

## NEWMA Specifications and Tolerances (S&T) Committee 2015 Annual Report

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Town of Barnstable, MA Weights and Measures

### 300 INTRODUCTION

The S&T Committee (hereinafter referred to as the “Committee”) submits this Committee Interim Report for consideration by National Conference on Weights and Measures (NCWM). This report contains the items discussed and actions proposed by the Committee during its Interim Meeting in Dayton Beach, Florida, January 18-21, 2015. The report will address the following items in Table A during the Annual Meeting. Table A identifies the agenda items by reference key, title of item, and page number and addresses the appendices by appendix designations and page number. The acronyms for organizations and technical terms used throughout the report are identified in Table B. The headings and subjects apply to NIST Handbook 44 *Specifications, Tolerances, and Other Technical Requirements for Weighing and Measuring Devices, 2015 Edition*. The first three digits of an item’s reference key 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; **(I) Informational 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**(V) Voting Item:** the Committee is making recommendations requiring a vote by the active members of NCWM; **(W) Withdrawn Item:** the item has been removed from consideration by the Committee.

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 will entertain any requests from the floor to remove specific items from the consent calendar to be discussed and voted upon individually.

Committees may change the status designation of agenda items (Developing, Informational, Voting, and Withdrawn) up until the time that the report is adopted, except that items which are marked Developing, Informational or Withdrawn cannot be changed to Voting Status. Any change from the Committee Interim Report (as contained in this publication) or from what appears on the addendum sheets will be explained to the attendees prior to a motion and will be acted upon by the active members of NCWM prior to calling for the vote.

An “Item Under Consideration” is a statement of proposal and not necessarily a recommendation of the Committee. Suggested revisions are shown in **bold face print** by ~~striking-out~~ information to be deleted and underlining information to be added. Requirements that are proposed to be nonretroactive are printed in ***bold faced italics***. Additional letters, presentations, and data may have been part of the Committee’s consideration. Please refer to <http://www.ncwm.net/meetings/annual/publication-16> to review these documents.

**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.

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**Subject Series List**


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Introduction .....	300 Series
NIST Handbook 44 – General Code.....	310 Series
Scales.....	320 Series
Belt-Conveyor Scale Systems .....	321 Series
Automatic Bulk Weighing Systems .....	322 Series
Weights.....	323 Series
Automatic Weighing Systems .....	324 Series
Liquid-Measuring Devices .....	330 Series
Vehicle-Tank Meters .....	331 Series
Liquefied Petroleum Gas and Anhydrous Ammonia Liquid-Measuring Devices .....	332 Series
Hydrocarbon Gas Vapor-Measuring Devices.....	333 Series
Cryogenic Liquid-Measuring Devices.....	334 Series
Milk Meters .....	335 Series
Water Meters .....	336 Series
Mass Flow Meters .....	337 Series
Carbon Dioxide Liquid-Measuring Devices.....	338 Series
Hydrogen Gas-Metering Devices – Tentative Code.....	339 Series
Vehicle Tanks Used as Measures .....	340 Series
Liquid Measures .....	341 Series
Farm Milk Tanks .....	342 Series
Measure-Containers.....	343 Series
Graduates.....	344 Series
Dry Measures .....	345 Series
Berry Baskets and Boxes.....	346 Series
Fabric-Measuring Devices.....	350 Series
Wire-and Cordage-Measuring Devices .....	351 Series
Linear Measures .....	352 Series
Odometers .....	353 Series
Taximeters.....	354 Series
Timing Devices .....	355 Series
Grain Moisture Meters .....	356 Series
Near-Infrared Grain Analyzers.....	357 Series
Multiple Dimension Measuring Devices .....	358 Series
Electronic Livestock, Meat, and Poultry Evaluation Systems and/or Devices – Tentative Code.....	359 Series
Other Items – Developing Items.....	360 Series

**Table A**  
**Table of Contents**

Reference Key	Title of Item	S&T Page
<b>300</b>	<b>INTRODUCTION .....</b>	<b>1</b>
<b>310</b>	<b>HANDBOOK 44 - GENERAL CODE .....</b>	<b>6</b>
310-1	D G-S.1. Identification. – (Software) .....	6
310-2	V G-UR.4.1. Maintenance of Equipment. ....	13
<b>320</b>	<b>SCALES.....</b>	<b>16</b>
320-1	W A.1. General.....	16
320-2	V T.N.3.5. Separate Main Elements. ....	21
320-3	W Table 7a. Typical Class or Type of Device for Weighing Applications .....	22
320-4	V Part 2.20. Weigh-In-Motion Vehicle Scales for Law Enforcement – Work Group.....	24
<b>321</b>	<b>BELT-CONVEYOR SCALE SYSTEMS .....</b>	<b>27</b>
321-1	V A.1. General.....	27
321-2	V S.4. Marking Requirements. ....	30
321-3	V N.2.1. Initial Verification.....	33
321-4	V N.2.3. Minimum Test Load. ....	37
321-5	V N.3.1.1. Determination of Zero.....	40
321-6	V UR.1.2. Conveyor Installation. ....	43
321-7	V UR.3.1. Scale and Conveyor Maintenance. – <del>Belt conveyor scales</del> Weighing systems. ....	45
321-8	V Appendix D – Definitions. weigh-belt systems. ....	48
<b>322</b>	<b>AUTOMATIC BULK WEIGHING SYSTEMS .....</b>	<b>51</b>
322-1	D N.1. Testing Procedures.....	51
<b>324</b>	<b>AUTOMATIC WEIGHING SYSTEMS.....</b>	<b>58</b>
324-1	W A.1. General.....	58
<b>330</b>	<b>LIQUID MEASURING DEVICES .....</b>	<b>59</b>
330-1	W A.1. General.....	59
330-2	V Table S.2.2. Categories of Device and Methods of Sealing.....	60
330-3	D N.4.1.3. Normal Tests on Wholesale Multi-Point Calibration Devices. ....	64
330-4	D N.4.2.5. Determination of Error on Wholesale Devices with Multiple Flow Rates and Calibration Factors .....	68
<b>331</b>	<b>VEHICLE-TANK METERS .....</b>	<b>74</b>
331-1	D N.4.1.4. Normal Tests on Wholesale Multi-Point Calibration Devices. ....	74
331-2	D N.4.2.1. Determination of Error on Vehicle-Tank Meters with Multiple Flow Rates and Calibration Factors .....	76
<b>332</b>	<b>LPG AND ANHYDROUS AMMONIA LIQUID-MEASURING DEVICES.....</b>	<b>80</b>
332-1	I 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.....	80
332-2	D N.3. Test Drafts. ....	97
<b>337</b>	<b>MASS FLOW METERS .....</b>	<b>100</b>
337-1	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.....	100
337-2	W	S.3.6. Automatic Density Compensation.....	125
337-3	D	N.3. Test Drafts. ....	129
<b>354</b>		<b>TAXIMETERS .....</b>	<b>131</b>
354-1	V	S.1.1.1. Recording Elements.....	131
354-2	V	S.1.2. Advancement of Indicating Elements.....	135
354-3	V	S.1.3.3. Passenger Indications. ....	138
354-4	V	S.1.8. Protection of Indications.....	140
354-5	V	S.1.9. Recorded Representation. ....	142
354-6	D	USNWG on Taximeters – Taximeter Code Revisions and Global Positioning System- Based Systems for Time and Distance Measurement .....	144
<b>358</b>		<b>MULTIPLE DIMENSION MEASURING DEVICES .....</b>	<b>147</b>
358-1	W	Measurement of Bulk Material in Open-Top Truck and Trailer Units .....	147
<b>360</b>		<b>OTHER ITEMS.....</b>	<b>148</b>
360-1	W	Appendix D – Definitions: batching system. ....	148
360-2	D	Appendix D – Definitions: calibration parameter and multi-point calibrated device. ....	150
360-3	V	Appendix D – Definitions. point-of-sale-system. ....	152
360-4	D	Appendix D – Definitions: Remote Configuration Capability .....	154
360-5	V	Electric Vehicle Fueling and Submetering .....	158

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## Appendices

A	Item 310-2: Background Information Provided by Mr. Henry Oppermann, Technical Director Seraphin Test Measure Company, A Division of Pemberton Fabricators, Inc. ....	A1
B	Items 320-1, 324-1, 330-1, and 360-1 Comments by Henry Oppermann, Weights and Measures Consulting ..	B1
C	Item 320-4 Draft Tentative Code Applicable to Weigh-In-Motion Systems Used for Vehicle Enforcement Screening .....	C1
D	Item 330-4 N.4.2.5. Determination of Error on Whole Sale Devices with Multiple Flow Rates and Calibration Factors .....	D1
E	Item 331-2: N.4.2.1. Determination of Error on Vehicle-Tank Meters with Multiple Flow Rates and Calibration Factors .....	E1
F	Agenda Item 337-1: Submitters Background and Justification for Handbook 44 Definition of “Diesel Gallon Equivalent (DGE)” of Compressed Natural Gas (CNG) and Liquefied Natural Gas (LNG) as a Vehicular Fuel .....	F1
G	Item 337-2: Mass Flow Meters Code Paragraph S.3.6. Automatic Density .....	G1
H	Item 360-5: Electric Vehicle Fueling and Submetering Draft Code.....	H1
I	Item 360-5: Electric Vehicle Fueling and Submetering / Amendments to Timing Devices Code .....	I1

**Table B**  
**Glossary of Acronyms and Terms**

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

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**Details of All Items**  
*(In order by Reference Key)*

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## **310 HANDBOOK 44 - GENERAL CODE**

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

**Source:**

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

**Purpose:**

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

**Item Under Consideration:**

Amend NIST Handbook 44: G-S.1. Identification 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) ~~a National Type Evaluation Program (NTEP) Certificate of Conformance (CC) number or a corresponding CC Addendum Number for devices that have a CC.~~

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

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

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

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

(b) *The CC Number shall be:*

(1) *permanently marked on the device;*

(2) *continuously displayed; or*

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

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

*[Nonretroactive as of January 1, 2004]*

(Added 2003) (Amended 2006 **and 20XX**)

#### **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 2013.



Just prior to the 2013 NCWM Annual Meeting, the Software Sector forwarded a modified version of paragraph G-S.1. for consideration, which included changes that the Sector had agreed were needed when it met in March 2013. The modified language, which is that shown in “Item Under Consideration,” includes 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.

In comments provided to the Committee, the Software Sector indicated that they considered the item sufficiently developed. The Sector noted that since the 2012 meeting, it had tried to promote this item using several means to attempt to address the concerns of other interested parties. For example, a presentation was generated and shared with the SMA at its 2012 meeting. Additionally, most of the regional weights and measures associations had access to this information prior to their meetings, since the proposal was posted on the NCWM website. Unfortunately, based on the comments from the fall 2012 regional association meetings, some regional associations were not aware that this information had been made available. The Sector also noted that they may want to consider more direct methods for sharing information with other groups, such as designating a representative to address the regional groups or other sectors at their meetings. An additional option would be to provide a presentation at the the NCWM Annual Meeting.

At the 2013 NCWM Annual Meeting one state director suggested that consideration be given to changing the status of the item to informational. In considering this suggestion, the Committee agreed that the change might be appropriate; however, decided instead to seek input from the NTEP Sectors and industry associations before making that decision. Consequently, the Committee requested that the sectors and industry associations review the Software Sector’s latest proposal at their next meetings. (See the Committee’s 2013 Final Report for details.)

At the 2014 NCWM Interim Meeting the SMA commented that it continues to support the work of the Software Sector and encourages communications with the other device sectors. NIST OWM raised two concerns and provided additional feedback on the modified proposal. For details, see the 2014 S&T Committee’s Interim Report.

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.

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. 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. 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. 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.

**NTEP Weighing and Software Sectors - Joint Meeting (August 2014):**

Members of the Weighing and Software Sectors agreed at their August 2014 joint meeting to recommend that the proposal shown in “Item Under Consideration” for S&T Agenda Item 310-1 Identification of Software be changed to read as follows:

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

- (a) the name, initials, or trademark of the manufacturer or distributor;
- (b) a model identifier that positively identifies the pattern or design of the device;
  - (1) *The model identifier shall be prefaced by the word “Model,” “Type,” or “Pattern.” These terms may be followed by the word “Number” or an abbreviation of that word. The abbreviation for the word “Number” shall, as a minimum, begin with the letter “N” (e.g., No or No.). The abbreviation for the word “Model” shall be “Mod” or “Mod.” Prefix lettering may be initial capitals, all capitals, or all lowercase.*  
[Nonretroactive as of January 1, 2003]  
(Added 2000) (Amended 2001)
- (c) *a nonrepetitive serial number, except for equipment with no moving or electronic component parts and ~~not built for purpose software based software devices~~ software;*  
[Nonretroactive as of January 1, 1968]  
(Amended 2003)
  - (1) *The serial number shall be prefaced by words, an abbreviation, or a symbol, that clearly identifies the number as the required serial number.*  
[Nonretroactive as of January 1, 1986]
  - (2) *Abbreviations for the word “Serial” shall, as a minimum, begin with the letter “S,” and abbreviations for the word “Number” shall, as a minimum, begin with the letter “N” (e.g., S/N, SN, Ser. No., and S. No.).*  
[Nonretroactive as of January 1, 2001]
- (d) *the current software version or revision identifier for not-built-for-purpose software-based devices; manufactured as of January 1, 2004 and all software-based devices or equipment manufactured as of January 1, 2020:*  
~~[Nonretroactive as of January 1, 2004]~~  
(Added 2003) (Amended 20XX)
  - (1) *The version or revision identifier shall be:*
    - i. *prefaced by words, an abbreviation, or a symbol, that clearly identifies the number as the required version or revision;*  
[Nonretroactive as of January 1, 2007]  
(Added 2006)

*Note: If the equipment is capable of displaying the version or revision identifier but is unable to meet the formatting requirement, through the NTEP type evaluation process,*

other options may be deemed acceptable and described in the CC.  
(Added 20XX)

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

iii. continuously displayed or 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 providing the device does not have an integral interface to communicate the version or revision identifier.

[Nonretroactive as of January 1, 2020]  
(Added 20XX)

(2) Abbreviations for the word “Version” shall, as a minimum, begin with the letter “V” and may be followed by the word “Number.” Abbreviations for the word “Revision” shall, as a minimum, begin with the letter “R” and may be followed by the word “Number.” The abbreviation for the word “Number” shall, as a minimum, begin with the letter “N” (e.g., No or No.). Prefix lettering may be initial capitals, all capitals, or all lowercase.  
[Nonretroactive as of January 1, 2007]  
 (Added 2006)

(e) *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)

The two sectors also agreed to recommend there be no changes to paragraph G-S.1.1. The Software Sector had earlier proposed changes to G-S.1.1., however, it was decided during the joint meeting that no changes to G-S.1.1. were necessary since the two sectors had agreed that the term “not-built-for-purpose software-based devices” in G-S.1.(d) would be retained.

In consideration of the advancements made at the joint meeting in further developing this item, the sectors agreed to recommend that the “Developing” status of the item be changed to “Informational” and that the revised draft of G-S.1. be forwarded to the different regional associations for consideration.

### **2015 NCWM Interim Meeting:**

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

Mr. Michael Keilty (Endress Hauser Flowtec AG), Chairman of the Measuring Sector, reported that Measuring Sector would be meeting with the Software Sector next October (2015) to consider the proposal.

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

**Regional Association Comments:**

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

SWMA indicated last year that if no progress had been made by the next cycle this item should be withdrawn. While there were no specific updates provided there were comments indicating progress had been made by the Software and Weighing Sectors. The Committee did not hear any comments in opposition to this item. As a result, the Committee recommends this item remain a Developing Item if those specific updates are provided to the NCWM S&T Committee at the NCWM Interim meeting in January 2015.

NEWMA recommended that the item be Withdrawn as no new information has been brought forward. If the Software sector continues their work on this item and wants to bring this forward again with new information; the committee could reconsider the item.

The CWMA recommended leaving this as a Developing item due to the lack of new information from the Software Sector.

<b>NEWMA Action: Item 310-1</b>
<b>Summary of comments considered by the regional committee (in writing or during the open hearings):</b>
A comment was made whether the proposal would exempt software from being required to have a serial number. The committee believes that the current proposal would exempt software.
<b>Item as proposed by the regional committee: (If different than agenda item)</b>
<b>Committee recommendation to the region:</b> Voting Item on the NCWM Agenda <input type="checkbox"/> Information Item on the NCWM Agenda <input type="checkbox"/> Withdraw the Item from the NCWM Agenda ( <i>In the case of new items, do not forward to NCWM</i> ) <input checked="" type="checkbox"/> Developing Item on the NCWM Agenda ( <i>To be developed by source</i> )
<b>Reasons for the committee recommendation:</b>
Testimony supports keeping this item as developing. Significant progress has been made by the software sector with notable changes. However a comment was made recommending withdrawal of this item next year unless further developments occur as this item has been on the S&T agenda since 2007.
<b>COMPLETE SECTION BELOW FOLLOWING VOTING SESSION</b>
<b>Final updated or revised proposal from the region: (If different than regional committee recommendation)</b>
<b>Regional recommendation to NCWM for item status:</b> <input type="checkbox"/> Voting Item on the NCWM Agenda <input type="checkbox"/> Information Item on the NCWM Agenda <input type="checkbox"/> Withdraw the Item from the NCWM Agenda ( <i>In the case of new items, do not forward to NCWM</i> ) <input checked="" type="checkbox"/> Developing Item on the NCWM Agenda ( <i>To be developed by source</i> ) <input type="checkbox"/> Unable to consider at this time ( <i>Provide explanation in the "Additional Comments" section below</i> )

**Regional Report to NCWM:**

Due to ongoing work regarding this item NEWMA recommends it remain developing.

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

**310-2 V G-UR.4.1. Maintenance of Equipment.****Source:**

Florida Department of Agriculture and Consumer Services (2015)

**Purpose:**

To further clarify the applicability of the General Code to device types or flow rates at a single facility.

**Item Under Consideration:**

Amend NIST Handbook 44 General Code as follows:

**G-UR.4.1 Maintenance of Equipment** – All equipment in service and all mechanisms and devices attached thereto or used in connection therewith shall be continuously maintained in proper operating condition throughout the period of such service. Equipment in service at a single place of business **(including, but not limited to, equipment of the same type or application)** found to be in error predominantly in a direction favorable to the device user shall not be considered “maintained in a proper operating condition.” ~~(see also Introduction, Section Q)~~

**Background / Discussion:**

It is not uncommon for a single place of business to have in use different types of devices (or meters with different flow rates) at the same time. A truck stop may have retail meters for passenger vehicles and high-volume meters for commercial vehicles, both having different tolerances and essentially operating as separate sections at a single place of business. As this section is currently written, it would include both of these meters types under ‘equipment’ and thus apply ‘predominantly in favor’ across all meters, despite the fact that one group of these meters could be predominantly in favor of the vendor while the other is not, thus leaving the weights and measures official without the ability to correct such a situation under the general code. Similar situations may exist with scales and other measuring devices. Further clarifying ‘equipment’ to apply to the same type or application use in this section would alleviate that potential. Consequently, the submitter of the item proposed the following amendments to paragraph G-UR.4.1.:

**G-UR.4.1 Maintenance of Equipment** – All equipment in service and all mechanisms and devices attached thereto or used in connection therewith shall be continuously maintained in proper operating condition throughout the period of such service. Equipment **of the same type or application** in service at a single place of business found to be in error predominantly in a direction favorable to the device user (see also Introduction, Section Q) shall not be considered “maintained in a proper operating condition.”

