined by NIST/NCWM in 1994 (see Appendix E) to allow users of natural gas vehicles to readily compare costs and fuel economy of light-duty natural gas vehicles with equivalent gasoline powered vehicles. For the medium and heavy duty natural gas vehicles in widespread use today, there is a need to officially define a unit (already in widespread use) allowing a comparison of cost and fuel economy with diesel powered vehicles. Also natural gas is sold as a vehicle fuel as either Compressed Natural Gas (CNG) or Liqufied Natural Gas (LNG) and each method of sale in measure in mass. Therefore, the generic term "natural gas" is proposed to be used in NIST Handbooks 44 and 130 with out the existing term "compressed." The mathematics justifying the specific quantity (mass) of natural gas in a DLE and DGE is included in Appendix E.

The official definition of a DLE and a DGE will likely provide justification for California, Wisconsin, and any other state to permit retail sales of LNG for heavy-duty vehicles in these convenient units.

NCWM 2013 Interim Meeting: The Committee heard comments from Mr. Keilty who expressed concern about the adoption of the proposed equivalent value as a unit of measure. He noted that the intent of this item is not to allow the user to toggle between mass units and equivalent units at the push of a button. He also noted that if the units are set as "DLE" or "DGE," the customer cannot also view units in "GLE" or "GGE." Mr. Dmitri Karimov (Liquid Controls Corporation, LLC), indicated opposition to the proposal to strike the work "compressed." Ms. Williams referenced NIST, OWM's comments made in association with Agenda Item 337-1 and suggested that the Committee consider those same comments in their deliberations of this item.

The Committee heard no comments in support of the proposal during its Open Hearings. See Item 337-1 for details regarding the S&T Committee's collaborations with the NCWM L&R Committee on Items 337-1 and 337-2 on the S&T Committee's agenda and Items 232-1 and 237-1 on the L&R Committee's agenda.

On the NCWM Online Position Forum, two Government representatives indicated a neutral position and one Government representative indicated opposition for this item. The neutral position was accompanied by a comment suggesting the establishment of a Joint Task Group and encouraging a final recommendation that would clarify whether the proposed units are or are not permitted. The opposing position was accompanied by a comment indicating opposition to artificial units of measure and noting that establishment of DGE and DLE values perpetuate the use of artificial units.

NCWM 2013 Annual Meeting: The Committee heard comments on Items 337-1 and 337-2 jointly. Details of comments are included in Item 337-1.

Additional Contacts: Clean Energy, Seal Beach, California; NGVAmerica, Washington, D.C.; and Clean Vehicle Education Foundation, Acworth, Georgia.

NCWM 2014 Interim Meeting: The NGSC suggested that the Committee Withdraw this item. The submitter of this item (who is also a member of the NGSC) submitted an alternative item in 2014 that was intended to replace this item. Consequently, the Committee decided to withdraw this item from its agenda.

Regional Association Comments:
The CWMA does not support the item as written and recommends the status remain as Developing. This is based on the lack of traceability for the conversion units proposed. It is suggested that the conversion units if accepted could be supplemental information. The majority of comments heard were in support of selling this product by a known mass (i.e., pounds or kilograms). In addition there was concern raised regarding the validity of the current CNG conversion units (GLE and GGE).

The WWMA heard no support on this item and recommended it be Withdrawn. The intent of the proposal is to make cost comparisons between diesel fuel and natural gas. The WWMA believes this proposal doesn't meet the historic definition of "Cost Comparison" and shouldn't be a specification item in NIST Handbook 44. The WWMA believes Natural Gas should be sold in traceable units and not artificial equivalent units. The NCWM Natural Gas Steering Committee should take into consideration global method of sale and advertising of LNG/CNG. The WWMA believes the urgency of this issue demands quick action by the NCWM because these devices are growing quickly in the marketplace.

NEWMA recommended that the item be Informational to give the Steering Committee time to work on the items and make suggestions.

SWMA heard comments in Open Hearing indicating that Item 337-5 was proposed to further clarify Item 337-4. The Committee agreed with comments heard that Item 337-4 continue to be a Developing Item. Based on the comments received, the Committee believed this item may be more appropriate as a user requirement and should be kept as developmental status with review by Steering Committee. The Committee believes the identity should be indicated in a single unit. The SWMA S&T and L&R Committees met jointly to discuss CNG and LNG items on both agendas.

See previous Reports of the National Conference on Weights and Measures for additional information on this item.

337-5 S.1.2. Compressed Natural Gas Dispensers, S.1.3.1.1. Compressed Natural Gas Used as an Engine Fuel, S.5.2. Marking of Gasoline Volume Equivalent Conversion Factor

The Committee considered the following proposal to modify multiple MFM specification paragraphs to recognize gasoline and diesel "equivalent" units for liquefied natural gas and compressed natural gas. This item (along with accompanying recommendations and background information) was consolidated with Item 337-2 as a result of action by the Committee at the 2014 NCWM Interim Meeting. See Item 337-2 for additional details.