**2015 NCWM Interim Meeting:**

During the S&T Committee open hearings at the 2015 NCWM Interim Meeting, there were a number of concerns raised regarding the impact this proposal might have on the application of the paragraph as it relates to predominance. There were also a number of state weights and measures officials who spoke in support of the proposed change. Mrs. Tina Butcher (OWM) commented that OWM believes the current language in G-UR.4.1. is adequately broad to provide jurisdictions the flexibility of being able to establish policies and guidelines for assessing “predominance.” However, if the Committee believes that a change is needed to this paragraph to assist jurisdictions who are having difficulty enforcing the requirements; the current proposal might be too restrictive. The current language would limit how a jurisdiction can apply the requirement and would not enable other groupings or

attributes to be considered. For example, if a gasoline station sets its most frequently used dispensers to operate in the station's favor, the proposed language would not allow the jurisdiction to apply the requirement and consider this to be a scenario of "predominance." OWM offered the following alternative language for consideration should the Committee decide changes were needed:

**G-UR.4.1 Maintenance of Equipment** – All equipment in service and all mechanisms and devices attached thereto or used in connection therewith shall be continuously maintained in proper operating condition throughout the period of such service. Equipment in service at a single place of business found to be in error predominantly in a direction favorable to the device user (including, but not limited to, equipment of the same type or application) shall not be considered "maintained in a proper operating condition." ~~(see also Introduction, Section Q)~~

Mrs. Butcher also noted that the reference to "Introduction, Section Q" should be deleted from the paragraph because the Introduction Section of HB 44 was amended in 2013 resulting in Section M. being deleted and subsequent sections renumbered. Consequently, Section P. is now the correct reference, but referencing it in G-UR.4.1. is of no benefit in OWM's view.

Dr. Matthew Curran (FL), submitter of the item, reported that the marketplace has changed over the years, and today, many facilities are multi-dimensional with respect to commodities they sell (e.g., a business might sell gasoline out front along with diesel through high-flow meters in the back, while selling frozen yogurt, meats, etc., by weight inside) as opposed to offering just one particular product or commodity as in the past. Thus, many facilities now have multiple different types of weighing and measuring devices in use at the same place of business. He went on to state that if a business of this nature had all devices of one particular device type set on the negative or short side (for whatever reason), but each device was within tolerance and the other devices of other types were random, the number of those affected devices of that particular type wouldn't constitute 'predominance.' For example, if six diesel meters in the truck lanes out back were all on the short side (set that way because they made the most money from them or for whatever reason), but were within tolerance and the 12 retail meters out front and the five scales inside were random, the six diesel meters all on the short side would not constitute 'predominance' at that location and the jurisdiction could not address the issue. In such instances, the jurisdiction would have no mechanism to remove those devices from service, but if the code was changed to address today's marketplace, jurisdictions would have a mechanism to address this problem. Further, jurisdictions could still look at the total number of devices regardless of type, thus making this language more flexible overall and not more restrictive. Dr. Curran specifically added that although NIST stated this language was more restrictive, it was actually less restrictive and gave the jurisdiction definitive authority to do what many were already doing in this regard. Dr. Curran went on to state that this issue was also introduced by Julie Quinn (MN) last year in a proposal for the LMD Code, but the S&T Committee stated it felt it would be more appropriate to address this in the General Code.

Mr. Henry Oppermann (Weights and Measures Consulting, LLC) speaking on behalf of Seraphin Test Measure Company, noted that predominance is typically applied to the errors that result from the testing of retail motor fuel dispensers at a gas station. Proposals to provide guidance and promote uniformity in the assessment of the predominance of error, particularly regarding retail motor fuel devices, have been addressed several times over the years by the S&T Committee. He reported that Seraphin (Test Measure Company) supports the efforts to achieve greater uniformity in the interpretation and assessment of the predominance in errors. Mr. Oppermann provided background information containing excerpts from a draft training manual, "Introduction to Liquid Measuring Devices," that had been prepared for the NIST Office of Weights and Measures that provide an indication of the effects of temperature on test results for liquid measuring systems. This information has been inserted in Appendix A of this report. Mr. Oppermann also provided a copy of one state's policy in applying existing HB 44 requirements associated with predominance to commercial retail dispensers.

Mr. Kurt Floren (LA County, CA) voiced opposition to the proposed changes noting that predominance applies not only to retail motor fuel dispensers, but also to other weights and measures equipment, e.g. scales, etc. He suggested possibly focusing in on the different applications and inserting requirements into the different codes of HB 44 to address this concern. After Dr. Matthew Curran (FL) provided a more detailed explanation of the intent of the proposed change, Mr. Floren added that he appreciated the clarification and did not have that understanding when he voiced his opposition, but now understands the concerns this issue addresses.

The SMA provided comment in opposition to the item noting that while it understands the intent of the item, it feels the existing language is sufficient to address the concern.

Ms. Julie Quinn (MN) spoke in support of this item and provided related examples from grocery stores in her state. Ms. Quinn mentioned her similarly proposed item last year for the liquid measuring device code that the S&T Committee opted to withdraw as it felt would be more appropriately addressed in the General Code.

Doug Deiman (AK) also spoke in support of this item and provided examples relating to hanging scales in his state.

In consideration of the comments received, the Committee agreed to amend the second sentence of paragraph G-UR.4.1., delete the reference to "Introduction, Section Q" as shown in Item Under Consideration, and recommend the item for vote.

#### **Regional Association Comments:**

CWMA received comments supporting this item. Multiple jurisdictions think this item will give them a stronger legal position. The CWMA believes this strengthens the application of this code and forwarded the item to NCWM, recommending it as a Voting Item.

At the 2014 WWMA Annual Meeting opposition to this item was expressed during open hearings. Several regulators spoke to the potential for multiple interpretations/confusion and believed the intent of the proposal was geared toward liquid measuring devices in spite of it being located in the General Code section. Based on testimony given, WWMA did not forward this item to NCWM.

SWMA did not hear any comments in opposition to this item and supports the intent to clarify this section and make it more defensible. SWMA also believes the recommended language strengthens the existing paragraph. SWMA forwarded the item to NCWM and recommended that it be a Voting Item.

NEWMA believes the proposal provides beneficial clarification to the general code. NEWMA forwarded the item to NCWM and recommended that it be a Voting Item.

<b>NEWMA Action: Item 310-2</b>
<b>Summary of comments considered by the regional committee (in writing or during the open hearings):</b>
Committee heard comments suggesting influence factors may affect results.
<b>Item as proposed by the regional committee: (If different than agenda item)</b>
<b>Committee recommendation to the region:</b>
<input checked="" type="checkbox"/> Voting Item on the NCWM Agenda <input type="checkbox"/> Information Item on the NCWM Agenda <input type="checkbox"/> Withdraw the Item from the NCWM Agenda ( <i>In the case of new items, do not forward to NCWM</i> ) <input type="checkbox"/> Developing Item on the NCWM Agenda ( <i>To be developed by source</i> )
<b>Reasons for the committee recommendation:</b>
Committee believes item has merit and should maintain voting status.
<b>COMPLETE SECTION BELOW FOLLOWING VOTING SESSION</b>
<b>Final updated or revised proposal from the region: (If different than regional committee recommendation)</b>

<b>Regional recommendation to NCWM for item status:</b> <input checked="" type="checkbox"/> Voting Item on the NCWM Agenda <input type="checkbox"/> Information Item on the NCWM Agenda <input type="checkbox"/> Withdraw the Item from the NCWM Agenda ( <i>In the case of new items, do not forward to NCWM</i> ) <input type="checkbox"/> Developing Item on the NCWM Agenda ( <i>To be developed by source</i> ) <input type="checkbox"/> Unable to consider at this time ( <i>Provide explanation in the “Additional Comments” section below</i> )
<b>Regional Report to NCWM:</b> NEWMA supports this as a voting item.

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

## 320 SCALES

### 320-1 W A.1. General.

**Source:**

KSi Conveyors, Inc. (2015)

**Purpose:**

Provide clarity in Handbook 44 as to what standards apply to weighing and measuring systems that provide a finished product based on the measurement of raw materials.

**Item Under Consideration:**

Amend NIST Handbook 44 Scales Code as follows:

**A.1. General.** – This code applies to all types of weighing devices other than automatic bulk-weighing systems, belt-conveyor scales, and automatic weighing systems, including non-automatic batching systems. The code comprises requirements that generally apply to all weighing devices, and specific requirements that are applicable only to certain types of weighing devices.  
(Amended 1972 and 1983)

**Background / Discussion:**

The reference to batching systems will accompany the proposal to add a definition for “batching systems” to Appendix D – Definitions. The CWMA has already agreed to forward the definition to the NCWM S&T Committee with the recommendation that it be a Voting Item. The CWMA noted that the definition needs to reference the specific codes where the definition is applicable.

There are both automatic and non-automatic batching systems the utilize scales and/or meters already in the market place and have been for many years. The lack of a definition and the accompanying references may have just been an oversight on the part of the NCWM S&T Committee. For further clarification and justification please refer to the proposal to add a definition for “batching systems” which was also submitted to the SWMA for consideration.

**2015 NCWM Interim Meeting:**

The Committee agreed to group together Agenda Items 320-1, 324-1, 330-1, and 360-1 since these items are related and announced that comments on all four items would be taken together during the open hearings.

Short presentations concerning these items were provided by Mr. Henry Oppermann (Weights and Measures Consulting LLC) and Mr. Dominic Meyer (KSi Conveyors, Inc.) both of whom described the automatic operation of



a seed treatment process involving a hopper scale used to weigh the seed. In describing the scale's operation, Mr. Oppermann classified the scale as an automatic bulk weighing system (ABWS). He stated it is the application of a scale that defines its classification. In a typical seed weighing operation, seed is loaded, weighed, and discharged from the hopper automatically and in repeated drafts until the weight of an order, which is pre-programmed into the system by an operator, is filled. Since only a single commodity is weighed, the scale cannot be classified as a batching scale, which would require two or more commodities to be weighed. The application of the scale makes it an ABWS. He stated that the scale does not comply with the ABWS Code because it does not record the no-load and loaded weight values accumulating the net weight of each draft and that there may be other compliance issues. He indicated that it doesn't make sense to include in the Application Section of several HB 44 device codes the term "batching system" when nowhere within those codes are there specific requirements that apply to them. Mr. Oppermann also provided written summary comments to the Committee in opposition to the four proposals which have been inserted into Appendix B of this report.

Mr. Richard Suiter (Richard Suiter Consulting) provided testimony on behalf of KSi conveyors, Inc. He reported that he had contacted a number of different states about the KSi system. Some states questioned whether scales used to weigh seed should be considered grain-hopper scales. The Federal Grain Inspection Service (FGIS) does not consider seed a grain. Mr. Suiter provided a short history of the ABWS Code dating back to the late 1970's when a manufacturer produced an electronic weighing system designed to replace old mechanical "trip weighers," which were a mechanical hopper scale that would fill with grain to a preset weight then trip and dump. A problem encountered with these electronic automatic weighing systems was that the weigh hopper would sometimes fail to completely empty when grain was discharged from the weigh hopper. As a result, the scale did not return to zero after each load had been discharged because of product left remaining (often referred to as a "heel") in the weigh hopper. At some point during a subsequent draft, the "heel" would discharge out of the weigh hopper along with the rest of the load causing a zero load balance change on the negative side of zero, which did not comply with Handbook 44 and would cause the system to "lock up." The manufacturer of the system worked closely with the State of Nebraska and FGIS to recognize a system that would utilize "no load reference values" that could be on either the negative or positive sides of zero. This effort resulted in the initial version of the ABWS Code for Grain being adopted by the NCWM in 1983.

Mr. Suiter reported that KSi Conveyors had submitted and received an NTEP CC for a bulk weighing system controller used in an ABWS application after one state had classified the system as an ABWS. He also stated that NTEP had already determined that the earlier system in question was not an ABWS and so stated on the Certificate of Conformance (CC). He stated that the KSi system does not necessarily retain a heel. Most products pass through the KSi system completely; returning to a zero indication following the discharge of each repeated load from the weigh hopper when in automatic operation. Mr. Suiter noted there are scales used in automatic batching operations that are not considered ABWSs. He concluded it is not necessary that these systems record the no-load and loaded weight values providing the scales in these systems return to zero following discharge of the product from the weigh hopper.

The SMA supported the item and suggested the wording offered by the SWMA be used. The SMA also supported the addition of definitions for non-automatic and automatic batching systems.

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

#### **OWM Analysis of S&T Items 320-1, 324-1, 330-1, and 360-1**

OWM considers items 320-1, 324-1 and 330-1 companion to this item (360-1) and understands that these first three items were submitted after it was made known to the submitter that definitions can only be added to NIST Handbook 44 (HB 44) to define terms appearing in one or more of the codes within the Handbook. That is, it is believed that Items 320-1, 324-1, and 330-1 were submitted as an afterthought because nowhere in the "Application" section of the Scales Code (Section 2.20), Automatic Weighing Systems Code (Section 2.24), or Liquid-Measuring Devices Code (Section 3.30) of HB 44 does the term "batching system" appear. The devices associated with these three codes are often components of batching systems. OWM presumes that the submitter is proposing this term be included in each of these device codes to make clear that these codes are intended to apply to these devices when installed in a batching system and to help differentiate a batching system from an automatic bulk

weighing system. The justification given for proposing that a definition be added is that one state tried to categorize batch systems as automatic bulk weighing systems under HB 44 Section 2.22 Automatic Bulk Weighing Systems.

Adding the term “batching system” to the “Application” section of each of these device codes when nowhere else within any of these codes is that term used is an inappropriate approach. It is not the batching system as a whole that typically gets inspected. The different devices used commercially in a batching system are examined independently of each other (and of the system) using the appropriate codes that apply to those devices, i.e., the General Code and whichever device code applies to the type of device being inspected as part of the batching system.

The proposed definition of “batching system” does not provide sufficient information to allow a conclusive distinction be made between a batching system and an ABWS. For example, nowhere in the definition does it specify that the commercial devices used in a batching system designed to automatically weigh commodities in successive drafts, must start each draft (i.e., the first and each successive draft) from a zero-load balance condition (if a scale), yet this is a significant distinguishing factor between an ABWS and a scale used in a batching system designed to operate in automatic mode. For this reason, OWM does not believe that the addition of the definition being proposed will solve the problem that the submitter has identified; nor does OWM believe that a definition of “batching system” is needed.

OWM’s research into the history of the ABWS Code revealed the Automatic Bulk Weighing Systems Code was first added to HB 44 in 1984. It was developed by the US Department of Agriculture (USDA) Federal Grain Inspection Service (FGIS) in consultation with OWM, to recognize electronic grain weighing systems which were becoming more prevalent at that time. Originally titled “Automatic Bulk Weighing Systems For Grain” the words “For Grain” were deleted from the title in 1987 to broaden the application of the code to include all ABWSs.

In 1981 (three years prior to the code being added to HB 44), the NCWM adopted five new principles relating to the design, operation, and testing of an ABWS that had been developed by USDA’s FGIS and OWM. Of notable mention, the first three principles (shown below) recognize that in order to weigh repeated drafts accurately, a no-load reference value must be indicated, recorded, and taken into account in the determination of the net load of each draft. In adopting these principles, the NCWM recognized that ABWSs operate by weighing repeated drafts automatically (without intervention of an operator) and the net weight determination is made by calculating the difference between the no-load reference value and the value of each draft load.

1. No load reference - Although H-44 seems to require an indication of "zero" as a no load reference, the principle expressed is that to weigh accurately it is necessary that a readily understandable, repeatable, and effective "no load reference" be indicated and recorded. Since automatic bulk weighing systems operate by weighing repeated drafts and the net weight determination is made by calculating the difference between the no load reference values and the values obtained with an equilibrium at specific loads, it is necessary only that the no load reference meet the previously mentioned criterion. A positive value seems to meet that criterion and additionally can be more accurate since the no load reference value is automatically determined and used in the calculation after every draft. Consequently any change in the no load equilibrium condition does not require the intervention of an operator. Therefore, for this special equipment, paragraph S.I.1. Zero Indications, should be interpreted as requiring only an appropriate "no load reference" rather than a "zero" reference. Also, paragraph UR.4.1. Balance Condition, should be interpreted as requiring that the "no load" or "zero load" reference be indicated and recorded.
2. Recorded Values.- It is necessary that these systems be equipped with recording elements since it is impractical and probably impossible to manually record the correct values in such a repeated operation. Other conditions necessary are:
  - a) an effective motion detect system consistent with the requirements of H-44 so that the values can be recorded only when the device is in stable equilibrium;
  - b) the values are displayed during the printing cycle;
  - c) some guarantee and indication that both gates (weigh hopper and loading garner) are closed during the print cycle;
  - d) the system shuts down automatically when it fails to operate in accord with its design;
  - e) some guarantee that a final partial draft quantity is recorded;

- f) in direct sale applications a complete record of all recorded values is provided the party not operating the equipment;
  - g) the values recorded are consistent with the requirements of G-S.5.; i.e., clear, definite and easily read under normal conditions of operation;
  - h) some guarantee that any test weights installed in the system cannot interfere with correct weighing; and
  - i) when the system is designed to transport grain through the scale without being weighed, means shall be provided to indicate clearly that this mode of operation is being utilized.
3. No load reference sequence. - Since these systems are used both to "weigh in" and/or to "weigh out" the sequence in which the quantity received or quantity delivered is determined must be stipulated. When the quantity of product received is being determined it is necessary that the "no load reference value" be determined and recorded first and the "full load reference value" determined and recorded next. Thus the difference is the amount received. Conversely, when the quantity of product delivered is being determined, the sequence must be reversed; i.e., "full load reference" first, and "no load reference" next. If a system does not have this dual capability, it can be considered appropriate only for service consistent with its design.

OWM believes it is important that these same principles (principles 1 through 3) be applied today to systems that weigh a single bulk commodity in repeated automatic drafts. This especially holds true for weighing any commodity where some residual product is likely to remain inside the load-receiving element (e.g., the hopper) after the discharge cycle has been completed. Certain types of products being weighed will inherently cling to the vessel in which they are contained, thus preventing complete product discharge. There is no way to predict how much residual product will remain after each weighing/discharge cycle; i.e., the amount will likely change with each discharged load and be reflected as a persistent change in the zero-load balance. The most accurate way to account for this remaining product is to require the no-load starting reference be recorded and taken into account in the calculation of each draft load. Rezeroing the scale to account for these changes should not be considered an option because such action would result in inaccurate net weight determinations. That is, if residual product remains after a weighed load has been discharged and its weight then zeroed off before the next load to be weighed is added, any difference in the amount of residual product remaining after that next load is discharged will not be accounted for in the net weight of that load. For example, if 20 lb of residual product left remaining in a weigh hopper were zeroed off to start a new draft load and 1000 lb of product was then added to the hopper and weighed, a 10 lb weighing error would result if when the load was discharged, 10 lb of residual product remained. When multiple draft loads are weighed to achieve some targeted load, such as is usually the case with ABWSs, rezeroing the scale to account for zero-load balance changes at the start of each draft load will result in cumulative errors affecting the entire load. In such applications, an automatic bulk weighing system is required.

The remaining two principles adopted in 1981 relate to the proposals in a less significant degree, but are copied below for reference.

- 4. Other Design Considerations. There are, of course, other design and operating characteristics that must be considered in determining the appropriateness of these systems. A check list has been developed by FGIS which is as complete as circumstances allow and this information will be included in the check list developed for the National Type Approval Task Force as soon as possible.
- 5. Test Procedures. The test of this equipment must follow the principles expressed in H-112; i.e., "A precise operation based upon proven standards and so conducted as to duplicate, as nearly as practicable, service conditions of operation."

It is the device application that differentiates a scale used in a batching system from one used in an ABWS and therefore determines the appropriate HB 44 codes that apply. In a batching operation, more than one product is weighed and/or measured and mixed together to form a batch (hence the name). A batching system typically consists of weighing elements (e.g., one or more weigh hoppers) that facilitate multiple individual weighments of different ingredients that ultimately get mixed together to form a product mix (or recipe). The system may be comprised of one or more commercial weighing and/or measuring devices. Each new draft load must be initiated from a zero-load balance condition. That is, the weighing process for each draft of a targeted load must start with

the weighing/load-receiving element empty and the scale indicating zero (i.e. a correct zero-load balance condition). The Scales Code and General Code apply to the scales used in a batching operation. In contrast, an ABWS weighs a single commodity in successive drafts of predetermined amounts and automatically records the no-load starting reference and loaded weight values, accumulating the net weight of each draft. The no-load starting reference for each draft is most oftentimes a value other than zero and must be recorded by the system (as required by the ABWS Code of HB 44). Only when the application of the system is understood can a determination of type of device be made and the appropriate HB 44 code applied.