As a result of June 12, 2014, discussions of the S&T Committee, in conjunction with NGSC recommendations, it became necessary to further clarify the status of Agenda Items 337-3 and 337-5. In March 2014, the Committee agreed with the NGSC's recommendation for modifications of the proposed NIST Handbook 44 requirements in these agenda items and their consolidation into a single Voting item under agenda Item 337-2. Consequently, the "V" (Voting) designation was removed from Agenda Items 337-3 and 337-5.

Source:
Clean Vehicle Education Foundation (2014)

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

Item Under Consideration:
Amend NIST Handbook 44, Mass Flow Meters Code 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** dispenser**s** used to refuel vehicles shall be of the computing type and shall indicate the quantity, the unit price, and the total price of each delivery. The dispensers shall display the mass measured for each transaction either continuously on an external or internal display accessible during the inspection and test of the dispensers, or display the quantity in mass units by using controls on the device.

(Added 1994)

S.1.3.1.1. 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" (see definitions).~~

(a) mass (in pounds or kilograms); or

(b) "gasoline liter equivalent (GLE) units" or "gasoline gallon equivalent (GGE) units;"

(c) "diesel liter equivalent (DLE) units" or "diesel gallon equivalent (DGE) units" (see definitions).

(Added 1994)

S.1.3.1.2. Liquefied Natural Gas Used as an Engine Fuel. – When liquefied natural gas is dispensed as an engine fuel, the delivered quantity shall be indicated in:

(a) Mass (in pounds or kilograms), or

(b) "diesel liter equivalent (DLE) units" or "diesel gallon equivalent (DGE) units" (see definitions).

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

(a) 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",

(b) either the statement "1 Diesel Liter Equivalent (DLE) is Equal to 0.765 kg of Natural Gas" or "1 Diesel Gallon Equivalent (DGE) is Equal to 6.38 lb of Natural Gas"

(Added 1994)

S.5.3. Marking of Diesel Volume Equivalent Conversion Factor. – A device dispensing liquefied natural gas shall have: the statement "1 Diesel Liter Equivalent (DLE) is Equal to 0.7263 kg of Natural Gas" or "1 Diesel Gallon Equivalent (DGE) is Equal to 6.06 lb of Natural Gas" permanently and conspicuously marked on the face of the dispenser according to the method of sale used.

337-6 D Mass Flow Meters Code, S.3.6. Automatic Density Compensation

Source:
NCWM Natural Gas Steering Committee (2014 Interim Meeting)

Source:
This is a new item (2014) that originated from the NCWM Natural Gas Steering Committee (NGSC) as a result of its deliberations January through March 2014 on agenda Item 337-1 (an alternative proposal for defining and establishing legal metrology requirements for quantity indications and markings on a device when CNG and LNG are dispensed and sold as engine fuel in volume equivalent units). The NGSC recommends the proposal as a developing item to allow additional time for the NCWM NTEP Measuring Sector and Measuring Laboratories to fully vet the newly proposed modifications to NIST Handbook 44 Mass Flow Meters Code paragraph S.3.6. Automatic Density Correction.

Purpose:
Provide a starting point for work identified in March 2014 by the NGSC and S&T Committee that is necessary to fully address legal metrology requirements for LNG retail and wholesale applications.

Item Under Consideration:
Amend NIST Handbook 44 Mass Flow Meters Code paragraph S.3.6. as follows:

S.3.6. Automatic Density Correction.

(a) An automatic means to determine and correct for changes in product density shall be incorporated in any mass flow metering system that is affected by changes in the density of the product being measured.

(b) Volume-measuring devices with automatic temperature compensation used to measure **liquefied** natural gas as a motor vehicle engine fuel shall be equipped with an automatic means to determine and correct for changes in product density due to changes in the temperature, ~~**pressure, and composition**~~ of the product.

(Amended 1994 ~~**and**~~ 1997, **and 201X**)

Background/Discussion:
After the January 2014 NCWM Interim Meeting, the NGSC and S&T Committee received input from Mr. Dmitri Karimov (Liquid Controls Corporation, LLC and a member of the NGSC) who proposed to differentiate between CNG and LNG in the requirements of paragraph S.3.6 "Automatic Density Correction" when using volumetric devices. Mr. Karimov indicated that density calculations of LNG when measured using a volumetric device, require temperature determination only. CNG devices will not be allowed to use indirect mass measurement in Mr. Karimov's proposal.

Mr. Karimov's provided the NGSC and S&T Committee with the following points as rationale for the proposed changes to paragraph S.3.6.:

- The requirements for volume-measuring devices were developed in 1994 and 1997 for CNG based on hydrocarbon gas vapor code. See the attached NCWM final reports at the end of the document.
- The concerns might be valid for CNG but not for LNG. For LNG, only temperature input is required to calculate mass value.
- Based on the most recent changes to the Mass Flow Meters Code by the NGSC, indirect mass measurement is proposed to be allowed for LNG but not CNG, so S.3.6 needs to be modified.
- CNG and LNG mass flow meters (Coriolis) with automatic density correction will be covered by paragraph S.3.6.(a)
- LNG volume-measuring devices (such as orifice plate and turbine meters) will be covered by paragraph S.3.6.(b) since indirect mass measurement for CNG is no longer allowed under the proposal by the NGSC.
- CNG (being gas) is very compressible, so pressure is a significant influence factor in density calculation. "Pressure" was added to S.3.6.(b) in 1997 because at that time the paragraph was relied upon only for CNG.
- LNG, on the other hand, is measured at very low pressure, and – being liquid- is not compressible at the pressures at which it is measured. Pressure effect on density of LNG is therefore negligible. See the table below where Mr. Karimov generated data on LNG density changes using the NIST REFPROP database.
- Per documentation received by the NGSC from the Clean Vehicle Education Foundation, the composition of the natural gas remained virtually unchanged over the last 21 years. Therefore, volumetric devices for LNG could use fixed composition in density calculations as per ASTM D4784, Clause 2.1 (see below).
- Finally, indirect mass measurement volumetric devices undergo type evaluation, and only those devices meeting accuracy requirements through proper density calculations are approved.

Supporting documentation:
ASTM D4784 – 93 (Reapproved 2010) Standard Specification for LNG Density Calculation Models ASTM D4784 provides models for density calculation.

2. Significance an d Use

2.1 The models in this specification can be used to calculate the density of saturated liquid natural gas in the temperature range 90 to 120 K. The estimated uncertainty for the density calculations is ± 0.1 %. The restrictions on composition of the liquefied natural gas are:

methane	**60 % or greater**
nitrogen	**less than 4 %**
***n*-butane**	**less than 4 %**
***i*-butane**	**less than 4 %**
pentanes	**less than 2 %**

Mr. Karimov also referenced excerpts from two previous Committee reports: 1) NIST SP 870 the 1994 Report of the 79th NCWM, Agenda Item 337-4B in the Final Report of the Specifications and Tolerances Committee; and 2) NIST SP 920 the 1997 Report of the 82nd NCWM, Agenda Item 337-2 in the Final Report of the Specifications and Tolerances Committee.

The following is the table Mr. Karimov generated on LNG density changes using the NIST REFPROP database. Mr. Karimov noted that density changes to LNG are negligible at 120 K with changes in pressure from the base pressure of 27.765 psi up to 200 psi.

Density Changes to LNG			
Temperature[1] (K)	**Pressure (psia)**	**Density (lb_{MASS}/gal)**	**% Density Difference[2]**
120	27.765	3.4208	0.000 %
120	30	3.4209	– 0.003 %
120	35	3.4213	– 0.015 %
120	40	3.4216	– 0.023 %
120	45	3.4219	– 0.032 %
120	50	3.4222	– 0.041 %
120	55	3.4225	– 0.050 %
120	60	3.4229	– 0.061 %
120	65	3.4232	– 0.070 %
120	70	3.4235	– 0.079 %
120	75	3.4238	– 0.088 %
120	80	3.4241	– 0.096 %
120	85	3.4245	– 0.108 %
120	90	3.4248	– 0.117 %
120	95	3.4251	– 0.126 %
120	100	3.4254	– 0.134 %
120	105	3.4257	– 0.143 %
120	110	3.4261	– 0.155 %
120	115	3.4264	– 0.164 %
120	120	3.4267	– 0.172 %
120	125	3.427	– 0.181 %
120	130	3.4273	– 0.190 %
120	135	3.4276	– 0.199 %
120	140	3.428	– 0.210 %
120	145	3.4283	– 0.219 %
120	150	3.4286	– 0.228 %
120	155	3.4289	– 0.237 %
120	160	3.4292	– 0.246 %
120	165	3.4295	– 0.254 %
120	170	3.4298	– 0.263 %
120	175	3.4302	– 0.275 %
120	180	3.4305	– 0.284 %
120	185	3.4308	– 0.292 %
120	190	3.4311	– 0.301 %

Density Changes to LNG			
Temperature[1] (K)	**Pressure (psia)**	**Density (lb_{MASS}/gal)**	**% Density Difference[2]**
120	195	3.4314	− 0.310 %
120	200	3.4317	− 0.319 %

[1]120 K (− 153 °C) (− 243 °F)
[2]Percent difference in product (pure methane) density is based on calculated variations to the base pressure of 27.765 psi using NIST REFPROP

Initially, Mr. Karimov presented his proposal to his colleagues on the NGSC. During the NGSC's deliberation on the Clean Vehicle Education Foundation's proposed changes to other Mass Flow Meters Code paragraphs (see Agenda Item 337-1), the NGSC also considered Mr. Karimov's proposal. The NGSC agreed to encourage further work beyond the current scope of their work on the CVEF's proposals. Admittedly, many of the NGSC indicated not fully comprehending the technical rationale for the Mr. Karimov's proposal. After discussions with the S&T Committee, both Committees agreed that the proposal should be vetted by the NCWM NTEP Measuring Sector and Measuring Laboratories to ensure the community understands the intent and impact of the proposed changes to paragraph S.3.6. Additionally, NIST, OWM plans to consult with its Cryogenics Group on the proposal. Based on its discussion with the S&T Committee, both Committees believe the proposal has merit and should be included in the S&T Interim Meeting report as a separate new item with Developing status.

2014 Annual Meeting: The Committee heard numerous comments suggesting the proposal remain in a Developing status. Ms. Juana Williams (NIST, OWM) commented that NIST, OWM agrees with other comments that additional review and development is needed on this proposal, particularly given the variation in composition of natural gas supplies. NIST, OWM also notes that previous S&T Committee work on this paragraph, including 1994 and 1997, should be considered. Consequently the Committee agreed to recommend this item remain Developing.

At its 2014 Annual Meetings, both CWMA and NEWMA supported continued development of this item.

On the 2014 NCWM Online Position Forum, one industry representative indicated opposition on this item with no additional comments. Emerson Process Management – Micro Motion maintains the position that further research is needed to establish with certainty the range of the possible variation of the composition and density of commercially traded Liquefied Natural Gas (LNG) before this proposed item can be considered as fully developed. Emerson provided the following input:

Emerson Process Management – MicroMotion:

The metrological validity of the proposal to convert measurements from volume measuring devices into mass units without the benefit of an automatic means to determine and correct for changes in product density due to changes in the pressure and composition of the product is fully dependent on the fundamental assumption that the composition and the associated density of commercially traded LNG will remain constant within tight limits. Because this assumption is so essential to the proposed item, all possible sources of information about the current and future potential for variability of LNG composition and density should be considered.

NCWM has recognized that the measurement of LNG is different from that of other cryogenic fluids primarily because of the uncertainty of its composition. This conclusion dates back to discussions that began when a tentative code for cryogenic liquid-measuring devices was introduced in the 1972 Report of the Committee on Specifications and Tolerances. These discussions eventually led to LNG being specifically excluded from Section 3.34. Cryogenic Liquid-Measuring Devices, as stated in paragraph A.2.

A.2. Exceptions – This Code does not apply to the following:

(c) Devices used solely for dispensing liquefied natural gas.

There is evidence to suggest that the composition of LNG can vary significantly enough to change the density by an amount that would result in errors far greater than the allowable tolerance if there is no correction made when converting from volume to mass units. As one example, on February 11, 2005, the Gas Technology Institute (GTI) issued data on LNG density in Table 3 (see attachment) of the Natural Gas Composition and Fuel Quality Information Report that indicates the specific gravity of LNG can vary by as much as 12 %. The error in specific gravity in terms of percent translates directly to an equivalent percent error in mass flow indication if density changes due to composition are not accounted for.

Furthermore, an understanding of past variability in LNG composition is not sufficient to ensure that variations of LNG composition will remain constant in the future. This new provision could create an incentive to manipulate LNG composition in order to influence measurement results in favor of one party or another in commercial transactions. Therefore, ongoing assurance of LNG composition within strict limits through enforcement would be needed to eliminate the facilitation of fraud when using volume-measuring devices to measure LNG without the benefit of an automatic means to determine and correct for changes in product density due to changes in the composition. To be considered fully developed, the proposed item should include the specific requirements for LNG composition that must be enforced whenever volume devices are uncorrected for composition changes in order to prevent the manipulation of LNG composition beyond the prescribed limits and thus ensure that the converted volume errors are within the mass measurement tolerances.

A proposed method or methods for verification of the composition and density of LNG samples must be included to complete the development of this item in order to offer jurisdictions at least one practical method to accomplish the enforcement of these LNG composition requirements for installations where volume measurements are converted into mass units without the benefit of an automatic correction for changes in product density due to changes in the composition of the product.

Finally, pressure is a variable that can be controlled by the design and operation of most delivery systems. Eliminating the requirement to include correction of volume measuring devices for changes in product density due to changes in the pressure of the product would introduce the opportunity for manipulation of the measurement results in favor of one party by adjusting system pressure. Although the effect of pressure on LNG density is relatively small, because pressure is a variable that can be easily controlled rather than random, it would be necessary to record and monitor system pressure in between inspections to prevent intentional manipulation of system pressures for the purpose of creating predominance in favor one party.

354 TAXIMETERS

354-1 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 (USNWG) 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 information and background on this item can be found in the Committee's 2013 and earlier final reports.

NCWM 2014 Interim Meeting: NIST, OWM provided an update regarding progress of the USNWG. The USNWG is conducting meetings on a regular basis to continue its work in updating the existing NIST Handbook 44 Taximeters Code. Numerous sections of the current Code are based on older technologies and may not reflect the more recent advances seen in this area. While there are no specific proposed changes to the Taximeters Code at this time, it is anticipated that some proposals will be submitted prior to the next cycle of regional meetings in 2014. Some of the proposed changes that are expected will affect requirements concerning: the need for a recording element within a system; the advancement of indications; information included on receipts; the display of customer's indications; and the use of GPS systems as a source of distance/time measurements. The next meeting of the USNWG is March 4, 2014. The Committee supports the efforts of the USNWG and looks forward to receiving proposed changes in the future.

During the 2014 NCWM Annual Meeting NIST, OWM provided the following update concerning this item:

The most recent meetings of the USNWG on Taximeters were held in March and May 2014. These meetings focused on the development of proposed changes to the NIST Handbook 44 Taximeters Code, which include:

- Changes to requirements regarding recording elements and passenger receipts;
- Amendments to requirement pertaining to the Code application;
- Specification requirements to passenger dedicated displays;
- Changes to the requirement regarding the basis of fare calculation; and
- Requirements to set parameters for the use of multiple rates in the calculation of fares.