A review of existing NTEP CCs for scale system controllers used in bulk weighing operations shows inconsistent terms used to identify them, e.g. Batching Controller, Bulkweighing System, Scale System Controller (Concrete/Asphalt Batching System Controller, Digital Electronic), etc. Coupled with information appearing in the “Application” portion of the CC leaves questionable whether some of these scale system controllers were evaluated for use in a batching operation, an ABWS operation, or both. Not knowing whether these inconsistencies might have been part of the reason which ultimately led to this proposal, NTEP may wish to consider a review of existing CC’s to determine whether additional information might be needed to identify the intended application(s) as well as providing additional guidance to the NTEP weighing evaluators regarding completion of future CCs.

The Committee agreed to withdraw these items in consideration of the comments and analysis that were provided. In discussing the issue, the Committee agreed that residual product left remaining in a weigh hopper following the discharge of product that is weighed automatically in repeated drafts could cause significant error in the weighing result of the summed total for all drafts. In reaching its decision to withdraw these items, the Committee considered the weighing application for which the proposals were intended to address. That is, the Committee considered the density and cost of the products (seeds) being weighed and their propensity to clinging to the sides of a hopper when being discharged after weighing. The Committee felt that in the case of some seeds, especially seed types that are light weight, not all of the weighed seed would necessarily be discharged when the hopper is emptied following completion of a weighing cycle. This being the case, the Committee was concerned that significant weighing errors could result from automatic operation of the system. The Committee recognized there are some applications, e.g., the weighing of stone, etc., in a batching operation, where, due to the weight and physical characteristics of the product being weighed, there is a presumed likelihood that all product would be discharged from a hopper following completion of each weighing cycle. In such applications, the no-load reference would not need to be recorded since the scales being used in these applications would presumably start on zero at the start of each new draft load to be weighed. The Scales Code would apply to the scales used in these batching systems and officials could and should confirm as part of their official examination of the system, that the scales return to zero each time a load is discharged from the weigh hopper. *(NIST Technical Advisor’s Note: The Committee’s acknowledgement that the Scales Code would apply is in recognition of the following reminder appearing in Agenda Item 304-3 of the 1985 NCWM Final Report of the S&T Committee: “The Committee reminds the Conference that this code (i.e., the ABWS Code) does not apply to batching systems, for which the Scale Code applies.”)* The Committee also considered whether or not it was appropriate to add the term “batching system” to various device codes in HB 44 as proposed when there are no requirements in any of those codes that apply specifically to batching systems. The Committee saw no benefit to adding the term and was concerned that by doing so, it could lead to confusion.

An action suggested by the Committee is that NTEP review all existing CC’s issued for a scale system controller to confirm the application(s) for which they were evaluated and that those applications are clearly specified on the CC.

#### **Regional Association Comments:**

SWMA did not hear any comments in opposition to this item. The Committee revised the proposed language to clarify, but not change the intent. SWMA suggested that the NCWM S&T Committee may wish to consider merging agenda items 320-1; 324-1; 330-1; and 360-1 as they are all related. Comments were heard for all four of these agenda items at the same time. SWMA forwarded the item to NCWM recommending it as a Voting Item as amended below.

**A.1. General.** – This code applies to all types of weighing devices, including non-automatic batching systems. This code does not apply to other than automatic bulk-weighing systems, belt-conveyor scales, and automatic weighing systems. The code comprises requirements that generally apply to all weighing devices, and specific requirements that are applicable only to certain types of weighing devices.

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

### **320-2 V T.N.3.5. Separate Main Elements.**

**Source:**

Ohio NTEP Laboratory (2015)

**Purpose:**

Improve uniformity in how the tolerance is applied by providing clarification of the intent.

**Item Under Consideration:**

Amend NIST Handbook 44 Scales Code as follows:

**T.N.3.5. Separate Main Elements: Load Transmitting Element, Indicating Element, Etc.** – If a main element separate from a complete weighing device is submitted for type evaluation, the tolerance for the main element is 0.7 that for the complete weighing device. This fraction includes the tolerance attributable to the testing devices used.

**Background / Discussion:**

The submitter wants to distinguish the difference between laboratory testing, and field testing to eliminate any confusion as to what tolerance to apply. The word “laboratory” is not implied in the current wording. As worded, there are differences in opinions as to the intent on this paragraph. This proposal would improve uniformity in all NTEP evaluations. The Ohio NTEP Laboratory has held field evaluations to 0.7 tolerance in the past.

**2015 NCWM Interim Meeting:**

The Committee considered the following proposal intended to provide additional clarification regarding the application of Scales Code paragraph T.N.3.5. Separate Main Elements: Load Transmitting Element, Etc.:

**T.N.3.5. Separate Main Elements: Load Transmitting Element, Indicating Element, Etc.** – If a main element separate from a complete weighing device is submitted for laboratory type evaluation, the tolerance for the main element is 0.7 that for the complete weighing device. This fraction includes the tolerance attributable to the testing devices used.

The SMA supported this item but recommended the word “laboratory” be removed noting that type evaluations are performed both in the field and laboratory. Ms. Fran Elson-Houston (OH), submitter of the item, agreed with the removal of the word “laboratory” from the proposal.

In discussing this item, the Committee felt that the proposed changes would help improve understanding of the paragraph, but also agreed that the word “laboratory” should be deleted from the proposal. Consequently, the Committee agreed to recommend this item for vote absent the word “laboratory” as shown in Item Under Consideration.

**Regional Association Comments:**

CWMA received comments supporting this item. The CWMA believes this item is sufficiently developed and forwarded the item to NCWM, recommending it as a Voting Item.

WWMA did not receive testimony on this item at the 2014 WWMA Annual Meeting. The WWMA S&T Committee would like additional background information and questions whether this item would be more suited to Publication 14 rather than Handbook 44. WWMA forwarded this item to NCWM and recommended that it be an Informational Item.

SWMA did not hear any comments in opposition to this item. SWMA forwarded the item to NCWM, recommending it as a Voting Item.

NEWMA believed the justifications for the item have merit and forwarded the item to NCWM recommending that it be a Voting Item.

<b>NEWMA Action: Item 320-2</b>
<b>Summary of comments considered by the regional committee (in writing or during the open hearings):</b>
Comments were made in support of this item.
<b>Item as proposed by the regional committee: <i>(If different than agenda item)</i></b>
<b>Committee recommendation to the region:</b>
<input checked="" type="checkbox"/> Voting Item on the NCWM Agenda <input type="checkbox"/> Information Item on the NCWM Agenda <input type="checkbox"/> Withdraw the Item from the NCWM Agenda <i>(In the case of new items, do not forward to NCWM)</i> <input type="checkbox"/> Developing Item on the NCWM Agenda <i>(To be developed by source)</i>
<b>Reasons for the committee recommendation:</b>
In discussing this item the committee believes the changes would improve understanding of the paragraph.
<b>COMPLETE SECTION BELOW FOLLOWING VOTING SESSION</b>
<b>Final updated or revised proposal from the region: <i>(If different than regional committee recommendation)</i></b>
<b>Regional recommendation to NCWM for item status:</b>
<input checked="" type="checkbox"/> Voting Item on the NCWM Agenda <input type="checkbox"/> Information Item on the NCWM Agenda <input type="checkbox"/> Withdraw the Item from the NCWM Agenda <i>(In the case of new items, do not forward to NCWM)</i> <input type="checkbox"/> Developing Item on the NCWM Agenda <i>(To be developed by source)</i> <input type="checkbox"/> Unable to consider at this time <i>(Provide explanation in the "Additional Comments" section below)</i>
<b>Regional Report to NCWM:</b>
NEWMA maintains support as a voting item.

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

### 320-3      **W      Table 7a. Typical Class or Type of Device for Weighing Applications**

**Source:**

Ohio NTEP Laboratory (2015)

**Purpose:**

Require that hopper scales less than 2000 lb., which are not grain hoppers, be class III devices and allow "special devices" greater than 30 000 lb that are not vehicle scales and not currently listed under Class III L, to be categorized as Class III L.

**Item Under Consideration:**

Amend NIST Handbook 44 Scale Code as follows:

<b>Table 7a.</b> <b>Typical Class or Type of Device for Weighing Applications</b>	
<b>Class</b>	<b>Weighing Application or Scale Type</b>
I	Precision laboratory weighing
II	Laboratory weighing, precious metals and gem weighing, grain test scales
III	All commercial weighing not otherwise specified, grain test scales, retail precious metals and semi-precious gem weighing, grain-hopper scales, <b>other hopper scales under 2,000 lb</b> , animal scales, postal scales, vehicle on-board weighing systems with a capacity less than or equal to 30 000 lb, and scales used to determine laundry charges
III L	Vehicle scales, vehicle on-board weighing systems <b>and other special devices</b> with a capacity greater than 30 000 lb, axle-load scales, livestock scales, railway track scales, crane scales, and hopper (other than grain hopper) scales
IIII	Wheel-load weighers and portable axle-load weighers used for highway weight enforcement
<b>Note:</b> A scale with a higher accuracy class than that specified as “typical” may be used.	

(Amended 1985, 1986, 1987, 1988, 1992, 1995, and 2012)

**Background / Discussion:**

Many small hoppers that are not grain hoppers are already receiving CC's as Class III hoppers, which does not meet Table 7a categories. There are also a few large capacity floor scales that have to meet Class III tolerances that really don't need that level of accuracy and would benefit from being categorized as a Class III L device.

**2015 NCWM Interim Meeting**

The SMA opposed this item and provided the following rationale for its position: This item would unnecessarily restrict applications of hopper scales or devices with capacities greater than 30 000 pounds.

An official questioned why 2,000 lb was selected as the proposed threshold, opposed to some other capacity value, such as 5000lb, and the meaning of “other special devices.”

Ms. Fran Elson-Houston (Ohio) reported that “other special devices” is intended to address a particular scale of special design (i.e., designed for use in weighing rolls of coil) that had been submitted to the Ohio NTEP lab.

OWM noted that Table 7a is not a requirement, but rather identifies typical classes of devices for weighing applications. The “Note” at the bottom of the table specifies that a scale with a higher accuracy class than that specified as “typical” may be used (“higher” meaning, a level higher in the table, with Class I being the highest, and Class IIII the lowest). Considering this point, the table provides scale manufacturers the necessary flexibility of being able to design and build scales of similar or same capacity, but with different levels of accuracy, in order to meet the demands of their customers by being able to supply them with scales suitable for many different weighing applications. With regard to the two sentences shown in the “Background/Discussion” of this item, it is incorrect to say that a small hopper scale of Accuracy Class III does not meet Table 7b considering the explanation provided in the “Note” at the bottom of the table. While the second sentence may be true, scale manufacturers designate accuracy class for scales they manufacture. Users are required to select a scale suitable for the application and officials verify that a proper scale has been selected based on its application. In some cases, users will select a scale with a higher accuracy class than what's needed for the application. Doing so is not a violation, but rather provides scale owners the opportunity of being able to use a scale that is more accurate than what's required or needed. For these reasons, OWM does not believe changes are needed to the table and making them could cause unnecessary confusion.

Members of the Committee were concerned that the changes proposed might cause unnecessary confusion. In recognition of the fact that Table 7a is intended to identify typical classes of weighing devices and that the “note” in Table 7a makes it permissible for a scale with a higher accuracy class than that specified as “typical” to be used (e.g., the note makes it permissible for a hopper scale under 2000 lb capacity to be classified as a Class III device), the Committee agreed to withdraw this item from its agenda.

**Regional Association Comments:**

CWMA reported that an industry representative suggested that the phrase “other special devices” needs clarification. It was then suggested that the wording “other special devices” be changed to “other special application scales”. Another industry representative voiced support for this change because it gives the manufactures more latitude when designing devices. CWMA forwarded the item to NCWM, recommending it as a Voting Item with the following change to the proposal: change the phrase, “other special devices” with “other devices” in the box for class IIIL.

WWMA did not receive comments on this item at the 2014 WWMA Annual Meeting. The WWMA S&T Committee would like to see further clarification of “other special devices”. Further, the committee would like consideration to be given to including hopper scales with a capacity of less than 5,000 lb to better align with other weighing devices in the category. WWMA forwarded this item to NCWM and recommended that it be a Developing Item.

SWMA questioned why the limit is set at 2,000 lb and not 5,000 lb. The Committee would appreciate the SMA’s comments on this question. SWMA forwarded the item to NCWM, recommending it as a Voting Item.

The NEWMA Committee wanted more information on the proposal, such as whether there are hopper scales over 2,000 lb to consider in this item? NEWMA forwarded the item to NCWM and recommended that it be an Informational item.

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

## **320-4 V 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 C as a tentative code in Section 2 of NIST Handbook 44, and adopt the proposed definitions of terms used in the tentative code (also included in Appendix C) 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. Additional background information and information on the work is also included in that report.

**2013 NCWM Interim Meeting:** The Committee agreed to designate the item Informational based on a recommendation from Mr. Darrell Flocken (NTEP), Chairman of the WIM WG and comments the Committee received in support of the item during its open hearings. Mr. Flocken reported that a new Draft WIM Code and a document containing definitions of terms used in the draft code had been developed by members of the USNWG and were ready for an initial review. Both documents had been posted on the NCWM website and the USNWG was requesting feedback from the W&M community on both parts.

**2013 NCWM Annual Meeting:** During its open hearings, the Committee was provided an update on the development of the draft WIM Code by Mr. Flocken, Chairman of WIM WG. Mr. Flocken also clarified that its scope is strictly for screening purposes. The Committee heard a number of comments in support of the item. OWM encouraged further development of the draft code by the Weigh-In-Motion WG and offered feedback on the first draft in response to the WG's request to do so. See the 2013 S&T Committee's Final Report for further details. Mr. Flocken expressed his appreciation for the comments received and indicated that he would forward them, along with OWM's feedback, to the WG for consideration.

At the 2014 NCWM Interim Meeting the WIM Project Leader, Mr. Tom Kearney (USDOT - FHWA) provided an update on the progress of this item. Mr. Kearney indicated that the WG had planned to convene during the fall of 2013 to address three concerns raised by 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 OWM concerns and to review the new comments that came in from the Netherlands. That WG meeting

will likely take place in April or May 2014. It is hoped that revisions to the draft code can be completed shortly thereafter so that a revised copy of the draft code can be made available to members of the W&M 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 work group and looks forward to seeing the next draft of the proposed code.

Mr. Steve Langford (Cardinal Scale Manufacturing Co.) 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.

At the 2014 NCWM Annual Meeting the NIST Technical Advisor provided a progress report of the FHWA's Work Group. Mr. Steve Langford, speaking as a member of the Project Oversight Committee, commented in support of the proposal and noted that an updated draft of the WIM Code will be submitted to the fall regional associations for consideration.

Following the 2014 NCWM Annual Meeting, the WIM Work Group held several conference calls to consider a few additional suggested changes to improve the proposed code that were received after the 2014 Annual Meeting. The Work Group believes the few changes in the draft code that resulted from these discussions have improved the proposal. The Work Group has submitted a copy of the most recent revision of the proposed code which is included as Appendix C of this publication.

#### **2015 NCWM Interim Meeting**

At the 2015 NCWM Interim Meeting, Mrs. Tina Butcher (OWM) thanked the WIM Work Group for providing fair consideration of OWM's many comments, which were provided throughout the different revisions of the draft code. She noted that although the process of developing the draft code may have taken longer than some had originally anticipated, the additional time taken had proven to be of benefit because it allowed for greater discussion and understanding of some of the more complex issues concerning WIM systems. OWM believes the Work Group has presented a draft code that is ready to be adopted and placed into Handbook 44 as a tentative code. OWM encouraged the use of the code, especially while in a tentative status, to help identify any remaining concerns. OWM also pointed out that the Section number designation "2.20" prefacing the title of this item is incorrect. The proposal is to add a tentative code into Section 2 of Handbook 44 and not Section 2.20.

Mr. Langford, speaking on behalf of the SMA, stated that the SMA continues to support the efforts of the Work Group and recommends a July vote on the final draft of the code.

In consideration of the comments provided in support of the item, the Committee agreed to recommend it move forward for vote.

#### **Regional Associations Comments:**

At the 2014 WWMA Annual Meeting testimony was presented in support of this item moving forward as a Voting Item and several felt that it is sufficiently developed. The WWMA supports this item and looks forward to it being presented on the 2015 NCWM Annual Meeting Agenda. WWMA recommends that this item be a Voting Item.

SWMA did not hear any comments in opposition to this item. The Committee recognizes the interest by the community to further develop this item and recommended that it be a Developing Item.

NEWMA received comment that new information will be forthcoming from the WIM group in January 2015; the Committee recommended that the item remain Developing.

CWMA reported that a regulatory official commented that these devices may not be under Weights and Measures jurisdiction. CWMA forwarded the item to NCWM, recommending it as an Informational Item.

<b>NEWMA Action: Item 320-4</b>
<b>Summary of comments considered by the regional committee (in writing or during the open hearings):</b>
No comments were made in opposition of this item. SMA supports the item.
<b>Item as proposed by the regional committee: (If different than agenda item)</b>
<b>Committee recommendation to the region:</b>
<input checked="" type="checkbox"/> Voting Item on the NCWM Agenda <input type="checkbox"/> Information Item on the NCWM Agenda <input type="checkbox"/> Withdraw the Item from the NCWM Agenda ( <i>In the case of new items, do not forward to NCWM</i> ) <input type="checkbox"/> Developing Item on the NCWM Agenda ( <i>To be developed by source</i> )
<b>Reasons for the committee recommendation:</b>
Committee feels this item is ready to launch as tentative code.
<b>COMPLETE SECTION BELOW FOLLOWING VOTING SESSION</b>
<b>Final updated or revised proposal from the region: (If different than regional committee recommendation)</b>
<b>Regional recommendation to NCWM for item status:</b>
<input checked="" type="checkbox"/> Voting Item on the NCWM Agenda <input type="checkbox"/> Information Item on the NCWM Agenda <input type="checkbox"/> Withdraw the Item from the NCWM Agenda ( <i>In the case of new items, do not forward to NCWM</i> ) <input type="checkbox"/> Developing Item on the NCWM Agenda ( <i>To be developed by source</i> ) <input type="checkbox"/> Unable to consider at this time ( <i>Provide explanation in the "Additional Comments" section below</i> )
<b>Regional Report to NCWM:</b>
NEWMA maintains support as a voting item.

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

## 321 BELT-CONVEYOR SCALE SYSTEMS

### 321-1 V A.1. General.

**Source:**

U.S. National Work Group on Belt-Conveyor Scales (2015)

**Purpose:**

Expand the application of the Belt-Conveyor scale Systems Code to include weigh-belt systems to ensure that they are held to proper standards.

**Item Under Consideration:**

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

**A.1. General.** – This code applies to belt conveyor scale systems **and weigh-belt systems** used for the weighing of bulk materials

### **Background / Discussion:**

The USNWG for Belt-Conveyor Scales has identified gaps in multiple locations within the Handbook 44 Belt-Conveyor Scales Systems Code which would not allow a typical weigh-belt system type of design to be appropriately covered by the requirements found in this code. The USNWG has developed a number of proposals to amend each of these requirements so that weigh-belt systems will be in compliance with them. Paragraph A.1. is the first in this series of proposed changes. This proposed change expressly states that the Handbook 44 Belt-Conveyor Scale Systems Code will also apply to weigh-belt systems.

NIST Handbook 44 Belt-Conveyor Scale Systems Code language that existed prior to 2001 provided an exemption for belt-conveyor scale systems designed and furnished by the manufacturer from requirements that concerned the details of installation of belt-conveyor scale systems. Generally, weigh-belt systems are designed and built by the manufacturer as a unit and are therefore are less likely to be susceptible to malfunctions or operational defects directly caused by a variance from the manufacturer's intended installation specifications. This is in contrast to belt-conveyor scale systems that are typically installed as separate components (conveyor, weighing system, belt loading system, speed sensor, etc.) within an existing conveyor system where the details of the installation for each component may greatly influence the performance of other components in the system. That language which has since been deleted is shown below:

**UR.2.2.1. For Scales not Installed by the Manufacturer.** - Unless the scale is installed in a conveyor designed and furnished by the scale manufacturer or built to the scale manufacturer's specifications, the conveyor shall comply with the following minimum requirements:

...\*

(Amended 1998)

\*The subparagraphs that followed, UR.2.2.1.(a) through (j), consisted of requirements addressing specific criteria related to design and installation of the conveyor system.