The next meeting is scheduled for Thursday, August 7, 2014, when the USNWG will continue the development of proposed changes to NIST Handbook 44. The USNWG has developed a number of proposals that will be submitted for consideration by the S&T Committees of the Regional Weights and Measures Associations this fall. Subsequent meetings of the USNWG are planned every other month using web-conferencing to accommodate the many members who are unable to travel.

CWMA did not receive any comments from the floor on this item during their 2013 Interim Meeting and 2014 Annual Meeting. CWMA encouraged the continued work of the USNWG and reported that it looked forward to continued developments in this area and recommended that the item remain as a Developing item.

WWMA believes this item is still developing and more information is needed in the meter display and receipt requirements. More information is also needed in determining the accuracy of GPS and cell phone technology. WWMA recommended that the item remain as a Developing Item.

At their 2013 fall Interim Meeting, NEWMA reported that it recognized the USNWG on Taximeters has the task of updating a code from 1970's to reflect current technology. The USNWG still needs time to work on developments to this item so it is recommended the item remain a developing item. At their 2014 Annual Meeting, NEWMA reported that it supports further development of the Taximeter Code to address new technologies existing in the marketplace.

SWMA did not receive any comments received on this item. The SWMA supported further development by the USNWG on Taximeters.

See previous Reports of the National Conference on Weights and Measures for additional information on this item.

358 MULTIPLE DIMENSION MEASURING DEVICES

358-1 D Measurement of Bulk Material in Open-Top Truck and Trailer Units

Source:
LoadScan US (2014)

Purpose:
Develop a standardized testing protocol for a non-contact volumetric measurement instrument designed to measure loads of bulk loose solids in open-top truck and trailer units.

Item Under Consideration:
Develop new language for type classification, accuracy classification, and test methodology for load volume scanning devices.

Background/Discussion:
Laser technology allows for accurate volume measurement of bulk materials loaded on open-top truck and trailer bodies. Standard industry practice is to count loader buckets or convert from weight, both highly variable and inaccurate ways of measuring cubic volume. See Appendix F for detail on Load Scanner Metrology, Test Methods and Suitability for Use.

Contacts: Mr. Peter Russell (LoadScan US) (603) 831-6014 or peter.russell@loadscan.us and Mr. Adrian Ruthe (Loadscan Ltd.) +64 7-847-5777 or adrian@loadscan.com.

NCWM 2014 Interim Meeting: Mr. Peter Russell (LoadScan, Ltd.) and Mr. Adrian Ruthe (LoadScan, Ltd.) provided a joint presentation regarding the operation of a device that uses a scanner to measure the volume of product loaded into open-top truck and trailer units. Mr. Russell and Mr. Ruthe indicated that they were not familiar with the procedures of how to go about adding new requirements into NIST Handbook 44; nor did they know where in NIST Handbook 44, requirements intended to apply to their equipment would best fit. They asked the Committee for guidance on how best to proceed concerning these issues.

The Committee acknowledged there is not yet a specific proposal to consider and additional information and input is needed for the development of this item. The Committee agreed to designate this item as a "Developing" item on its agenda to allow time for the issue to be further developed by the submitter. The Committee noted a specific

proposal outlining recommended changes to NIST Handbook 44 is needed in order for the item to advance through the process.

While the Committee is not certain if the MDMD Code is the most appropriate code for addressing these devices, the Committee suggested the MDMD Work Group might be willing to consider this issue and provide input on further development of draft NIST Handbook 44 language. Alternatively, or in addition, the submitter may wish to contact the NTEP Weighing Sector to determine if that Sector or its' members might be able to provide additional assistance.

The Committee received a document from the submitter (titled "Load Volume Scanner, Proposals for Integration into NIST Handbook 44") that provides additional information and supporting arguments for addressing this issue, along with some recommended changes to NIST Handbook 44. The Committee has included this document in Appendix G of this report and encourages interested parties to provide input to the submitter.

2014 NCWM Annual Meeting: Mr. Rick Harshman (NIST Technical Advisor) reported that he had recently contacted LoadScan Ltd. to determine if there had been any further development of the item since the 2014 NCWM Interim Meeting and was provided the following update from Mr. Ruthe:

> LoadScan Ltd. in New Zealand is aware that the NCWM Annual Meeting is coming up. Unfortunately, the reality is we have not had the resources to be able to pursue our case this year and will not be making any submissions at the moment. We plan to engage the services of local experts within the USA to pursue this matter for us over the next year. We are also completing further background work with weights & measures authorities in New Zealand and Australia which we hope will support our drive for approval in the USA. At this state we request only to retain our "Developing Item" status.

The Committee agreed to retain the "Developing" status of the item based on the update provided by the submitter of the item and his request to do so.

At their 2014 spring meeting, CWMA supported the continued development of this item.

NEWMA reported at their 2013 Interim Meeting that it would like to see the submitter move forward with further development of this new item to explore the feasibility of this item in NIST Handbook 44. During their 2014 Annual Meeting, NEWMA recommended the item remain "Developing" until such time that the manufacturer of the equipment can provide supporting documentation relative to the performance of the device. The item also needs to be developed to address test standards, test methods, and draft language for NIST Handbook 44.

SWMA received a presentation but heard no additional comments in its Open Hearings. The submitter did have questions from members about the device itself, but there were not any comments on the item. Based on this, the SWMA recommended the item continue to be developed. SWMA forwarded the item to NCWM.

360 OTHER ITEMS

360-1 D International Organization of Legal Metrology (OIML) Report

Many issues before the OIML, the Asian-Pacific Legal Metrology Forum, and other international groups are within the purview of the Committee. The Committee has maintained an item on its report as a means of keeping NCWM members abreast of these activities, and NIST, OWM has regularly provided an update as part of this item. In recent years, rather than providing separate reports to individual Committees, NIST, OWM has begun providing a single update of activities relative to all NCWM Committees in conjunction with the Board of Directors' agenda. The Committee believes that this is the most efficient approach to keep members abreast of these activities, and based on discussions with NIST, OWM, the Committee plans to eliminate this item from its agenda beginning with the next NCWM cycle. The Committee will include a note in the preamble to its report referencing the OIML report that is provided as part of the Board of Directors' Report so that those interested in these activities can locate this information.

Additional information on OIML activities will continue to appear in the Board of Directors agenda and Interim and Final Reports and on the OIML website at www.oiml.org. NIST, OWM staff will continue to provide the latest updates on OIML activities during the BOD's Open Hearings at NCWM meetings. For more information on specific OIML related device activities, contact the NIST, OWM staff listed in the table below. The list below of OIML projects only represents active projects.

NIST Office of Weights and Measures Staff Contact List for International Activities	
Contact Information	**Responsibilities**
Mr. John Barton –LMDP Phone: (301) 975-4002 Email: john.barton@nist.gov	• R 21 *Taximeters* • R 50 *Continuous Totalizing Automatic Weighing Instruments (Belt Weighers)* • R 60 *Metrological Regulations for Load Cells* • R 106 *Automatic Rail-weighbridges*
Mr. Kenneth Butcher –LMP Phone: (301) 975-4859 Email: k.butcher@nist.gov	• TC 6 *Prepackaged Products*
Dr. Charles Ehrlich –ILMP Phone : (301) 975-4834 Email : charles.ehrlich@nist.gov	• International Committee of Legal Metrology Member for the United States • V1 *International Vocabulary of Terms in Legal Metrology* • V2 *International Vocabulary of Basic and General Terms in Metrology* • B 3 *OIML Certificate System for Measuring Instruments* • B 6 *OIML Directives for the Technical Work* • B 10 *Framework for a Mutual Acceptance Arrangement on OIML Type Evaluations* • TC 3/SC 5 *Expression of Uncertainty in Measurement in Legal Metrology Applications, Guidelines for the Application of ISO/IEC 17025 to the Assessment of Laboratories Performing Type Evaluation Tests* • TC 3 *Metrological Control* • ISO/IEC *Guide to the Expression of Uncertainty in Measurement*
Mr. Richard Harshman –LMDP Phone: (301) 975-8107 Email: richard.harshman@nist.gov	• R 51 *Automatic Catchweighing Instruments* • R 61 *Automatic Gravimetric Filling Instruments* • R 76 *Non-automatic Weighing Instruments* • R 107 *Discontinuous Totalizing Automatic Weighing Instruments* (totalizing hopper weighers) • R 134 *Automatic Instruments for Weighing Road Vehicles In-Motion and Measuring Axle Loads*
Ms. Diane Lee –LMDP Phone: (301) 975-4405 Email: diane.lee@nist.gov	• R 59 *Moisture Meters for Cereal Grains and Oilseeds* • R 92 *Wood Moisture Meters – Verification Methods and Equipment* • TC 17/SC 8 *Protein Measuring Instruments for Cereal Grains and Oil Seeds*

NIST Office of Weights and Measures Staff Contact List for International Activities	
Contact Information	**Responsibilities**
Mr. Ralph Richter –ILMP Phone: (301) 975-3997 Email: ralph.richter@nist.gov	• D 11 *General Requirements for Measuring Instruments – Environmental Conditions* • R 35 *Material Measures of Length for General Use* • R 49 *Water Meters* (Cold Potable Water and Hot Water Meters) • R 71 *Fixed Storage Tanks* • R 80 *Road and Rail Tankers* (static measurement) • R 85 *Automatic Level Gauges for Measuring the Level of Liquid in Fixed Storage Tanks* • R 95 *Ship's Tanks* • R 117 *Measuring Systems for Liquids Other Than Water* (all measuring technologies) • R 118 *Testing Procedures and Test Report Format for Pattern Examination of Fuel Dispensers for Motor Vehicles* • TC 3/SC 4 *Verification Period of Utility Meters Using Sampling Inspections* • R 137 *Gas Meters* (all measuring technologies) • R 140 *Measuring Systems for Gaseous Fuel* (i.e., large pipelines) • ISO TC 30/SC 7 *Water Meters*
Dr. Ambler Thompson –ILMP Phone: (301) 975-2333 Email: ambler@nist.gov	• V1 *International Vocabulary of Terms in Legal Metrology* • D 16 *Principles of Assurance of Metrological Control* • D 19 *Pattern Evaluation and Pattern Approval* • D 20 *Initial and Subsequent Verification of Measuring Instruments and Processes* • D 27 *Initial Verification of Measuring Instruments Using the Manufacturer's Quality Management System* • D 31 *General Requirements for Software Controlled Measuring Instruments* • R 34 *Accuracy Classes of Measuring Instruments* • R 46 *Active Electrical Energy Meters for Direct Connection of Class 2*
Ms. Juana Williams –LMDP Phone: (301) 975-3989 Email: juana.williams@nist.gov	• R 81 Dynamic Measuring Devices and Systems for Cryogenic Liquids • R 139 Compressed Gaseous Fuels Measuring Systems for Vehicles