The deletion of the statement: "installed in a conveyor designed and furnished by the scale manufacturer or built to the scale manufacturer's specifications" created a situation where all belt-conveyor scale systems that were covered by the Handbook 44 BCS Code were to meet requirements in that included: specific limitations on the location of conveyor components in relation to the weighing element; specific limits on the length of the conveyor; and the type of take-up device used in the system. Due to the design and construction of typical weigh-belt systems, this type of device was not able to comply with these requirements largely due to the size, placement, and location of components in a weigh-belt type of system and the distances required between those components and the weighing elements.

USNWG members have agreed that it is important not to impose prescriptive requirements that may restrict innovation in the design of this type of device. Requirements that place limitations on the placement of components in a conveyor system in relation to the weighing device and to each other are viewed as being arbitrary and may be invalid if the design of a system is shown to operate within performance requirements regardless of the configuration of its components.

Belt-conveyor scale manufacturers who are members of the USNWG reported a demand from various clients for relatively compact weigh-belt type of systems to be used as a commercial device. However, unless the Handbook 44 BCS Code is amended to allow for their unique design characteristics, there was not an appropriate code in Handbook 44 to apply to weigh-belt systems. The USNWG therefore, has developed a number of proposed changes throughout the existing Belt-Conveyor Scale Systems Code to adapt these requirements so that they may be applied to weigh-belt systems as well.

### **2015 NCWM Interim Meeting**

Agenda items 321-1 through 321-8 were grouped together and comments taken simultaneously as the Committee considered them all related. Mrs. Tina Butcher (OWM) spoke in support of this item. She stated that HB 44 included certain exceptions for installations of belt-conveyor scale systems installed under close supervision and control of the scale system manufacturer (prior to 2001). Mrs. Butcher went on to state that it would be appropriate to reinstate these exemptions for the weigh-belt systems, as recognized by this item and she concurred these items should be grouped together (with perhaps the exception being 321-6) and designated as Voting. Item 321-6 is different in that the item does not relate to the inclusion of the term "weigh-belt systems" into the Belt-Conveyor

Scale Systems Code of HB 44. Steve Langford representing the Scale Manufacturer's Association stated the SMA had no position on these items.

In consideration of the comments provided the Committee agreed to recommend this item for vote.

**Regional Association Comments:**

CWMA received a comment from a regulatory official who agreed with the necessity of this requirement. CWMA appreciates the efforts of the work group and believes this item is sufficiently developed. CWMA forwarded the item to NCWM, recommending it as a Voting Item.

At the 2014 WWMA Annual Meeting testimony was presented in support of this item and moving it to Voting Status. The WWMA S&T Committee agreed that it was developed and recommended that 2014 WWMA S&T Agenda Items 321-1, 321-2, 321-3, 321-4, 321-5, 321-6, 321-7 and 321-8 be combined into one proposal. WWMA forwarded this item to NCWM and recommended that it be a Voting Item.

SWMA recommended that items 321-1 through 321-8 be combined into one agenda item since they are all related to belt conveyor scales. Comments were heard for all eight of these agenda items at the same time. SMWA forwarded this item to NCWM and recommended that it be a Voting Item.

NEWMA supported the recommendations of the USNWG on Belt-Conveyor Scales since the majority of these devices are located outside of the region. NEWMA forwarded the item to NCWM and recommended that it be a Voting Item.

<b>NEWMA Action: Item 321-1</b>
<b>Summary of comments considered by the regional committee (in writing or during the open hearings):</b>
SMA supports all of the combined items. No comments were made in opposition.
<b>Item as proposed by the regional committee: (If different than agenda item)</b>
Agenda items 321-1 through 321-8 were grouped together and comments were taken simultaneously.
<b>Committee recommendation to the region:</b>
<input checked="" type="checkbox"/> Voting Item on the NCWM Agenda <input type="checkbox"/> Information Item on the NCWM Agenda <input type="checkbox"/> Withdraw the Item from the NCWM Agenda ( <i>In the case of new items, do not forward to NCWM</i> ) <input type="checkbox"/> Developing Item on the NCWM Agenda ( <i>To be developed by source</i> )
<b>Reasons for the committee recommendation:</b>
Hearing no comments in opposition, the committee recommends this item as voting.
<b>COMPLETE SECTION BELOW FOLLOWING VOTING SESSION</b>
<b>Final updated or revised proposal from the region: (If different than regional committee recommendation)</b>
<b>Regional recommendation to NCWM for item status:</b>
<input checked="" type="checkbox"/> Voting Item on the NCWM Agenda <input type="checkbox"/> Information Item on the NCWM Agenda <input type="checkbox"/> Withdraw the Item from the NCWM Agenda ( <i>In the case of new items, do not forward to NCWM</i> ) <input type="checkbox"/> Developing Item on the NCWM Agenda ( <i>To be developed by source</i> ) <input type="checkbox"/> Unable to consider at this time ( <i>Provide explanation in the "Additional Comments" section below</i> )
<b>Regional Report to NCWM:</b>
This is part of group items 321-1 through 321-8. Without any opposition NEWMA supports this as a voting item.

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

### 321-2 V S.4. Marking Requirements.

**Source:**

U.S. National Work Group on Belt-Conveyor Scales (2015)

**Purpose:**

Add weigh-belt systems to the code and also create a new marking requirement to provide an accurate representation of the actual belt speed on systems that may operate at more than one speed. This information is needed to assure that the system is operated within limitations of its ability to maintain accuracy and for testing purposes.

**Item Under Consideration:**

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

**S.4. Marking Requirements.** – ~~A belt-conveyor scale~~ **Belt-conveyor scales and weigh-belt systems** shall be marked with the following: (Also see also G-S.1. Identification.)

- (a) the rated capacity in units of weight per hour (minimum and maximum);
- (b) the value of the scale division;
- (c) the belt speed in terms of feet (or meters) per minute at which the belt will deliver the rated capacity **, or the maximum and minimum belt speeds at which the conveyor system will be operated for variable speed belts;**
- (d) the load in terms of pounds per foot or kilograms per meter (determined by materials tests); and
- (e) *the operational temperature range if other than – 10 °C to 40 °C (14 °F to 104 °F).*

*[Nonretroactive as of January 1, 1986]*

**Background / Discussion:**

Many belt-conveyor type of scale systems have the capability to operate at more than one belt speed setting or have the ability to operate using a variable belt speed. Since the weighing operation is dependent upon the belt speed (as a critical performance factor) in a belt-conveyor scale system, it is important that the speed at which the belt travels be accounted for during an evaluation of the system. Changes in the speed of belt travel can result in significant changes to the performance of the weighing system therefore the requirement for the marking of belt speed on the device is of significance.

In spite of what the maximum capacity of a conveyor system is designed for, the belt speed at which the system will be operated will be primarily determined by characteristics of components that comprise the entire system. Generally, the belt speed will be adjusted to a maximum setting that will permit optimal output of the system but also so that the individual components in the system are not overloaded with the flow of material. In addition, on systems where different materials are weighed, the belt speed may be adjusted to accommodate the physical characteristics of different types of materials. Therefore, the speed setting at which the conveyor belt is operated at may vary in accordance with these considerations and the USNWG on Belt-Conveyor Scales agreed that the marking of the belt speed(s) which will be used should reflect this notion.

NIST Handbook 44 Belt-Conveyor Scale Systems Code language that existed prior to 2001 provided an exemption for belt-conveyor scale systems designed and furnished by the manufacturer from requirements that concerned the details of installation of belt-conveyor scale systems. Generally, weigh-belt systems are designed and built by the manufacturer as a unit and are therefore are less likely to be susceptible to malfunctions or operational defects directly caused by a variance from the manufacturer's intended installation specifications. This is in contrast to belt-conveyor scale systems that are typically installed as separate components (conveyor, weighing system, belt loading system, speed sensor, etc.) within an existing conveyor system where the details of the installation for each

component may greatly influence the performance of other components in the system. That language which has since been deleted is shown below:

**UR.2.2.1. For Scales not Installed by the Manufacturer.** - Unless the scale is installed in a conveyor designed and furnished by the scale manufacturer or built to the scale manufacturer's specifications, the conveyor shall comply with the following minimum requirements:

...\*

(Amended 1998)

\*The subparagraphs that followed, UR.2.2.1.(a) through (j), consisted of requirements addressing specific criteria related to design and installation of the conveyor system.

The deletion of the statement: "installed in a conveyor designed and furnished by the scale manufacturer or built to the scale manufacturer's specifications" created a situation where all belt-conveyor scale systems that were covered by the Handbook 44 BCS Code were to meet requirements in that included: specific limitations on the location of conveyor components in relation to the weighing element; specific limits on the length of the conveyor; and the type of take-up device used in the system. Due to the design and construction of typical weigh-belt systems, this type of device was not able to comply with these requirements largely due to the size, placement, and location of components in a weigh-belt type of system and the distances required between those components and the weighing elements.

USNWG members have agreed that it is important not to impose prescriptive requirements that may restrict innovation in the design of this type of device. Requirements that place limitations on the placement of components in a conveyor system in relation to the weighing device and to each other are viewed as being arbitrary and may be invalid if the design of a system is shown to operate within performance requirements regardless of the configuration of its components.

Belt-conveyor scale manufacturers who are members of the USNWG reported a demand from various clients for relatively compact weigh-belt type of systems to be used as a commercial device. However, unless the Handbook 44 BCS Code is amended to allow for their unique design characteristics, there was not an appropriate code in Handbook 44 to apply to weigh-belt systems. The USNWG therefore, has developed a number of proposed changes throughout the existing Belt-Conveyor Scale Systems Code to adapt these requirements so that they may be applied to weigh-belt systems as well.

### **2015 NCWM Interim Meeting**

Agenda items 321-1 through 321-8 were grouped together and comments taken simultaneously as the Committee considered them all related. Mrs. Tina Butcher (OWM) spoke in support of this item. She stated that HB 44 included certain exceptions for installations of belt-conveyor scale systems installed under close supervision and control of the scale system manufacturer (prior to 2001). Mrs. Butcher went on to state that it would be appropriate to reinstate these exemptions for the weigh-belt systems, as recognized by this item and she concurred these items should be grouped together (with perhaps the exception being 321-6) and designated as Voting. Item 321-6 is different in that the item does not relate to the inclusion of the term "weigh-belt systems" into the Belt-Conveyor Scale Systems Code of HB 44. Steve Langford representing the Scale Manufacturer's Association stated the SMA had no position on these items.

In consideration of the comments provided the Committee agreed to recommend this item for vote

### **.Regional Association Comments:**

CWMA received a comment from a regulatory official who agreed with the necessity of this requirement. CWMA appreciates the efforts of the work group and believes this item is sufficiently developed. CWMA forwarded the item to NCWM, recommending it as a Voting Item.

At the 2014 WWMA Annual Meeting testimony was presented in support of this item and moving it to Voting Status. The WWMA S&T Committee agreed that it was developed and recommended that 2014 WWMA S&T Agenda Items 321-1, 321-2, 321-3, 321-4, 321-5, 321-6, 321-7 and 321-8 be combined into one proposal. WWMA forwarded this item to NCWM and recommended that it be a Voting Item.

SWMA recommended that items 321-1 through 321-8 be combined into one agenda item since they are all related to belt conveyor scales. Comments were heard for all eight of these agenda items at the same time. SMWA forwarded this item to NCWM and recommended that it be a Voting Item.

NEWMA supported the recommendations of the USNWG on Belt-Conveyor Scales since the majority of these devices are located outside of the region. NEWMA forwarded the item to NCWM and recommended that it be a Voting Item.

<b>NEWMA Action: Item 321-2</b>
<b>Summary of comments considered by the regional committee (in writing or during the open hearings):</b>
SMA supports all of the combined items. No comments were made in opposition.
<b>Item as proposed by the regional committee: (If different than agenda item)</b>
Agenda items 321-1 through 321-8 were grouped together and comments were taken simultaneously.
<b>Committee recommendation to the region:</b> <input checked="" type="checkbox"/> Voting Item on the NCWM Agenda <input type="checkbox"/> Information Item on the NCWM Agenda <input type="checkbox"/> Withdraw the Item from the NCWM Agenda ( <i>In the case of new items, do not forward to NCWM</i> ) <input type="checkbox"/> Developing Item on the NCWM Agenda ( <i>To be developed by source</i> )
<b>Reasons for the committee recommendation:</b>
Hearing no comments in opposition, the committee recommends this item as voting.
<b>COMPLETE SECTION BELOW FOLLOWING VOTING SESSION</b>
<b>Final updated or revised proposal from the region: (If different than regional committee recommendation)</b>
<b>Regional recommendation to NCWM for item status:</b> <input checked="" type="checkbox"/> Voting Item on the NCWM Agenda <input type="checkbox"/> Information Item on the NCWM Agenda <input type="checkbox"/> Withdraw the Item from the NCWM Agenda ( <i>In the case of new items, do not forward to NCWM</i> ) <input type="checkbox"/> Developing Item on the NCWM Agenda ( <i>To be developed by source</i> ) <input type="checkbox"/> Unable to consider at this time ( <i>Provide explanation in the "Additional Comments" section below</i> )
<b>Regional Report to NCWM:</b>
This is part of group items 321-1 through 321-8  Without any opposition NEWMA supports this as a voting item.

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



**321-3 V N.2.1. Initial Verification.****Source:**

U.S. National Work Group on Belt-Conveyor Scales (2015)

**Purpose:**

Include weigh-belt systems in the test note. Also, clearly identify how many tests are to be performed and the specific settings, at which they will be conducted. Provide specific testing guidance according to the configuration of the system, and to clarify the required procedures.

**Item Under Consideration:**

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

**N.2.1. Initial Verification.** – A belt-conveyor scale system or a weigh-belt system shall be ~~verified with~~ tested using of a minimum of two test runs performed at each ~~of the following flow rates: setting for belt speed/belt loading as indicated in Table N.2.1.~~

- ~~(a) normal use flow rate;~~
- ~~(b) 35 % of the maximum rated capacity; and~~
- ~~(c) an intermediate flow rate between these two points.~~

<b><u>Table N.2.1. Initial Verification</u></b>		
<b><u>Device Configuration</u></b>	<b><u>Minimum of 2 test runs at each of the following settings</u></b>	<b><u>Total Tests (minimum)</u></b> <b><u>2</u></b>
<b><u>Constant belt speed/ Variable loading</u></b>	<ul style="list-style-type: none"> <li>– <b><u>belt loading: high (normal)</u></b></li> <li>– <b><u>belt loading: medium (intermediate)</u></b></li> <li>– <b><u>belt loading: low (35%)</u></b></li> </ul>	<b><u>6</u></b>
<b><u>Variable belt speed/ Constant loading</u></b>	<ul style="list-style-type: none"> <li>– <b><u>belt speed: maximum</u></b></li> <li>– <b><u>belt speed: medium</u></b></li> <li>– <b><u>belt speed: minimum</u></b></li> </ul>	<b><u>6</u></b>
<b><u>Variable belt speed/ Variable loading</u></b>	<ul style="list-style-type: none"> <li>– <b><u>speed: maximum / belt loading: high (normal)</u></b></li> <li>– <b><u>speed: maximum / belt loading: medium (intermediate)</u></b></li> <li>– <b><u>speed: maximum / belt loading: low (35%)</u></b></li> <li>– <b><u>speed: minimum/ belt loading: high (normal)</u></b></li> <li>– <b><u>speed: minimum/ belt loading: medium (intermediate)</u></b></li> <li>– <b><u>speed: minimum/ belt loading: low (35%)</u></b></li> </ul>	<b><u>12</u></b>
<p><b><u>Use the device configurations in the left-hand column to identify the scale being tested.</u></b></p> <p><b><u>Perform 2 test runs (minimum) at each of the settings shown in the center column.</u></b></p> <p><b><u>The following terminology applies:</u></b></p> <ul style="list-style-type: none"> <li>• <b><u>High: maximum (normal use) operational rate.</u></b></li> <li>• <b><u>Low: 35% of the maximum rated capacity of the system.</u></b></li> <li>• <b><u>Medium: an intermediate rate between the high and low settings.</u></b></li> </ul>		

**Results of the individual test runs in each pair of tests shall not differ by more than the absolute value of the tolerance as specified in T.2. Tolerance Values, Repeatability Tests. All tests shall be within the tolerance as specified in T.1. Tolerance Values.**

Test runs may also be conducted at any other rate of flow that may be used at the installation. A minimum of four test runs may be conducted at only one flow rate if evidence is provided that the system is used at a ~~single flow rate~~ **constant speed/constant loading setting** and that rate does not vary in either direction by an amount more than 10 % of the normal flow rate that can be developed at the installation for at least 80 % of the time.

#### **Background / Discussion:**

The existing N.2.1. mentions specifically “belt-conveyor scale system” in the opening sentence but does not mention weigh-belt systems. The USNWG on Belt-Conveyor Scales agreed that this omission of weigh-belt systems would exclude the HB44 Belt-Conveyor Scale Systems Code from being applied to that type of system. The proposed changes therefore include the addition of “weigh-belt systems” in this sentence.

In addition, the current language used in N.2.1. does not take into consideration that on some conveyor systems, there can be two separate means to adjust the rate of product flow across the weighing device. The flow of material onto the belt may be increased at the loading point which will result in a higher weight per unit of belt length,

thereby increasing the rate of material flow across the weighing device or the speed of belt travel may simply be increased which will also result in an increase of material flow rate.

At their February 2014 meeting, it was the consensus of the USNWG on Belt-Conveyor Scales that testing should include the variation of product flow through the adjustment of: 1) the rate at which the material is loaded on to the belt; and 2) by adjustment of the belt speed where the system has the means to do so. The existing language does not provide specific instruction needed to adequately evaluate systems that may normally operate at more than one belt speed and are equipped with means to adjust the flow of material by either adjusting the speed of the belt or the flow of material at the loading point on the belt.

The proposed amendments to N.2.1. and the accompanying Table N.2.1. will clearly identify how many tests are to be performed and at what specific settings they will be conducted at. These proposed changes are intended to provide specific testing guidance according to the configuration of the system and to clarify the required procedures.

NIST Handbook 44 Belt-Conveyor Scale Systems Code language that existed prior to 2001 provided an exemption for belt-conveyor scale systems designed and furnished by the manufacturer from requirements that concerned the details of installation of belt-conveyor scale systems. Generally, weigh-belt systems are designed and built by the manufacturer as a unit and are therefore are less likely to be susceptible to malfunctions or operational defects directly caused by a variance from the manufacturer's intended installation specifications. This is in contrast to belt-conveyor scale systems that are typically installed as separate components (conveyor, weighing system, belt loading system, speed sensor, etc.) within an existing conveyor system where the details of the installation for each component may greatly influence the performance of other components in the system. That language which has since been deleted is shown below:

**UR.2.2.1. For Scales not Installed by the Manufacturer.** - Unless the scale is installed in a conveyor designed and furnished by the scale manufacturer or built to the scale manufacturer's specifications, the conveyor shall comply with the following minimum requirements:

...\*

(Amended 1998)

\*The subparagraphs that followed, UR.2.2.1.(a) through (j), consisted of requirements addressing specific criteria related to design and installation of the conveyor system.

The deletion of the statement: "installed in a conveyor designed and furnished by the scale manufacturer or built to the scale manufacturer's specifications" created a situation where all belt-conveyor scale systems that were covered by the Handbook 44 BCS Code were to meet requirements in that included: specific limitations on the location of conveyor components in relation to the weighing element; specific limits on the length of the conveyor; and the type of take-up device used in the system. Due to the design and construction of typical weigh-belt systems, this type of device was not able to comply with these requirements largely due to the size, placement, and location of components in a weigh-belt type of system and the distances required between those components and the weighing elements.

USNWG members have agreed that it is important not to impose prescriptive requirements that may restrict innovation in the design of this type of device. Requirements that place limitations on the placement of components in a conveyor system in relation to the weighing device and to each other are viewed as being arbitrary and may be invalid if the design of a system is shown to operate within performance requirements regardless of the configuration of its components.

Belt-conveyor scale manufacturers who are members of the USNWG reported a demand from various clients for relatively compact weigh-belt type of systems to be used as a commercial device. However, unless the Handbook 44 BCS Code is amended to allow for their unique design characteristics, there was not an appropriate code in Handbook 44 to apply to weigh-belt systems. The USNWG therefore, has developed a number of proposed changes throughout the existing Belt-Conveyor Scale Systems Code to adapt these requirements so that they may be applied to weigh-belt systems as well.

### 2015 NCWM Interim Meeting

Agenda items 321-1 through 321-8 were grouped together and comments taken simultaneously as the Committee considered them all related. Mrs. Tina Butcher (OWM) spoke in support of this item. She stated that HB 44 included certain exceptions for installations of belt-conveyor scale systems installed under close supervision and

control of the scale system manufacturer (prior to 2001). Mrs. Butcher went on to state that it would be appropriate to reinstate these exemptions for the weigh-belt systems, as recognized by this item and she concurred these items should be grouped together (with perhaps the exception being 321-6) and designated as Voting. Item 321-6 is different in that the item does not relate to the inclusion of the term “weigh-belt systems” into the Belt-Conveyor Scale Systems Code of HB 44. Steve Langford representing the Scale Manufacturer's Association stated the SMA had no position on these items.

In consideration of the comments provided the Committee agreed to recommend this item for vote.

**Regional Association Comments:**

CWMA received a comment from a regulatory official who agreed with the necessity of this requirement. CWMA appreciates the efforts of the work group and believes this item is sufficiently developed. CWMA forwarded the item to NCWM, recommending it as a Voting Item.

At the 2014 WWMA Annual Meeting testimony was presented in support of this item and moving it to Voting Status. The WWMA S&T Committee agreed that it was developed and recommended that 2014 WWMA S&T Agenda Items 321-1, 321-2, 321-3, 321-4, 321-5, 321-6, 321-7 and 321-8 be combined into one proposal. WWMA forwarded this item to NCWM and recommended that it be a Voting Item.

SWMA recommended that items 321-1 through 321-8 be combined into one agenda item since they are all related to belt conveyor scales. Comments were heard for all eight of these agenda items at the same time. SMWA forwarded this tem to NCWM and recommended that it be a Voting Item.

NEWMA supported the recommendations of the USNWG on Belt-Conveyor Scales since the majority of these devices are located outside of the region. NEWMA forwarded the item to NCWM and recommended that it be a Voting Item.

<b>NEWMA Action: Item 321-3</b>
<b>Summary of comments considered by the regional committee (in writing or during the open hearings):</b>
SMA supports all of the combined items. No comments were made in opposition.
<b>Item as proposed by the regional committee: (If different than agenda item)</b>
Agenda items 321-1 through 321-8 were grouped together and comments were taken simultaneously.
<b>Committee recommendation to the region:</b>
<input checked="" type="checkbox"/> Voting Item on the NCWM Agenda <input type="checkbox"/> Information Item on the NCWM Agenda <input type="checkbox"/> Withdraw the Item from the NCWM Agenda ( <i>In the case of new items, do not forward to NCWM</i> ) <input type="checkbox"/> Developing Item on the NCWM Agenda ( <i>To be developed by source</i> )
<b>Reasons for the committee recommendation:</b>
Hearing no comments in opposition, the committee recommends this item as voting.
<b>COMPLETE SECTION BELOW FOLLOWING VOTING SESSION</b>
<b>Final updated or revised proposal from the region: (If different than regional committee recommendation)</b>
<b>Regional recommendation to NCWM for item status:</b>
<input checked="" type="checkbox"/> Voting Item on the NCWM Agenda <input type="checkbox"/> Information Item on the NCWM Agenda <input type="checkbox"/> Withdraw the Item from the NCWM Agenda ( <i>In the case of new items, do not forward to NCWM</i> ) <input type="checkbox"/> Developing Item on the NCWM Agenda ( <i>To be developed by source</i> ) <input type="checkbox"/> Unable to consider at this time ( <i>Provide explanation in the “Additional Comments” section below</i> )

**Regional Report to NCWM:**

This is part of group items 321-1 through 321-8.  
Without any opposition NEWMA supports this as a voting item.

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

**321-4 V N.2.3. Minimum Test Load.****Source:**

U.S. National Work Group on Belt-Conveyor Scales (2015)

**Purpose:**

Add the appropriate minimum test load for weigh-belt systems that are being proposed to be included in this code under a separate proposal.

**Item Under Consideration:**

Amend NIST Handbook 44 Belt-Conveyor Scales System Code as follows:

**N.2.3. Minimum Test Load.**

**N.2.3.1 Minimum Test Load, Weigh-Belt Systems. - The minimum test load shall not be less than the largest of the following values.**

- (a) **800 scale divisions;**
- (b) **the load obtained at maximum flow rate in one revolution of the belt; or**
- (c) **at least 1 minute of operation.**

**N.2.3.2. Minimum Test Load, All Other Belt-Conveyor Scale Systems.** - Except for applications where a normal weighment is less than 10 minutes, the minimum test load shall not be less than the largest of the following values.

- (a) 800 scale divisions;
- (b) the load obtained at maximum flow rate in one revolution of the belt; or
- (c) at least 10 minutes of operation.

For applications where a normal weighment is less than 10 minutes (e.g., belt-conveyor scale systems used exclusively to issue net weights for material conveyed by individual vehicles and railway track cars) the minimum test load shall be the normal weighment that also complies with **N.2.3.2.**(a) and (b).

The official with statutory authority may determine that a smaller minimum totalized load down to 2 % of the load totalized in 1 hour at the maximum flow rate may be used for subsequent tests, provided that:

1. the smaller minimum totalized load is greater than the quantities specified in **N.2.3.2.** (a)  
and (b); and

2. consecutive official testing with the minimum totalized loads described in N.2.3.2 (a), (b), or (c) and the smaller minimum test load has been conducted that demonstrates the system complies with applicable tolerances for repeatability, acceptance, and maintenance.

(Added 2004) (Amended 2008, and 201X)

#### **Background / Discussion:**

Since the typical design of weigh-belt systems (see proposal for the addition of a new definition for “weigh-belt systems” in HB44, Appendix D) consists of significantly shorter conveyors compared to those normally found in belt-conveyor scale systems, the time needed for a complete revolution of the belt to occur on a weigh-belt system is much shorter. The USNWG on Belt-Conveyor Scales agreed that due to the generally shorter time needed for a belt revolution on a weigh-belt system, the dynamics of the weigh-belt system could be evaluated without the need of an extended (10 minutes) period of operation as is required for a belt-conveyor scale system. The USNWG concluded that the weigh-belt systems could be sufficiently evaluated over a shorter time span and recommended that, as a minimum, 1 minute of operation would suffice.

Longer periods of operation of a belt-conveyor or weigh-belt system during a test will provide more time in which the effects of extreme low and high points of belt loading would be mitigated since these highs and lows are averaged into the total load. The high and low points of the belt loading would be seen during the start-up of the conveyor when material is just beginning to be loaded on the belt and then when the flow of material is cut off at the end of a “run” where a gradual decrease of material on the belt occurs. These extremes of belt loading would comprise a larger proportion of the total load during shorter periods of operation and could expose errors caused by inconsistent belt loading or other problems within the system. This could be interpreted that a test comprised of a shorter duration would be more stringent than one of a longer duration.

NIST Handbook 44 Belt-Conveyor Scale Systems Code language that existed prior to 2001 provided an exemption for belt-conveyor scale systems designed and furnished by the manufacturer from requirements that concerned the details of installation of belt-conveyor scale systems. Generally, weigh-belt systems are designed and built by the manufacturer as a unit and are therefore are less likely to be susceptible to malfunctions or operational defects directly caused by a variance from the manufacturer’s intended installation specifications. This is in contrast to belt-conveyor scale systems that are typically installed as separate components (conveyor, weighing system, belt loading system, speed sensor, etc.) within an existing conveyor system where the details of the installation for each component may greatly influence the performance of other components in the system. That language which has since been deleted is shown below:

**UR.2.2.1. For Scales not Installed by the Manufacturer.** - Unless the scale is installed in a conveyor designed and furnished by the scale manufacturer or built to the scale manufacturer’s specifications, the conveyor shall comply with the following minimum requirements:

...\*

(Amended 1998)

\*The subparagraphs that followed, UR.2.2.1.(a) through (j), consisted of requirements addressing specific criteria related to design and installation of the conveyor system.

The deletion of the statement: “installed in a conveyor designed and furnished by the scale manufacturer or built to the scale manufacturer’s specifications” created a situation where all belt-conveyor scale systems that were covered by the Handbook 44 BCS Code were to meet requirements in that included: specific limitations on the location of conveyor components in relation to the weighing element; specific limits on the length of the conveyor; and the type of take-up device used in the system. Due to the design and construction of typical weigh-belt systems, this type of device was not able to comply with these requirements largely due to the size, placement, and location of components in a weigh-belt type of system and the distances required between those components and the weighing elements.

USNWG members have agreed that it is important not to impose prescriptive requirements that may restrict innovation in the design of this type of device. Requirements that place limitations on the placement of components in a conveyor system in relation to the weighing device and to each other are viewed as being arbitrary and may be invalid if the design of a system is shown to operate within performance requirements regardless of the configuration of its components.

Belt-conveyor scale manufacturers who are members of the USNWG reported a demand from various clients for relatively compact weigh-belt type of systems to be used as a commercial device. However, unless the Handbook 44 BCS Code is amended to allow for their unique design characteristics, there was not an appropriate code in Handbook 44 to apply to weigh-belt systems. The USNWG therefore, has developed a number of proposed changes throughout the existing Belt-Conveyor Scale Systems Code to adapt these requirements so that they may be applied to weigh-belt systems as well.

### 2015 NCWM Interim Meeting

Agenda items 321-1 through 321-8 were grouped together and comments taken simultaneously as the Committee considered them all related. Mrs. Tina Butcher (OWM) spoke in support of this item. She stated that HB 44 included certain exceptions for installations of belt-conveyor scale systems installed under close supervision and control of the scale system manufacturer (prior to 2001). Mrs. Butcher went on to state that it would be appropriate to reinstate these exemptions for the weigh-belt systems, as recognized by this item and she concurred these items should be grouped together (with perhaps the exception being 321-6) and designated as Voting. Mrs. Butcher added that this item; however, may need to be reviewed for structure and provided alternate language. Steve Langford representing the Scale Manufacturer's Association stated the SMA had no position on these items.

The Committee concluded that the alternative language provided by OWM is more appropriate and agreed to replace the submitter's original proposed language (shown below) with the alternative language developed by OWM as shown in "Item Under Consideration." The Committee then agreed to recommend this item for vote.

**N.2.3. Minimum Test Load.** – Except for applications where a normal weighment is less than 10 minutes, the minimum test load shall not be less than the largest of the following values.

- (a) 800 scale divisions;
- (b) the load obtained at maximum flow rate in one revolution of the belt; or
- (c) at least 10 minutes of operation **for belt-conveyor scale systems or, for weigh-belt systems only, at least 1 minute of operation.**

### Regional Association Comments:

CWMA reported that a regulatory official questioned the one-minute requirement. It was suggested that this was to warm the belt prior to testing. CWMA appreciates the efforts of the work group and believes this item is sufficiently developed. CWMA forwarded the item to NCWM, recommending it as a Voting Item.

At the 2014 WWMA Annual Meeting testimony was presented in support of this item and moving it to Voting Status. The WWMA S&T Committee agreed that it was developed and recommended that 2014 WWMA S&T Agenda Items 321-1, 321-2, 321-3, 321-4, 321-5, 321-6, 321-7 and 321-8 be combined into one proposal. WWMA forwarded this item to NCWM and recommended that it be a Voting Item.

SWMA recommended that items 321-1 through 321-8 be combined into one agenda item since they are all related to belt conveyor scales. Comments were heard for all eight of these agenda items at the same time. SMWA forwarded this item to NCWM and recommended that it be a Voting Item.

NEWMA supported the recommendations of the USNWG on Belt-Conveyor Scales since the majority of these devices are located outside of the region. NEWMA forwarded the item to NCWM and recommended that it be a Voting Item.

<b>NEWMA Action: Item 321-4</b>	
<b>Summary of comments considered by the regional committee (in writing or during the open hearings):</b>	
SMA supports all of the combined items. No comments were made in opposition.	
<b>Item as proposed by the regional committee: (If different than agenda item)</b>	
Agenda items 321-1 through 321-8 were grouped together and comments were taken simultaneously.	

<b>Committee recommendation to the region:</b> <input checked="" type="checkbox"/> Voting Item on the NCWM Agenda <input type="checkbox"/> Information Item on the NCWM Agenda <input type="checkbox"/> Withdraw the Item from the NCWM Agenda ( <i>In the case of new items, do not forward to NCWM</i> ) <input type="checkbox"/> Developing Item on the NCWM Agenda ( <i>To be developed by source</i> )
<b>Reasons for the committee recommendation:</b> Hearing no comments in opposition, the committee recommends this item as voting.
<b>COMPLETE SECTION BELOW FOLLOWING VOTING SESSION</b>
<b>Final updated or revised proposal from the region: (<i>If different than regional committee recommendation</i>)</b>
<b>Regional recommendation to NCWM for item status:</b> <input checked="" type="checkbox"/> Voting Item on the NCWM Agenda <input type="checkbox"/> Information Item on the NCWM Agenda <input type="checkbox"/> Withdraw the Item from the NCWM Agenda ( <i>In the case of new items, do not forward to NCWM</i> ) <input type="checkbox"/> Developing Item on the NCWM Agenda ( <i>To be developed by source</i> ) <input type="checkbox"/> Unable to consider at this time ( <i>Provide explanation in the "Additional Comments" section below</i> )
<b>Regional Report to NCWM:</b> This is part of group items 321-1 through 321-8. Without any opposition NEWMA supports this as a voting item.

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

### 321-5 V N.3.1.1. Determination of Zero.

**Source:**

U.S. National Work Group on Belt-Conveyor Scales (2015)

**Purpose:**

Segregating the requirements for belt-conveyor scales that use electronic integrators from those that use mechanical integrators and add weigh-belt systems to the code.

**Item Under Consideration:**

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

**N.3.1.1. Determination of Zero.** – A zero-load test is a determination of the error in zero, expressed as an internal reference, a percentage of the full-scale capacity, or a change in a totalized load over a whole number of complete belt revolutions. ~~For belt-conveyor scales with electronic integrators, the test must be performed over a period of at least three minutes and with a whole number of complete belt revolutions. For belt-conveyor scales with mechanical integrators, the test shall be performed with no less than three complete revolutions or 10 minutes of operation, whichever is greater.~~ **A zero-load test shall be performed as follows:**

- (a) **For belt-conveyor scales with electronic integrators, the test must be performed over a period of at least 3 minutes and with a whole number of complete belt revolutions;**
- (b) **For belt-conveyor scales with mechanical integrators, the test shall be performed with no less than three complete revolutions or 10 minutes of operation, whichever is greater;**



- (c) **For weigh belt systems the test must be performed over a period of at least one minute and at least one complete revolution of the belt.**

(Added 2002) (**Amended 20XX**)

#### **Background / Discussion:**

Since the typical design of weigh-belt systems (see proposal to add definition in Appendix D for “weigh-belt systems”) consists of significantly shorter conveyors compared to those normally found in belt-conveyor scale systems, the time needed for a complete revolution of the belt to occur on a weigh-belt system is much shorter. The USNWG on Belt-Conveyor Scales agreed that due to the generally shorter time needed for a belt revolution on a weigh-belt system, the dynamics of the weigh-belt system (including the ability to maintain a zero load reference) could be evaluated without the need of an extended (10 minutes) period of operation as is required for a belt-conveyor scale system. The USNWG concluded that the weigh-belt system’s ability to maintain a stable zero condition could be sufficiently evaluated over a shorter time span and recommended that, as a minimum, 1 minute of operation would suffice. This provision has been added in bullet point (c).

This proposed amendment is also considered to improve the structure of the existing language of the requirement by segregating the requirements for belt-conveyor scales that use electronic integrators from those that use mechanical integrators into bullet points (a) and (b).

NIST Handbook 44 Belt-Conveyor Scale Systems Code language that existed prior to 2001 provided an exemption for belt-conveyor scale systems designed and furnished by the manufacturer from requirements that concerned the details of installation of belt-conveyor scale systems. Generally, weigh-belt systems are designed and built by the manufacturer as a unit and are therefore are less likely to be susceptible to malfunctions or operational defects directly caused by a variance from the manufacturer’s intended installation specifications. This is in contrast to belt-conveyor scale systems that are typically installed as separate components (conveyor, weighing system, belt loading system, speed sensor, etc.) within an existing conveyor system where the details of the installation for each component may greatly influence the performance of other components in the system. That language which has since been deleted is shown below:

**UR.2.2.1. For Scales not Installed by the Manufacturer.** - Unless the scale is installed in a conveyor designed and furnished by the scale manufacturer or built to the scale manufacturer’s specifications, the conveyor shall comply with the following minimum requirements:

...\*

(Amended 1998)

\*The subparagraphs that followed, UR.2.2.1.(a) through (j), consisted of requirements addressing specific criteria related to design and installation of the conveyor system.

The deletion of the statement: “installed in a conveyor designed and furnished by the scale manufacturer or built to the scale manufacturer’s specifications” created a situation where all belt-conveyor scale systems that were covered by the Handbook 44 BCS Code were to meet requirements in that included: specific limitations on the location of conveyor components in relation to the weighing element; specific limits on the length of the conveyor; and the type of take-up device used in the system. Due to the design and construction of typical weigh-belt systems, this type of device was not able to comply with these requirements largely due to the size, placement, and location of components in a weigh-belt type of system and the distances required between those components and the weighing elements.

USNWG members have agreed that it is important not to impose prescriptive requirements that may restrict innovation in the design of this type of device. Requirements that place limitations on the placement of components in a conveyor system in relation to the weighing device and to each other are viewed as being arbitrary and may be invalid if the design of a system is shown to operate within performance requirements regardless of the configuration of its components.

Belt-conveyor scale manufacturers who are members of the USNWG reported a demand from various clients for relatively compact weigh-belt type of systems to be used as a commercial device. However, unless the Handbook 44 BCS Code is amended to allow for their unique design characteristics, there was not an appropriate code in Handbook 44 to apply to weigh-belt systems. The USNWG therefore, has developed a number of proposed changes

throughout the existing Belt-Conveyor Scale Systems Code to adapt these requirements so that they may be applied to weigh-belt systems as well.

### 2015 NCWM Interim Meeting

Agenda items 321-1 through 321-8 were grouped together and comments taken simultaneously as the Committee considered them all related. Mrs. Tina Butcher (OWM) spoke in support of this item. She stated that HB 44 included certain exceptions for installations of belt-conveyor scale systems installed under close supervision and control of the scale system manufacturer (prior to 2001). Mrs. Butcher went on to state that it would be appropriate to reinstate these exemptions for the weigh-belt systems, as recognized by this item and she concurred these items should be grouped together (with perhaps the exception being 321-6) and designated as Voting. Item 321-6 is different in that the item does not relate to the inclusion of the term “weigh-belt systems” into the Belt-Conveyor Scale Systems Code of HB 44. Steve Langford representing the Scale Manufacturer's Association stated the SMA had no position on these items.

In consideration of the comments provided the Committee agreed to recommend this item for vote.

### Regional Association Comments:

CWMA did not receive comments on this item. CWMA appreciates the efforts of the work group and believes this item is sufficiently developed. CWMA forwarded the item to NCWM, recommending it as a Voting Item.

At the 2014 WWMA Annual Meeting testimony was presented in support of this item and moving it to Voting Status. The WWMA S&T Committee agreed that it was developed and recommended that 2014 WWMA S&T Agenda Items 321-1, 321-2, 321-3, 321-4, 321-5, 321-6, 321-7 and 321-8 be combined into one proposal. WWMA forwarded this item to NCWM and recommended that it be a Voting Item.

SWMA recommended that items 321-1 through 321-8 be combined into one agenda item since they are all related to belt conveyor scales. Comments were heard for all eight of these agenda items at the same time. SMWA forwarded this item to NCWM and recommended that it be a Voting Item.

NEWMA supported the recommendations of the USNWG on Belt-Conveyor Scales since the majority of these devices are located outside of the region. NEWMA forwarded the item to NCWM and recommended that it be a Voting Item.