List of Acronyms

B	Basic Publication	LMDP	Legal Metrology Devices Program
CIML	International Committee of Legal Metrology	P	Project
D	Document	R	Recommendation
ILMP	International Legal Metrology Program	SC	Subcommittee
LMP	Laws and Metrics Program	TC	Technical Committee

Contact Point: See contacts listed in the table above for specific technical areas.

Regional Association Comments:
CWMA supports the work of OIML and suggests this remain as a Developing item.

WWMA thanks NIST for their work in the International arena and looks forward to future updates. FYI, the next OIML meeting will be in Vietnam in 2013. The WWMA recommended that the item remain as a Developing item.

NEWMA recognized the importance of this item and recommended that it remain as a Developing item.

SWMA did not receive comments on this item and recommended further development. The SWMA continues to support these issues.

See previous Reports of the National Conference on Weights and Measures for additional information on this item.

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 its 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. Either the SD memory card can 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.

Grain Analyzer Sector 2011Meeting: The Sector agreed by consensus that the following changes to Table S.2.5. of Section 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.

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

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

NIST, OWM also reported that it planned to develop draft language and ask for input from the various Sectors at their upcoming meetings.

Additional information and background on this item can be found in the Committee's 2013 final report.

NCWM 2014 Interim Meeting: The SMA indicated that the language in the "Item Under Consideration" is acceptable.

The Committee received comments from the Measuring Sector indicating opposition to the proposed language and suggesting that the current definition is adequate. The Committee also heard comments from NIST, OWM expressing concern that the proposed language does not clearly define when a device is considered "remotely configurable." NIST, OWM noted that it is continuing to develop this issue and has approached the various NTEP Sectors for additional input regarding the capabilities of new technology with regard to metrologically significant adjustments. During their 2013 meeting, the Weighing Sector asked its members to assist NIST, OWM in identifying the various types of removable storage media used in weighing equipment.

The Committee acknowledged comments from NIST, OWM expressing concern that the issue be carefully considered to avoid unintentional consequences. The Committee agreed to maintain the Developing status of item in consideration of the ongoing work of NIST, OWM to further develop this item.

NCWM 2014 Annual Meeting: NIST, OWM commented that it does not believe the proposed changes to the definition of "remote configuration capability" are appropriate, but doesn't have an alternative to offer at this time. NIST, OWM plans to continue work on this item after the 2014 NCWM Annual meeting. The Committee again agreed to maintain the Developing status of item in consideration of the ongoing work of NIST, OWM to further develop this item.

The SMA supported the intent of the item and looked forward to further clarification of the requirements.

CWMA agreed in 2013 that remote configuration capability may need to be addressed in the General Code and supported this as a Developing Item at both the 2013 CWMA Interim Meeting and 2014 CWMA Annual Meeting.

WWMA believes this item needs further development and should consider the effects on other device types. WWMA encourages NIST, OWM to develop draft language and ask for input from various Sectors at their upcoming meetings. The WWMA recommended that the item remain as a Developing Item.

NEWMA members were encouraged by NIST at the 2013 NCWM Annual Meeting to consider this work as it applies to all device types. NEWMA supported this item as a Developing Item in 2013 and 2014.

SWMA did not receive comments on this item and recommended further development.

See previous Reports of the National Conference on Weights and Measures for additional information on this item.

360-3 D Electric Vehicle Fueling and Submetering

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

Purpose:
Keep the weights and measures community apprised of work to develop standards for Electric Vehicle Fueling and Submetering (EVF&S) and to encourage their participation in this work.

Item Under Consideration:
The U.S. National Work Group (USNWG) for Electric Vehicle Fueling and Submetering is developing proposed specifications, tolerances, and other technical requirements for Electric Vehicle Fueling and Submetering Systems for inclusion in NIST Handbook 44. The code currently under development by the USNWG is included in

Appendix H; however, this draft is NOT yet ready for consideration by the NCWM. The USNWG plans to complete revisions to this document and submit a final draft version to the regional weights and measures associations by fall 2014.

Background/Discussion:
In 2013, the NCWM adopted a uniform method of sale for retail electrical energy sold as a vehicle fuel. Adding specifications, tolerances, and other technical requirements for equipment that measures electricity as a motor fuel are necessary to provide consumer confidence that measurement of electricity is accurate and that there is sufficient information for the selection of charging equipment, (Levels I, II, and III), and price to pay.