<b>NEWMA Action: Item 321-5</b>
<b>Summary of comments considered by the regional committee (in writing or during the open hearings):</b>
SMA supports all of the combined items. No comments were made in opposition.
<b>Item as proposed by the regional committee: (If different than agenda item)</b>
Agenda items 321-1 through 321-8 were grouped together and comments were taken simultaneously.
<b>Committee recommendation to the region:</b>
<input checked="" type="checkbox"/> Voting Item on the NCWM Agenda <input type="checkbox"/> Information Item on the NCWM Agenda <input type="checkbox"/> Withdraw the Item from the NCWM Agenda ( <i>In the case of new items, do not forward to NCWM</i> ) <input type="checkbox"/> Developing Item on the NCWM Agenda ( <i>To be developed by source</i> )
<b>Reasons for the committee recommendation:</b>
Hearing no comments in opposition, the committee recommends this item as voting.
<b>COMPLETE SECTION BELOW FOLLOWING VOTING SESSION</b>
<b>Final updated or revised proposal from the region: (If different than regional committee recommendation)</b>

**Regional recommendation to NCWM for item status:**

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

**Regional Report to NCWM:**

This is part of group items 321-1 through 321-8.  
 Without any opposition NEWMA supports this as a voting item.

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

**321-6 V UR.1.2. Conveyor Installation.****Source:**

U.S. National Work Group on Belt-Conveyor Scales (2015)

**Purpose:**

Remove ambiguous and prescriptive language that fails to recognize improvements in manufacturing.

**Item Under Consideration:**

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

**UR.1.2. Conveyor Installation**

.....

- (k) **Belt Composition and Maintenance.** – ~~Conveyor belting shall be no heavier than is required for normal use.~~ In a loaded or unloaded condition, the belt shall make constant contact with horizontal and wing rollers of the idlers in the scale area. Splices shall not cause any undue disturbance in scale operation. (Also see N.3. Test Procedures.)  
 (Amended 1998, 2000, ~~and 2001, and 20XX~~)

**Background / Discussion:**

The existing language in this requirement that is being proposed to be deleted is intended to prevent the use of excessively thick, heavy-duty belt material that could be problematic when it's rigidity would prevent the belt from making proper contact with contour of the rollers that support the belt in the weighing area of the system. This could result in poor performance of the weighing system. In addition, a heavier belt would create a larger value for the "dead load" weight that must be accounted for by the scale in an unloaded zero-balance condition.

The USNWG on Belt-Conveyor Scales considers the use of the term "heavier" to be ambiguous in that it can be interpreted to mean a higher weight value per unit of length or it may mean that the relative thickness of the belt is greater than a "lighter" version of belt material. The USNWG recognizes that manufacturers of belt material have made improvements to their products through modernized manufacturing processes and the use of alternative raw materials. These practices have resulted in improvements over the traditional-style of belt material and may allow for belts of various thickness or weights to be used without detracting from scale performance.

The language that is proposed to be stricken is viewed as being prescriptive and the USNWG believes that the requirement should not attempt to establish a parameter for the design of belt material. The remaining portion of the requirement is considered as being sufficient for conveying the intent of the requirement in that, regardless of the manufacturing characteristics, the belt must make contact with the supporting rollers and be spliced appropriately to avoid the introduction of significant weighing errors.

NIST Handbook 44 Belt-Conveyor Scale Systems Code language that existed prior to 2001 provided an exemption for belt-conveyor scale systems designed and furnished by the manufacturer from requirements that concerned the details of installation of belt-conveyor scale systems. Generally, weigh-belt systems are designed and built by the manufacturer as a unit and are therefore less likely to be susceptible to malfunctions or operational defects directly caused by a variance from the manufacturer's intended installation specifications. This is in contrast to belt-conveyor scale systems that are typically installed as separate components (conveyor, weighing system, belt loading system, speed sensor, etc.) within an existing conveyor system where the details of the installation for each component may greatly influence the performance of other components in the system. That language which has since been deleted is shown below:

**UR.2.2.1. For Scales not Installed by the Manufacturer.** - Unless the scale is installed in a conveyor designed and furnished by the scale manufacturer or built to the scale manufacturer's specifications, the conveyor shall comply with the following minimum requirements:

...\*

(Amended 1998)

\*The subparagraphs that followed, UR.2.2.1.(a) through (j), consisted of requirements addressing specific criteria related to design and installation of the conveyor system.

The deletion of the statement: "installed in a conveyor designed and furnished by the scale manufacturer or built to the scale manufacturer's specifications" created a situation where all belt-conveyor scale systems that were covered by the Handbook 44 BCS Code were to meet requirements in that included: specific limitations on the location of conveyor components in relation to the weighing element; specific limits on the length of the conveyor; and the type of take-up device used in the system. Due to the design and construction of typical weigh-belt systems, this type of device was not able to comply with these requirements largely due to the size, placement, and location of components in a weigh-belt type of system and the distances required between those components and the weighing elements.

USNWG members have agreed that it is important not to impose prescriptive requirements that may restrict innovation in the design of this type of device. Requirements that place limitations on the placement of components in a conveyor system in relation to the weighing device and to each other are viewed as being arbitrary and may be invalid if the design of a system is shown to operate within performance requirements regardless of the configuration of its components.

Belt-conveyor scale manufacturers who are members of the USNWG reported a demand from various clients for relatively compact weigh-belt type of systems to be used as a commercial device. However, unless the Handbook 44 BCS Code is amended to allow for their unique design characteristics, there was not an appropriate code in Handbook 44 to apply to weigh-belt systems. The USNWG therefore, has developed a number of proposed changes throughout the existing Belt-Conveyor Scale Systems Code to adapt these requirements so that they may be applied to weigh-belt systems as well.

### **2015 NCWM Interim Meeting**

Agenda items 321-1 through 321-8 were grouped together and comments taken simultaneously as the Committee considered them all related. OWM provided no comment to this particular agenda item other than to report that this item is different from the other "321" items. That is, this particular item does not relate to the inclusion of the term "weigh-belt systems" into the Belt-Conveyor Scale Systems Code of HB 44. Steve Langford representing the Scale Manufacturer's Association stated the SMA had no position on these items.

Hearing no comments in opposition to this item, the Committee agreed to recommend this item for vote.

### **Regional Association Comments:**

CWMA did not receive comments on this item. CWMA appreciates the efforts of the work group and believes this item is sufficiently developed. CWMA forwarded the item to NCWM, recommending it as a Voting Item.

At the 2014 WWMA Annual Meeting testimony was presented in support of this item and moving it to Voting Status. The WWMA S&T Committee agreed that it was developed and recommended that 2014 WWMA S&T Agenda Items 321-1, 321-2, 321-3, 321-4, 321-5, 321-6, 321-7 and 321-8 be combined into one proposal. WWMA forwarded this item to NCWM and recommended that it be a Voting Item.

SWMA recommended that items 321-1 through 321-8 be combined into one agenda item since they are all related to belt conveyor scales. Comments were heard for all eight of these agenda items at the same time. SMWA forwarded this item to NCWM and recommended that it be a Voting Item.

NEWMA supported the recommendations of the USNWG on Belt-Conveyor Scales since the majority of these devices are located outside of the region. NEWMA forwarded the item to NCWM and recommended that it be a Voting Item.

<b>NEWMA Action: Item 321-6</b>
<b>Summary of comments considered by the regional committee (in writing or during the open hearings):</b>
SMA supports all of the combined items. No comments were made in opposition.
<b>Item as proposed by the regional committee: (If different than agenda item)</b>
Agenda items 321-1 through 321-8 were grouped together and comments were taken simultaneously.
<b>Committee recommendation to the region:</b>
<input checked="" type="checkbox"/> Voting Item on the NCWM Agenda <input type="checkbox"/> Information Item on the NCWM Agenda <input type="checkbox"/> Withdraw the Item from the NCWM Agenda ( <i>In the case of new items, do not forward to NCWM</i> ) <input type="checkbox"/> Developing Item on the NCWM Agenda ( <i>To be developed by source</i> )
<b>Reasons for the committee recommendation:</b>
Hearing no comments in opposition, the committee recommends this item as voting.
<b>COMPLETE SECTION BELOW FOLLOWING VOTING SESSION</b>
<b>Final updated or revised proposal from the region: (If different than regional committee recommendation)</b>
<b>Regional recommendation to NCWM for item status:</b>
<input checked="" type="checkbox"/> Voting Item on the NCWM Agenda <input type="checkbox"/> Information Item on the NCWM Agenda <input type="checkbox"/> Withdraw the Item from the NCWM Agenda ( <i>In the case of new items, do not forward to NCWM</i> ) <input type="checkbox"/> Developing Item on the NCWM Agenda ( <i>To be developed by source</i> ) <input type="checkbox"/> Unable to consider at this time ( <i>Provide explanation in the "Additional Comments" section below</i> )
<b>Regional Report to NCWM:.</b>
This is part of group items 321-1 through 321-8. Without any opposition NEWMA supports this as a voting item.

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

### **321-7     V     UR.3.1. Scale and Conveyor Maintenance. – ~~Belt-conveyor scales~~ Weighing systems.**

**Source:**

U.S. National Work Group on Belt-Conveyor Scales (2015)

**Purpose:**

Allow the requirement to apply to weigh-belt systems and require alignment checks whenever work is performed on weigh-belt systems as well as belt-conveyor scale systems that may alter the alignment.

**Item Under Consideration:**

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

**UR.3.1. Scale and Conveyor Maintenance.** – ~~Belt-conveyor scales~~**Weighing systems** and idlers shall be maintained and serviced in accordance with manufacturer’s instructions and the following:

...  
.  
.

- (e) **Scale Alignment.** – Alignment checks shall be conducted in accordance with the manufacturer’s recommendation ~~when conveyor work is performed in the scale area.~~ A material test is required after any realignment.

(Amended 1986, ~~and 2000~~, and 20XX)

**Background / Discussion:**

The USNWG on Belt-Conveyor Scales have proposed a number of changes to the HB44 BCS Code intended to allow the code to be applied to “weigh-belt systems” as well as belt-conveyor scale systems. To facilitate this effort references to “belt-conveyor scales” are being proposed to be changed to a more inclusive terminology such as is recommended in the first sentence in UR.3.1. (See also remarks in “Additional Considerations” below). This proposed change is intended to eliminate the exclusion of weigh-belt systems from this requirement.

Since the typical design of weigh-belt systems (see proposal for the addition of a new definition for “weigh-belt systems” in HB44, Appendix D) consists of an all-inclusive unit and significantly shorter conveyors as compared to those normally found in belt-conveyor scale system, *any* work performed on weigh-belt systems could possibly be considered to take place “in the scale area.” Any misalignment of the conveyor belt during its operation can have a detrimental effect on the performance of the system.

The USNWG on BCS agreed that it is appropriate to require alignment checks whenever work is performed on weigh-belt systems (as well as belt-conveyor scale systems) that may alter this alignment. The USNWG members who are employees of device manufacturers have stated that the manufacturers of weigh-belt systems will emphasize the critical nature of belt alignment and will specify that owners/operators check the belt alignment if work is performed on the conveyor system that could have any effect on this. Therefore, the USNWG agreed that the proposed change to require an alignment check to be done according to manufacturer’s instructions is a sound basis for this user requirement.

NIST Handbook 44 Belt-Conveyor Scale Systems Code language that existed prior to 2001 provided an exemption for belt-conveyor scale systems designed and furnished by the manufacturer from requirements that concerned the details of installation of belt-conveyor scale systems. Generally, weigh-belt systems are designed and built by the manufacturer as a unit and are therefore are less likely to be susceptible to malfunctions or operational defects directly caused by a variance from the manufacturer’s intended installation specifications. This is in contrast to belt-conveyor scale systems that are typically installed as separate components (conveyor, weighing system, belt loading system, speed sensor, etc.) within an existing conveyor system where the details of the installation for each component may greatly influence the performance of other components in the system. That language which has since been deleted is shown below:

**UR.2.2.1. For Scales not Installed by the Manufacturer.** - Unless the scale is installed in a conveyor designed and furnished by the scale manufacturer or built to the scale manufacturer’s specifications, the conveyor shall comply with the following minimum requirements:

...\*

(Amended 1998)

\*The subparagraphs that followed, UR.2.2.1.(a) through (j), consisted of requirements addressing specific criteria related to design and installation of the conveyor system.

The deletion of the statement: “installed in a conveyor designed and furnished by the scale manufacturer or built to the scale manufacturer’s specifications” created a situation where all belt-conveyor scale systems that were covered by the Handbook 44 BCS Code were to meet requirements in that included: specific limitations on the location of conveyor components in relation to the weighing element; specific limits on the length of the conveyor; and the type

of take-up device used in the system. Due to the design and construction of typical weigh-belt systems, this type of device was not able to comply with these requirements largely due to the size, placement, and location of components in a weigh-belt type of system and the distances required between those components and the weighing elements.

USNWG members have agreed that it is important not to impose prescriptive requirements that may restrict innovation in the design of this type of device. Requirements that place limitations on the placement of components in a conveyor system in relation to the weighing device and to each other are viewed as being arbitrary and may be invalid if the design of a system is shown to operate within performance requirements regardless of the configuration of its components.

Belt-conveyor scale manufacturers who are members of the USNWG reported a demand from various clients for relatively compact weigh-belt type of systems to be used as a commercial device. However, unless the Handbook 44 BCS Code is amended to allow for their unique design characteristics, there was not an appropriate code in Handbook 44 to apply to weigh-belt systems. The USNWG therefore, has developed a number of proposed changes throughout the existing Belt-Conveyor Scale Systems Code to adapt these requirements so that they may be applied to weigh-belt systems as well.

### **2015 NCWM Interim Meeting**

Agenda items 321-1 through 321-8 were grouped together and comments taken simultaneously as the Committee considered them all related. Mrs. Tina Butcher (OWM) spoke in support of this item. She stated that HB 44 included certain exceptions for installations of belt-conveyor scale systems installed under close supervision and control of the scale system manufacturer (prior to 2001). Mrs. Butcher went on to state that it would be appropriate to reinstate these exemptions for the weigh-belt systems, as recognized by this item and she concurred these items should be grouped together (with perhaps the exception being 321-6) and designated as Voting. Item 321-6 is different in that the item does not relate to the inclusion of the term “weigh-belt systems” into the Belt-Conveyor Scale Systems Code of HB 44. Steve Langford representing the Scale Manufacturer's Association stated the SMA had no position on these items.

In consideration of the comments provided the Committee agreed to recommend this item for vote.

### **Regional Association Comments:**

CWMA received a comment from a regulatory official supporting this item. CWMA appreciates the efforts of the work group and believes this item is sufficiently developed. CWMA forwarded the item to NCWM, recommending it as a Voting Item.

At the 2014 WWMA Annual Meeting testimony was presented in support of this item and moving it to Voting Status. The WWMA S&T Committee agreed that it was developed and recommended that 2014 WWMA S&T Agenda Items 321-1, 321-2, 321-3, 321-4, 321-5, 321-6, 321-7 and 321-8 be combined into one proposal. WWMA forwarded this item to NCWM and recommended that it be a Voting Item.

SWMA recommended that items 321-1 through 321-8 be combined into one agenda item since they are all related to belt conveyor scales. Comments were heard for all eight of these agenda items at the same time. SMWA forwarded this item to NCWM and recommended that it be a Voting Item.

NEWMA supported the recommendations of the USNWG on Belt-Conveyor Scales since the majority of these devices are located outside of the region. NEWMA forwarded the item to NCWM and recommended that it be a Voting Item.

<b>NEWMA Action: Item 321-7</b>	
<b>Summary of comments considered by the regional committee (in writing or during the open hearings):</b>	
SMA supports all of the combined items. No comments were made in opposition.	
<b>Item as proposed by the regional committee: (If different than agenda item)</b>	
Agenda items 321-1 through 321-8 were grouped together and comments were taken simultaneously.	

<b>Committee recommendation to the region:</b> <input checked="" type="checkbox"/> Voting Item on the NCWM Agenda <input type="checkbox"/> Information Item on the NCWM Agenda <input type="checkbox"/> Withdraw the Item from the NCWM Agenda ( <i>In the case of new items, do not forward to NCWM</i> ) <input type="checkbox"/> Developing Item on the NCWM Agenda ( <i>To be developed by source</i> )
<b>Reasons for the committee recommendation:</b> Hearing no comments in opposition, the committee recommends this item as voting.
<b>COMPLETE SECTION BELOW FOLLOWING VOTING SESSION</b>
<b>Final updated or revised proposal from the region: (<i>If different than regional committee recommendation</i>)</b>
<b>Regional recommendation to NCWM for item status:</b> <input checked="" type="checkbox"/> Voting Item on the NCWM Agenda <input type="checkbox"/> Information Item on the NCWM Agenda <input type="checkbox"/> Withdraw the Item from the NCWM Agenda ( <i>In the case of new items, do not forward to NCWM</i> ) <input type="checkbox"/> Developing Item on the NCWM Agenda ( <i>To be developed by source</i> ) <input type="checkbox"/> Unable to consider at this time ( <i>Provide explanation in the "Additional Comments" section below</i> )
<b>Regional Report to NCWM:</b> This is part of group items 321-1 through 321-8. Without any opposition NEWMA supports this as a voting item.

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

### 321-8 V Appendix D – Definitions. weigh-belt systems.

**Source:**

U.S. National Work Group on Belt-Conveyor Scales (2015)

**Purpose:**

Provide a definition for this device type if other proposals are adopted that would reference it in the Belt-Conveyor Scales Code.

**Item Under Consideration:**

Amend NIST Handbook 44 Appendix D – Definitions as follows:

**weigh-belt systems. – A type of belt-conveyor scale system designed by the manufacturer as a self-contained conveyor system and which is installed as a unit. The units are comprised of integral components including as a minimum: conveyor belt; belt drive; conveyor frame; and weighing system. They may operate at single or multiple flow rates and may use variable-speed belt drives**

**Background / Discussion:**

Based on the submission of proposed changes to the HB44 Belt-Conveyor Scale Systems Code that are intended to facilitate the application of that code to a specific, self-contained type of design devices commonly referred to as "weigh-belt systems," the USNWG on Belt-Conveyor Scales (BCS) agreed that it is necessary to establish a definition for this type of device. This definition would help to distinguish the weigh-belt type of systems from the more familiar belt-conveyor scale systems.



Several terms have been used to describe relatively shorter conveyor systems including “weigh-belts” and “weigh-feeders.” The USNWG agreed that the term “weigh-belt system” is best suited for describing this type of device. The work group also agreed that if this term is to be understood and routinely used to describe a specific type of weighing device/system, then a definition should be developed to be included in HB44 Appendix D (Definitions).

NIST Handbook 44 Belt-Conveyor Scale Systems Code language that existed prior to 2001 provided an exemption for belt-conveyor scale systems designed and furnished by the manufacturer from requirements that concerned the details of installation of belt-conveyor scale systems. Generally, weigh-belt systems are designed and built by the manufacturer as a unit and are therefore are less likely to be susceptible to malfunctions or operational defects directly caused by a variance from the manufacturer’s intended installation specifications. This is in contrast to belt-conveyor scale systems that are typically installed as separate components (conveyor, weighing system, belt loading system, speed sensor, etc.) within an existing conveyor system where the details of the installation for each component may greatly influence the performance of other components in the system. That language which has since been deleted is shown below:

**UR.2.2.1. For Scales not Installed by the Manufacturer.** - Unless the scale is installed in a conveyor designed and furnished by the scale manufacturer or built to the scale manufacturer’s specifications, the conveyor shall comply with the following minimum requirements:

...\*

(Amended 1998)

\*The subparagraphs that followed, UR.2.2.1.(a) through (j), consisted of requirements addressing specific criteria related to design and installation of the conveyor system.

The deletion of the statement: “installed in a conveyor designed and furnished by the scale manufacturer or built to the scale manufacturer’s specifications” created a situation where all belt-conveyor scale systems that were covered by the Handbook 44 BCS Code were to meet requirements in that included: specific limitations on the location of conveyor components in relation to the weighing element; specific limits on the length of the conveyor; and the type of take-up device used in the system. Due to the design and construction of typical weigh-belt systems, this type of device was not able to comply with these requirements largely due to the size, placement, and location of components in a weigh-belt type of system and the distances required between those components and the weighing elements.

USNWG members have agreed that it is important not to impose prescriptive requirements that may restrict innovation in the design of this type of device. Requirements that place limitations on the placement of components in a conveyor system in relation to the weighing device and to each other are viewed as being arbitrary and may be invalid if the design of a system is shown to operate within performance requirements regardless of the configuration of its components.

Belt-conveyor scale manufacturers who are members of the USNWG reported a demand from various clients for relatively compact weigh-belt type of systems to be used as a commercial device. However, unless the Handbook 44 BCS Code is amended to allow for their unique design characteristics, there was not an appropriate code in Handbook 44 to apply to weigh-belt systems. The USNWG therefore, has developed a number of proposed changes throughout the existing Belt-Conveyor Scale Systems Code to adapt these requirements so that they may be applied to weigh-belt systems as well.

### 2015 NCWM Interim Meeting

Agenda items 321-1 through 321-8 were grouped together and comments taken simultaneously as the Committee considered them all related. Mrs. Tina Butcher (OWM) spoke in support of this item. She stated that HB 44 included certain exceptions for installations of belt-conveyor scale systems installed under close supervision and control of the scale system manufacturer (prior to 2001). Mrs. Butcher went on to state that it would be appropriate to reinstate these exemptions for the weigh-belt systems, as recognized by this item and she concurred these items should be grouped together (with perhaps the exception being 321-6) and designated as Voting. Item 321-6 is different in that the item does not relate to the inclusion of the term “weigh-belt systems” into the Belt-Conveyor Scale Systems Code of HB 44. Steve Langford representing the Scale Manufacturer's Association stated the SMA had no position on these items.

In consideration of the comments provided the Committee agreed to recommend this item for vote.

**Regional Association Comments:**

CWMA did not receive comments on this item. CWMA appreciates the efforts of the work group and believes this item is sufficiently developed. CWMA forwarded the item to NCWM, recommending it as a Voting Item.

At the 2014 WWMA Annual Meeting testimony was presented in support of this item and moving it to Voting Status. The WWMA S&T Committee agreed that it was developed and recommended that 2014 WWMA S&T Agenda Items 321-1, 321-2, 321-3, 321-4, 321-5, 321-6, 321-7 and 321-8 be combined into one proposal. WWMA forwarded this item to NCWM and recommended that it be a Voting Item.

SWMA recommended that items 321-1 through 321-8 be combined into one agenda item since they are all related to belt conveyor scales. Comments were heard for all eight of these agenda items at the same time. SMWA forwarded this item to NCWM and recommended that it be a Voting Item.

NEWMA supported the recommendations of the USNWG on Belt-Conveyor Scales since the majority of these devices are located outside of the region. NEWMA forwarded the item to NCWM and recommended that it be a Voting Item.

<b>NEWMA Action: Item 321-8</b>
<b>Summary of comments considered by the regional committee (in writing or during the open hearings):</b>
SMA supports all of the combined items. No comments were made in opposition.
<b>Item as proposed by the regional committee: (If different than agenda item)</b>
Agenda items 321-1 through 321-8 were grouped together and comments were taken simultaneously.
<b>Committee recommendation to the region:</b>
<input checked="" type="checkbox"/> Voting Item on the NCWM Agenda <input type="checkbox"/> Information Item on the NCWM Agenda <input type="checkbox"/> Withdraw the Item from the NCWM Agenda ( <i>In the case of new items, do not forward to NCWM</i> ) <input type="checkbox"/> Developing Item on the NCWM Agenda ( <i>To be developed by source</i> )
<b>Reasons for the committee recommendation:</b>
Hearing no comments in opposition, the committee recommends this item as voting.
<b>COMPLETE SECTION BELOW FOLLOWING VOTING SESSION</b>
<b>Final updated or revised proposal from the region: (If different than regional committee recommendation)</b>
<b>Regional recommendation to NCWM for item status:</b>
<input checked="" type="checkbox"/> Voting Item on the NCWM Agenda <input type="checkbox"/> Information Item on the NCWM Agenda <input type="checkbox"/> Withdraw the Item from the NCWM Agenda ( <i>In the case of new items, do not forward to NCWM</i> ) <input type="checkbox"/> Developing Item on the NCWM Agenda ( <i>To be developed by source</i> ) <input type="checkbox"/> Unable to consider at this time ( <i>Provide explanation in the "Additional Comments" section below</i> )
<b>Regional Report to NCWM:</b>
This is part of group items 321-1 through 321-8. Without any opposition NEWMA supports this as a voting item.

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

## 322 AUTOMATIC BULK WEIGHING SYSTEMS

### 322-1 D N.1. Testing Procedures.

**Source:**

Oregon (2015)

**Purpose:**

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

**Item Under Consideration:**

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

#### N.1. Testing Procedures.

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

- ~~(a) on automatic grain bulk weighing systems installed after January 1, 1984; and~~
- ~~(b) on other automatic bulk weighing systems installed after January 1, 1986.~~

~~(Amended 1987)~~

~~N.1.2. Increasing Load Test. — An increasing load test consisting of substitution and strain load tests shall be conducted up to the used capacity of the weighing system.~~

~~(Amended 1987)~~

~~N.1.3. Decreasing Load Test. — A decreasing load test shall be conducted on devices used to weigh out.~~

~~(Added 1986)~~

N.1.1. Material Tests. – Material used for test must be the actual material weighed by system or similar in nature. Material tests should be conducted using actual scale loading conditions. These loading conditions shall include, three accumulation tests consisting of three loadings at maximum capacity for the material and a partial loading of between 30% and 50% (three and a partial loadings).

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

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

- (a) The containers, whether railroad cars, trucks, or boxes, must not leak, and shall not be overloaded to the point that material will be lost.
- (b) The actual empty or tare weight of the containers shall be determined at the time of the test. Stenciled tare weight of railway cars, trucks or boxes shall not be used. Gross and tare weights shall be determined on the same scale.

- (c) When a pre-weighed test load is passed through the scale, the loading system shall be examined before and after the test to assure that the system is empty and that only the material of the test load has passed through the scale.
- (d) Where practicable, a reference scale should be tested within 24 hours preceding the determination of the weight of the test load used for an Automatic Bulk Weighing System material test.

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

- (e) If any suitable known weight load other than a certified test weight load is used for re-verification of the reference scale accuracy, its weight shall be determined on the reference scale after the reference scale certification and before commencing the Automatic Bulk Weighing System material test.\*
- (f) The test shall not be conducted if the weight of the test load has been affected by environmental conditions.

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

N.1.1.1. Accuracy of Material. – The quantity of material used to conduct a material test shall be weighed on a reference scale to an accuracy within 0.1 %. Scales typically used for this purpose include Class III and III L scales or a scale without a class designation as described in Handbook 44, Section 2.20., Table T.1.1. Tolerances for Unmarked Scales.

N.1.1.2. Associated Equipment. – All associated equipment in local vicinity shall be in operation at time of test. This would include items such as conveyors; tote dumps, cleaning drums, rock separators, etc.

~~N.1.4.~~ N.1.2. Zero-Balance or No-Load Reference Value Change Test. – A test for change of zero-balance or no-load reference value shall be conducted on all scales after the removal of any test load. The change shall not be more than the minimum tolerance applicable.

~~N.1.5.~~ N.1.3 Discrimination Test. – *A discrimination test shall be conducted on all automatic indicating scales with the weighing device in equilibrium at zero-load and at maximum test load, and under controlled conditions in which environmental factors are reduced to the extent that they will not affect the results obtained.*

*[Nonretroactive as of January 1, 1986]*

~~N.1.5.1.~~ N.1.3.1. Digital Device. – On a digital device, this test is conducted from just below the lower edge of the zone of uncertainty for increasing-load tests, or from just above the upper edge of the zone of uncertainty for decreasing-load tests.

(Added 1987)

~~T.1.2. To Increasing Load Tests. – Basic tolerances shall be applied.~~

~~**T.1.3. To Decreasing Load Tests.** – Basic tolerances shall be applied to systems used to weigh out.~~

~~(Added 1986)~~

~~**T.1.4. T.1.2. To Tests Involving Digital Indications or Representations.** – To the tolerances that would otherwise be applied, there shall be added an amount equal to one-half the value of the scale division. This does not apply to digital indications or recorded representations that have been corrected for rounding using error weights.~~

~~(Added 1986)~~

### **T.3. Basic Tolerance Values.**

**T.3.1. Acceptance Tolerance.** – The basic acceptance tolerance shall be one-half the basic maintenance tolerance.

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

**T.3.3. For All Other Systems.** – The basic maintenance tolerance shall be 0.2 % of ~~test load~~ accumulation material test.

(Amended 1986)

**T.5. Repeatability.** – The ~~results obtained by several weighings of the same load under reasonably static test conditions~~ variation in the values obtained during the conduct of accumulation material tests shall agree within the absolute value of the maintenance tolerance for that load, and shall be within applicable tolerances.

~~(Added 1986)~~

### **Background / Discussion:**

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

While evaluating Automatic Bulk Weighing Systems in the State of Oregon it was found that devices meeting static testing tolerances were in fact weighing with errors as high as 6%. Through investigation it was found that a high percentage of the Automatic Bulk Weighing Systems in the state were in fact weighing in error when operating in their normal dynamic mode. These same devices would have received approval using only static methods.

The fundamentals of testing call for “testing as used” this proposal lays out a method to do exactly that “test as used”.

Some facilities may find it difficult to accommodate the material test method. There may be substantial cost in restructuring facilities to allow for either the capture or introduction of test material.

Adopting this proposal would align with another dynamic device type, Belt Scales, NIST Handbook 44, Section 2.21.

### **2015 NCWM Interim Meeting**

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

Mr. Doug Deiman (AK) stated that while the proposal provided by the State of Oregon is a serious issue that needs to be addressed, he could not support a material test as written and gave an example of a test of the fish scales

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

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

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

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

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

*OWM Analysis S&T Item 324-1*

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

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

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

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

1. How does one account for the loss of material caused by conveyance of the reference material, e.g., water loss, if weighing wet commodities such as fish, grain loss if using circulating augers to transfer, etc.? Guidelines for weighing and controlling the reference material will need to be developed.

2. Guidelines will also need to be established for determining the suitability and accuracy of the reference scale used to weigh the material used for the materials test and the timing of the testing in relation to when materials tests are conducted.
3. Can we get more comparison data for other commodities?
4. Should the materials test be optional? This item isn't ready for vote – the issue needs more investigation.
5. How many material tests need to be conducted considering the weight/varieties of commodities weighed?

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

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

#### **Regional Association Comments:**

CWMA received a comment from an industry representative suggesting retaining the stricken language and potentially using the new language as a supplemental test method. The CWMA supports the development of this item and forwarded the item to NCWM for further development.

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

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

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

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

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

- (b) The actual empty or tare weight of the containers shall be determined at the time of the test. Stenciled tare weight of railway cars, trucks or boxes shall not be used. Gross and tare weights shall be determined on the same scale.
- (c) When a pre-weighed test load is passed through the scale, the loading system shall be examined before and after the test to assure that the system is empty and that only the material of the test load has passed through the scale.
- (d) Where practicable, a reference scale should be tested within 24 hours preceding the determination of the weight of the test load used for an Automatic Bulk Weighing System material test.

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

- (e) If any suitable known weight load other than a certified test weight load is used for re-verification of the reference scale accuracy, its weight shall be determined on the reference scale after the reference scale certification and before commencing the Automatic Bulk Weighing System material test.\*
- (f) The test shall not be conducted if the weight of the test load has been affected by environmental conditions.

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

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

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

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

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

*[Nonretroactive as of January 1, 1986]*

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

(Added 1987)



**T.3. Basic Tolerance Values.**

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

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

(Amended 1986)

**T.5. Repeatability.**

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

(Added 1986)

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

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

NEWMA believes the justification for the proposal has merit. NEWMA forwarded the item to NCWM and recommended that it be a Voting Item.

<b>NEWMA Action: Item 322-1</b>
<b>Summary of comments considered by the regional committee (in writing or during the open hearings):</b>
Comments were heard stating that this item should be addressed in the initial verification of the device.
<b>Item as proposed by the regional committee: <i>(If different than agenda item)</i></b>
<b>Committee recommendation to the region:</b> <input type="checkbox"/> Voting Item on the NCWM Agenda <input type="checkbox"/> Information Item on the NCWM Agenda <input type="checkbox"/> Withdraw the Item from the NCWM Agenda <i>(In the case of new items, do not forward to NCWM)</i> <input checked="" type="checkbox"/> Developing Item on the NCWM Agenda <i>(To be developed by source)</i>
<b>Reasons for the committee recommendation:</b>
The committee feels that there is still work to do on this item and recommends it remain developing.
<b>COMPLETE SECTION BELOW FOLLOWING VOTING SESSION</b>
<b>Final updated or revised proposal from the region: <i>(If different than regional committee recommendation)</i></b>
<b>Regional recommendation to NCWM for item status:</b>
<input type="checkbox"/> Voting Item on the NCWM Agenda <input type="checkbox"/> Information Item on the NCWM Agenda <input type="checkbox"/> Withdraw the Item from the NCWM Agenda <i>(In the case of new items, do not forward to NCWM)</i> <input checked="" type="checkbox"/> Developing Item on the NCWM Agenda <i>(To be developed by source)</i> <input type="checkbox"/> Unable to consider at this time <i>(Provide explanation in the “Additional Comments” section below)</i>

<b>Regional Report to NCWM:</b>
NEWMA recommends this item remain developing.

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

## 324 AUTOMATIC WEIGHING SYSTEMS

### 324-1 W A.1. General.

**Source:**

KSi Conveyors, Inc. (2015)

**Purpose:**

Provide clarity in Handbook 44 as to what standards apply to weighing and measuring systems that provide a finished product based on the measurement of raw materials.

**Item Under Consideration:**

Amend NIST Handbook 44 Automatic Weighing Systems Code as follows:

**A.1. General.** – This code applies to devices used to automatically weigh pre-assembled discrete loads or single loads or loose materials in applications where automatic weighing systems<sup>1</sup> are used or employed in the determination of quantities, things, produce, or articles for distribution, for purchase, offered or submitted for sale, for distribution, purchase, or in computing any basic charge or payment for services rendered on the basis of weight, and in packaging plants subject to regulation by the USDA. Some weigh-labelers and checkweighers may also include a scale that is incorporated in a conveyor system that weighs packages in a static or non-automatic weighing mode<sup>2</sup>.

This includes:

- (a) Automatic weigh-labelers;
  - (b) Combination automatic and non-automatic weigh-labelers;
  - (c) Automatic checkweighers;
  - (d) **Automatic batching systems;**
  - ~~(de)~~ Combination automatic and non-automatic checkweighers; and
  - ~~(ef)~~ Automatic gravimetric filling machines that weigh discrete loads or single loads of loose materials and determine package and production lot compliance with net content representations.
- (Amended 1997 and 2004)

<sup>1</sup> An automatic weighing system does not require the intervention of an operator during the weighing process. The necessity to give instructions to start a process or to release a load or the function of the instrument (static, dynamic, set-up, etc.) is not relevant in deciding the category of automatic or non-automatic instruments.

(Added 2004)

<sup>1</sup> Prepackaging scales (and other commercial devices) used for putting up packages in advance of sale are acceptable for use in commerce if all appropriate provisions of Handbook 44 are met. Users of such devices must be alert to the legal requirements relating to the declaration of quantity on a package. Such requirements are to the effect that, on the average, the contents of the individual packages of a particular commodity comprising a lot, shipment, or delivery must contain at least the quantity declared on the label. The fact that a scale or other commercial device may overregister, but within established tolerances, and is approved for commercial service is not a legal justification for packages to contain, on the average, less than the labeled quantity.

(Added 2004)

#### **Background / Discussion:**

The reference to batching systems will accompany the proposal to add a definition for “batching systems” to Appendix D – Definitions. The CWMA has already agreed to forward the definition to the NCWM S&T Committee with the recommendation that it be a Voting Item. The CWMA noted that the definition needs to reference the specific codes where the definition is applicable.

There are both automatic and non-automatic batching systems the utilize scales and/or meters already in the market place and have been for many years. The lack of a definition and the accompanying references may have just been an oversight on the part of the NCWM S&T Committee. For further clarification and justification please refer to the proposal to add a definition for “batching systems” which was also submitted to the SWMA for consideration.

#### **2015 NCWM Interim Meeting**

The Committee agreed to group Agenda Items 320-1, 324-1, 330-1, and 360-1 together since these items are related and announced that comments on all four items would be taken together during the open hearings. The Committee agreed to withdraw these items in consideration of the comments and analysis that were provided. Refer to Agenda Item 320-1 for a summary of the comments provided concerning these four items and the reasons why they were withdrawn.

#### **Regional Association Comments:**

SWMA did not hear any comments in opposition to this item. SWMA suggested that the NCWM S&T Committee may wish to consider merging agenda items 320-1; 324-1; 330-1; and 360-1 as they are all related. Comments were heard for all four of these agenda items at the same time. SWMA forwarded the item to NCWM recommending it as a Voting Item.

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

## **330 LIQUID MEASURING DEVICES**

### **330-1 W A.1. General.**

#### **Source:**

KSi Conveyors, Inc. (2015)

#### **Purpose:**

Provide clarity in Handbook 44 as to what standards apply to weighing and measuring systems that that provide a finished product based on the measurement of raw materials.

**Item Under Consideration:**

Amend NIST Handbook 44 Liquid Measuring Devices Code as follows :

**A.1. General.** – This code applies to:

- (a) devices used for the measurement of liquids, including liquid fuels and lubricants; ~~and~~
- (b) ~~wholesale~~ devices used for the measurement and delivery of agri-chemical liquids such as fertilizers, feeds, herbicides, pesticides, insecticides, fungicides, and defoliants; ~~and~~ and
- (c) liquid batching systems using meters to measure raw materials.  
(Added 1985)

**Background / Discussion:**

The reference to batching systems will accompany the proposal to add a definition for “batching systems” to Appendix D – Definitions. The CWMA has already agreed to forward the definition to the NCWM S&T Committee with the recommendation that it be a Voting Item. The CWMA noted that the definition needs to reference the specific codes where the definition is applicable. With the current definition for retail referring to an end user the term wholesale should be removed from A.1. (b).

There are both automatic and non-automatic batching systems the utilize scales and/or meters already in the market place and have been for many years. The lack of a definition and the accompanying references may have just been an oversight on the part of the NCWM S&T Committee. For further clarification and justification please refer to the proposal to add a definition for “batching systems” which was also submitted to the SWMA for consideration.

**2015 NCWM Interim Meeting**

The Committee agreed to group Agenda Items 320-1, 324-1, 330-1, and 360-1 together since these items are related and announced that comments on all four items would be taken together during the open hearings. The Committee agreed to withdraw these items in consideration of the comments and analysis that were provided. Refer to Agenda Item 320-1 for a summary of the comments provided concerning these four items and the reasons why they were withdrawn.

**Regional Association Comments:**

SWMA requested an explanation from the submitter as to why ‘wholesale’ was stricken from the language in the proposal. The submitter explained that when the definition for ‘retail’ was amended last it referenced the end user, which excluded retail applications under the new definition. SWMA did not hear any comments in opposition to this item. SWMA suggested that the NCWM S&T Committee may wish to consider merging agenda items 320-1; 324-1; 330-1; and 360-1 as they are all related. Comments were heard for all four of these agenda items at the same time. SWMA forwarded the item to NCWM recommending it as a Voting Item.

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

**330-2 V Table S.2.2. Categories of Device and Methods of Sealing.**

**Source:**

Gilbarco, Inc. (2015)

**Purpose:**

Allow an electronic means to transfer the event logger information for Category 3 event loggers.

**Item Under Consideration:**

Amend NIST Handbook 44 Liquid Measuring Devices Code as follows:

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

[Nonretroactive as of January 1, 1995]

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

### **Background / Discussion:**

This proposal would recognize the use of an electronic means such as a thumb drive, flash drive, laptop computer, email or cell phone to receive the event logger information from a dispenser or another on-site device. Event logger information in an electronic format is easier to sort and search than the traditional paper format. Paper version of the event logger cannot be readily sorted and analyzed like an electronic log. A consideration is that W&Ms officials may not have means to receive the electronic version of the event logger. HB44 allows the use of electronic receipts for consumers. Event loggers could be developed to take advantage of technology to facilitate W&Ms review of event logs.