The USNWG EVF&S discussed a number of challenges to field inspection and testing of EVSE systems. Utility companies and at least one U.S. Weights and Measures jurisdiction have established test procedures and test equipment specifications for utility-type and submetering electrical energy metering applications.

The USNWG EVF&S was formed to develop proposed requirements for commercial electricity-measuring devices (including those used to measure and sell electricity commercially delivered as vehicle fuel and those used in submetering electricity at residential and business locations) and to ensure that the prescribed methodologies and standards facilitate measurements that are traceable to the International System of Units (SI).

The "West Coast Electric Highway" is a project with an extensive network of electric vehicle DC fast charging stations located every 25 miles to 50 miles along Interstate 5 and other major roadways in the Pacific Northwest. In California alone, there are currently 1387 electric charging stations and over one million plug-in electric vehicles (PEV) are projected to be on California roads by 2020. The development of standards for PEV charging equipment is needed to provide consumers with fueling experiences and expectations similar to those at traditional gasoline dispensers.

Additionally, these standards, once they are developed and adopted, will be used to provide training and education to weights and measures officials about testing and regulating these devices, and support uniform standards and enforcement of these standards throughout the United States.

See Appendix H for a Tentative Code being considered by the USNWG EVF&S.

NCWM 2014 Interim Meeting: Ms. Juana Williams (NIST, OWM), Technical Advisor to the USNWG EVF&S reported that the USWNG met two weeks prior to the Interim Meeting and is continuing work on a draft code for eventual inclusion in NIST Handbook 44. Ms. Williams emphasized that because the USNWG has additional work to complete on various portions of the draft code, the draft is not ready for consideration by the NCWM. The draft included in NCWM Publication 15 has been revised and will be made available on the NIST, OWM web site. The USNWG will hold several meetings over the next six months and plans to submit a final draft in fall 2014.

Ms. Tina Butcher (NIST, OWM), Chairman of the USNWG, asked that state and local jurisdictions provide contact information of appropriate personnel from their corresponding public utility to assist the WG in identifying specific requirements that apply to EVSE in their jurisdictions.

The Committee acknowledged the need for EVSE Industry to participate in the NCWM process. This need was also expressed through comments heard during the Open Hearings. The Committee heard additional comments from a member of the WG who noted that a limited number of weights and measures officials are members of the WG and encouraged more to participate.

The Committee agreed forward to further work by the USNWG and agreed to designate this as a Developing item.

NCWM 2014 Annual Meeting: Ms. Butcher provided a short presentation updating the NCWM membership on the progress of the USNWG in developing a draft code. Mrs. Butcher's presentation provided an overview of:

- the types of commercial electric vehicle fueling equipment;

- key objectives of the USNWG;
- the method of sale requirements that were adopted in 2013;
- the development of device requirements; and
- the test equipment that will be needed and the test procedures that will likely need to be applied to verify device performance.

Ms. Butcher advised that the USNWG is developing separate draft codes for proposed inclusion in NIST Handbook 44: one code to address electric vehicle refueling and one code to address other submetering applications subject to regulation by weights and measures jurisdictions. The USNWG plans to have the draft code for electric vehicle refueling systems ready for submission to the fall 2014 regional weights and measures associations with a request that the regional associations consider recommending it for a vote in the 2015 cycle. The USNWG hopes that the Committee will consider designating this item as a Voting item in January 2015 and recommend the draft code for adoption in July 2015. As also noted during Ms. Butcher's presentation, the USNWG will continue its work to finalize recommended requirements and test procedures for this equipment.

The Committee also heard a number of comments from regulatory officials in appreciation of the work NIST, OWM and others had done thus far in developing the draft code while also acknowledging the need to have such a standard in place to be able to inspect and test such equipment.

The Committee agreed to maintain the "Developing" status of this item and looks forward to the completion of a draft code by the USNWG.

Regional Association Comments:
Interim 2013 Meeting and 2014 Annual Meeting: The CWMA agreed to forward the item to NCWM recommending it as a Developing item.

Annual 2014 Meeting: NEWMA recommended maintaining the Developing status of this item and reported that it supports the ongoing work of the WG.

The WWMA recognized that the draft tentative Code is still under development by the USNWG. The WWMA recommends all jurisdictions review the draft tentative Code and provide comments to the WG. The WWMA recommended that the item remain as a Developing Item.

SWMA did not receive any comments. The SWMA recommends the item remain as a Developing Item. The SWMA forwarded the item to NCWM.

Mr. Brett Gurney, Utah | Committee Chair
Mr. Mahesh Albuquerque, Colorado | Member
Ms. Jane Zulkiewicz, Town of Barnstable, MA | Member
Dr. Matthew Curran, Florida | Member
Mr. Ivan Hankins, Iowa | Member
Mr. Luciano Burtini, Measurement Canada | Canadian Technical Advisor
Ms. Tina Butcher, NIST, OWM | NIST Technical Advisor
Mr. Rick Harshman, NIST, OWM | NIST Technical Advisor

Specifications and Tolerances Committee

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