### **Measuring Sector**

The Measuring Sector considered this item during its 2014 meeting (2014 Measuring Sector Agenda Item 16.) and decided that this proposal needs further development and agreed to carry it over to its 2015 agenda.

### **2015 NCWM Interim Meeting**

The Committee considered the following proposal to amend the sealing requirements for Category 3 devices covered by the Liquid Measuring Devices Code:

*An event logger is required in the device; it must include an event counter (000 to 999), the parameter ID, the date and time of the change, and the new value of the parameter. **The use of an electronic means such as a thumb drive, flash drive, laptop computer, Email, cell phone may be used to receive the event logger information from a dispenser or another on-site device.** A printed copy of the information must be available through the device or through another on-site device **if the device is not equipped to offer an electronic means of supplying the information.** The event logger shall have a capacity to retain records equal to 10 times the number of sealable parameters in the device, but not more than 1000 records are required. (Note: Does not require 1000 changes to be stored for each parameter.)*

During the open hearings, Mr. Gordon Johnson (Gilbarco), submitter of the item, gave a short presentation on the merits of the proposal. During that presentation, Mr. Johnson requested that the original language proposed be amended to that shown in “Item Under Consideration.” He noted that this new language also incorporated slight changes that had been recommended by the Meter Manufacturers Association and that he agreed with those changes.

Mrs. Tina Butcher (OWM) commented that, while OWM understands the desire to make the information electronically accessible and agrees with the need to move in that direction, inspectors need the information at the time of inspection and in a form that is readily reviewable. This allows for better analysis and review of the changes that have been made overtime. They (inspectors) need to be able to review the changes before they begin their inspection of the device. Inspectors shouldn’t be expected to provide the equipment necessary for retrieval of the information, and use of foreign storage devices to retrieve the information would likely be a security issue for some. She also noted that reviewing a history of changes on a cell phone would be difficult because of the limited display size. A printed log of the changes is needed to enable a review of the changes made over time.

Mr. Ross Andersen (NY-retired) stated that the changes proposed are not needed and are already addressed in the public record laws of each state. Some questioned whether or not those laws apply to this type of record and suggested further examination of those laws is needed.

A few regulatory officials voiced concern regarding the equipment that would be needed to access the information and whether or not every official in every jurisdiction would have access to the equipment. An additional concern raised by officials is how secure would the data be if collected electronically. With respect to the security concern, it was suggested that perhaps equipment manufacturers could design their equipment in such a way to prevent uploads of data from occurring. Another suggestion was to possibly password encrypt the data. Comments in support of being able to access the data electronically were also heard. Ms. Kristin Macey (CA) stated that we absolutely need the ability to provide information electronically. Government will catch up.

Mr. Paul Lewis (Rice Lake Weighing) pointed out that officials typically only look at the sealable parameters that have changed since they last inspected the device. He reported it was his experience that it’s not all that much information.

The Committee agreed to replace the language originally proposed by the submitter with that shown in “Item Under Consideration” and move this item forward for a vote.

**Regional Association Comments:**

Testimony was presented by the submitter during the 2014 WWMA Annual Meeting with no opposing opinions being presented. The WWMA S&T Committee felt that the item had merit and would more easily facilitate examination of an audit trail. However, there are some concerns with respect to data security and the transfer of information to W&M officials. Therefore WWMA forwarded the item to NCWM, recommending that it be a Developing Item to allow the submitter to refine the proposal.

SWMA supports the general concept of this item, but believes it needs to be further developed by the submitter. Specifically, concerns were raised regarding corruption of files, violation of government IT policies pertaining to foreign devices interacting with government computers and input by other manufacturers. SWMA forwarded the item to NCWM, recommending it as a Developing Item.

<b>NEWMA Action: Item 330-2</b>
<b>Summary of comments considered by the regional committee (in writing or during the open hearings):</b>
Submitter endorses this item. A comment was made from floor questioning whether electronic statements are already an acceptable form of record in accord with public record laws of individual states.
<b>Item as proposed by the regional committee: (If different than agenda item)</b>
<b>Committee recommendation to the region:</b> <input checked="" type="checkbox"/> Voting Item on the NCWM Agenda <input type="checkbox"/> Information Item on the NCWM Agenda <input type="checkbox"/> Withdraw the Item from the NCWM Agenda ( <i>In the case of new items, do not forward to NCWM</i> ) <input type="checkbox"/> Developing Item on the NCWM Agenda ( <i>To be developed by source</i> )
<b>Reasons for the committee recommendation:</b>
This proposal allows for advancement in technology yet still requires a printed copy to be available on site.
<b>COMPLETE SECTION BELOW FOLLOWING VOTING SESSION</b>
<b>Final updated or revised proposal from the region: (If different than regional committee recommendation)</b>
<b>Regional recommendation to NCWM for item status:</b> <input checked="" type="checkbox"/> Voting Item on the NCWM Agenda <input type="checkbox"/> Information Item on the NCWM Agenda <input type="checkbox"/> Withdraw the Item from the NCWM Agenda ( <i>In the case of new items, do not forward to NCWM</i> ) <input type="checkbox"/> Developing Item on the NCWM Agenda ( <i>To be developed by source</i> ) <input type="checkbox"/> Unable to consider at this time ( <i>Provide explanation in the “Additional Comments” section below</i> )
<b>Regional Report to NCWM:</b>
NEWMA supports the advancement in technology and recommends this as a voting item.

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

**330-3 D N.4.1.3. Normal Tests on Wholesale Multi-Point Calibration Devices.**

**Source:**

NCWM Multi-Point Calibration Group (2015)

**Purpose:**

Update the Liquid Measuring Device Code to reflect advances in meter calibration technology.

**Item Under Consideration:**

Add a new paragraph to the NIST Handbook 44 Liquid Measuring Devices Code as follows:

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

**Background / Discussion:**

New technology makes it possible to use linearization factors to optimize accuracy at every flow rate for which a wholesale meter is programmed to deliver. A special tolerance has traditionally been applied to slow flow tests on wholesale meters with mechanical single-point calibrators because accuracy could only be optimized at one flow rate. A wholesale multi-point calibrated meter does not require a special tolerance at any flow rate since every flow rate can be adjusted as close to zero as practicable.

This supports the principle expressed in G-UR.4.3. that adjustments shall be made so as to bring performance errors as close to zero as possible. It also reduces the amount of bias error which startup and shutdown rates introduce into the proving process by reducing performance errors at slow-flow startup and shutdown flow rates. 3. Applies only to meters which are actually configured with multiple calibration points. Meter owners who do not want to take the time to calibrate at multiple flow rates may configure their meters for single point calibration.

This allows meters with single point calibration to have a larger tolerance at slow-flow rates than meters with multi-point calibration. Multi-point calibrated devices are increasingly used as commercial meters. The question of whether they should be treated differently than devices with single-point calibration needs to be addressed.

**2015 NCWM Interim Meeting**

Agenda items 330-3, 331-1 and 360-2 were grouped together and comments taken simultaneously as the Committee considered them related. A summary of comments heard on all three items are as follows:

With respect to Agenda Item 330-3, Mrs. Tina Butcher (OWM) stated that there appears to be a 'structural issue' and potential conflict with N.4.1.3. She provided a brief summary of OWM's analysis of this item (shown below), which was provided to Committee members in a written report and made available to the NCWM membership during the open hearings.



*OWM's Analysis of Agenda Item 330-3*

Additional work is needed on this proposal. In considering this item, OWM identified the following issues that will need to be addressed:

- The second sentence of proposed new paragraph N.4.1.3. conflicts with the second sentence of current paragraph N.4.1. Normal Tests. Given this conflict, how can the code best be structured to accommodate the addition of this new proposed requirement? That is, what should the paragraph hierarchy look like and will current requirements need to be changed to avoid conflicts and added confusion?
- Why does the proposal limit testing to wholesale devices? OWM questions why this principle wouldn't apply to any measuring device with multi-point calibration capability?
- Should Table T.2. be amended to make clear the tolerance intended to apply to the results of all the testing that will need to be conducted on devices with multi-point calibration?
- Paragraph N.4.2. Special Tests specifies that a "Special Test" shall be made; yet, OWM believes that the multi-calibration group intends for all testing associated with a device equipped with multi-point calibration be "Normal" tests and "Normal" test tolerances intended to apply. If this is the case, how are officials to meet the obligation of performing a "Special Test" as specified?
- How will the addition of this new paragraph affect other paragraphs in the code? All current paragraphs should to be reviewed to make certain additional conflicts or confusion isn't being created by the addition of any new paragraph.

With respect to Agenda Item 331-1, Mrs. Butcher noted that OWM's analysis and comments for the item are the same those made in NCWM S&T Item 330-3. However, it is important to point out that the language proposed was copied and pasted from NCWM S&T Item 330-3 and then modifications of terms from "wholesale" to "vehicle-tank" were made. The reference to "Wholesale" multi-point calibrated devices was overlooked in several places and remains in this item. Consequently, there are multiple corrections that must be made to change references from "wholesale" to "vehicle-tank" or "vehicle-tank meter" as appropriate. In that regard, the following amendments are needed:

1. The proposal's NCWM Publication 15 heading be amended: "331-1 N.4.1.4. Normal Tests on ~~Wholesale~~ Vehicle-Tank Multi-Point Calibration Devices."
2. The "Purpose" statement be amended: "Update the ~~Liquid Measuring Device~~ Vehicle-Tank Meter Code to reflect advances in meter calibration technology."
3. The Item Under Consideration statement be amended: "Add a new paragraph to the NIST Handbook 44 ~~Liquid Measuring Devices~~ Vehicle-Tank Meter Code as follows:"
4. The proposal's reference title be amended: "N.4.1.4. Normal Tests on ~~Wholesale~~ Vehicle-Tank Multi-Point Calibration Devices."

With respect to Agenda Item 360-2, Mrs. Butcher provided a brief summary of OWM's analysis of this item, which was also provided to Committee members in a written report and made available to the NCWM membership during the open hearings. The following analysis was provided:

*OWM's analysis of Agenda Item 360-2:*

If adopted, NCWM S&T Item 360-2 would do the following:

1. It would include citations to NIST HB 44 sections; 3.31, 3.32, 3.34, and 3.35 into the definition of, “calibration parameter”, and
2. It would add a definition for, “multi-point calibrated device.”

The term, “calibration parameter” is used in the, *Categories of Device and Methods of Sealing*, tables in NIST HB 44 Sections 3.31, 3.32, 3.34, and 3.35, but these Sections are not currently cited in the definition of calibration parameter. NIST OWM believes that for consistency and correctness, it is appropriate that these references be added to this definition.

The term, “multi-point calibrated device” does not currently appear in NIST HB 44, and for that reason, it would not be appropriate to add a definition unless one or more of the proposals related to multiple-point calibration are adopted. If this were to occur, then a definition would be necessary.

In the, “Background/Discussion” portion of this item, there are comments that other equipment “such as meters, weighing devices, and other devices” have the capability of multiple-point calibration. This may be true; however, the term, “multi-point calibrated device” is not used in any of the current HB 44 codes; thus, NIST OWM believes this definition is not necessary.

Due to the similar context, intent, and companionship of NCWM S&T Committee agenda items, 330-3, 330-4, 331-1, 331-2, and 360-2, NIST OWM recommends that all of these items be heard and discussed by the Conference at the same time.

Mr. Henry Oppermann (Weights and Measures Consulting, LLC) provided written comments to the Committee in opposition to Agenda Items 330-3 and 331-1 and provided a summary of his concerns during the open hearings. He stated that these items went against some weights and measures principles and that existing tolerances for these devices were acceptable. The proposal would have the effect of changing HB 44 tolerances by considering flow rates down to the minimum discharge rate of meter to be normal tests on multi-point calibration devices. This is wrong because:

1. Accuracy requirements (tolerances) are established based on the accuracy that is required for a particular application of the devices at a reasonable cost.
2. The tolerances for a given measurement application are **not** based upon the technologies used in devices.
3. Any device that meets the specifications and tolerances for a given application may be used for that application.
4. It is wrong to penalize a technology with tighter tolerances simply because it can produce more accurate measurements than other technologies used in the same application.

Mr. Oppermann also noted that weights and measures officials, industry representatives and users of weighing and measuring devices work together to establish acceptable tolerances for different applications based upon the fundamental consideration stated above. If changes to tolerances are considered, then the changes should apply to all devices and device technologies that are used in the application of interest. If weights and measures deviate from the principles stated above, then different tolerances could be established for positive displacement meters, turbine meters and mass flow meters used in the same applications. Similarly, different tolerances could be proposed for mechanical versus load cell vehicle scales. This would be unnecessary and wrong. Tolerances for devices must be based upon what is considered acceptable for the application. Favoring or penalizing one technology or design over another is unacceptable.

Mr. Constantine Cotsoradis (Flint Hills Resources), a member of the multi-point calibration workgroup, stated that this was an issue of a “Special Test” versus a “Normal Test” and puts the burden on the user.

Mr. Ross Andersen (NY-Retired) suggested that the “Fundamental Considerations” in HB 44 needed to be fixed to address calibration drift. He stated that meters operate in an environment and it needs to be recognized that meter performance is affected by temperature, viscosity of product, and other factors. He further noted that if you test the same meter once a week for an entire month, it will provide different results. Mr. Andersen agreed with Mr. Oppermann’s assessment that calibration curves change due to drift.

Mr. Dick Suiter (Richard Suiter Consulting) stated that if a meter with multi-point calibration is used then weights and measures officials need to look at multiple points. Ms. Julie Quinn (MN), Chair of the Multi-Point Calibration Workgroup requested this item remain in 'Developing' status as they a consensus within the workgroup has not been achieved.

Dmitri Karimov representing the Meter Manufacturer's Association and a member of the Multi-Point Calibration Workgroup added that the workgroup also discussed the length of time for testing, which is also a concern.

The SMA reported that it opposed the definition of multi-point calibrated device and offered the following alternative for consideration:

Multi-point calibration – A means to electronically program calibration factors at multiple measurement points.

The Committee agreed this item should move forward as a Developing item based on the comments received and the submitter’s recommendation that it remain “Developing” because additional work is needed.

#### **Regional Association Comments:**

CWMA received a presentation to clarify the purpose of this item. A regulatory official voiced support for this item. The CWMA appreciates the efforts of the work group and believes this item is sufficiently developed. CWMA forwarded the item to NCWM, recommending it as a Voting Item.

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

SWMA commented that, if adopted, this item would result in extensive additional work required by inspectors; increased downtime for businesses; questionable gain when compared to existing tolerances and result in the approval of devices for each product type. SWMA did not forward this item to NCWM.

NEWMA believed the item has merit but required more information before any further judgment could be made on it. NEWMA forwarded the item to NCWM and recommended that it be an Informational item.

<b>NEWMA Action: Item 330-3</b>
<b>Summary of comments considered by the regional committee (in writing or during the open hearings):</b>
Comment was heard stating support of further development of this item.
<b>Item as proposed by the regional committee: (If different than agenda item)</b>
330-3, 331-1, & 360-2 were combined agenda items.
<b>Committee recommendation to the region:</b> <input type="checkbox"/> Voting Item on the NCWM Agenda <input type="checkbox"/> Information Item on the NCWM Agenda <input type="checkbox"/> Withdraw the Item from the NCWM Agenda ( <i>In the case of new items, do not forward to NCWM</i> ) <input checked="" type="checkbox"/> Developing Item on the NCWM Agenda ( <i>To be developed by source</i> )

<b>Reasons for the committee recommendation:</b>
Based on comment heard and previous letter of concern from Henry Oppermann the committee suggests leaving the item developing.
<b>COMPLETE SECTION BELOW FOLLOWING VOTING SESSION</b>
<b>Final updated or revised proposal from the region: (If different than regional committee recommendation)</b>
<b>Regional recommendation to NCWM for item status:</b> <input type="checkbox"/> Voting Item on the NCWM Agenda <input type="checkbox"/> Information Item on the NCWM Agenda <input type="checkbox"/> Withdraw the Item from the NCWM Agenda ( <i>In the case of new items, do not forward to NCWM</i> ) <input checked="" type="checkbox"/> Developing Item on the NCWM Agenda ( <i>To be developed by source</i> ) <input type="checkbox"/> Unable to consider at this time ( <i>Provide explanation in the "Additional Comments" section below</i> )
<b>Regional Report to NCWM:</b>
NEWMA supports this item as developing.

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

#### 330-4 D N.4.2.5. Determination of Error on Wholesale Devices with Multiple Flow Rates and Calibration Factors

**Source:**

Minnesota Weights and Measures Division (2014)

**Purpose:**

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

**Item Under Consideration:**

Add a new paragraph to the NIST Handbook 44 Liquid Measuring Devices Code as follows:

**N.4.2.5. Initial Verification**

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

**A wholesale liquid measuring device not equipped with means to electronically program its flow rates and calibration factors shall be tested at a low and high flow rate with all products delivered prior to placing it into commercial service for the first time or after being repaired or replaced.**

**Example: A meter is electronically programmed to deliver regular and premium gasoline at a startup/shutdown flow rate of 150 gpm, a normal operating flow rate of 650 gpm, and a fall-back rate of 450 gpm. The meter is to be tested with regular gasoline at 150 gpm, 450 gpm and 650 gpm; and with premium gasoline at 150 gpm, 450 gpm and 650 gpm.**

**The official with statutory authority has the discretion to determine the flow rates and products at which a meter will be tested on subsequent verifications.**

#### **UR.2.5.1. Initial Verification Proving Reports**

**Initial verification proving reports for wholesale liquid measuring devices equipped with means to electronically program flow rates shall be attached to and sent with placed-in-service reports when the regulatory agency with statutory authority requires placed-in-service reports.**

#### **Background / Discussion:**

Wholesale metering systems are used to deliver product at many different flow rates. Many of these systems are equipped with features that allow different calibration factors to be programmed at those flow rates. Companies commonly set accuracy goals of  $\pm 0.05\%$  at normal and “fallback” delivery rates; however, they are often reluctant to spend time entering different calibration factors for the initial (“start-up”) and ending (“shut-down”) portions of the delivery. Spending time calibrating the metering system at normal and fallback delivery rates to such a high degree of accuracy is wasted if the error introduced into the measurement by the start-up and shut-down quantities is unknown. An additional concern is that an unscrupulous operator could use the error introduced by the start-up and shut-down portions of the delivery (if known) to adjust calibration at the normal delivery rate such that the overall error of a typical delivery is predominantly in the user’s favor. Officials should be aware that when delivered quantities are greater than the prover used at calibration, start-up and shutdown errors have a counter-intuitive effect. Underregistration errors (which are normally in the consumers’ favor) in the start-up and shut-down portions of the delivery may actually create shortages in the total delivery if calibration of the normal rate is adjusted to compensate for that underregistration. While these errors should be well within tolerance if the start-up and shut-down errors are in tolerance, an official who is trying to determine predominance of error should be aware of this effect and know how to determine the expected error in a typical delivery. Operators need to understand the importance of knowing and accounting for the effects of start-up and shut-down errors. Officials need to be aware of the potential for misusing that knowledge. Terminals and refineries want to maximize the accuracy of their liquid measuring devices by optimizing the calibration factors at typical delivery rates.

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

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

At the 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 Mrs. 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 (MN), 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. Juana Williams raised some additional questions and noted some comments from NIST OWM (extracted from 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 that, 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.

At the 2014 Annual Meeting, the Committee heard comments from Ms. Williams (NIST OWM) who commented that, like the S&T Committee, 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. 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 above in “Item Under Consideration.”

### 2015 NCWM Interim Meeting

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

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

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

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

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

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

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

**Regional Association Comments:**

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

**N.4.1.3.N.4.2.5. Initial Verification**

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

**(b) A wholesale liquid measuring device not equipped with means to electronically program its flow rates and calibration linearization factors shall be tested at a low and high flow rate with all products delivered prior to placing it into commercial service for the first time or after being repaired or replaced.**

**Example: A meter is electronically programmed to deliver regular and premium gasoline at a startup/shutdown flow rate of 150 gpm, a normal operating flow rate of 650 gpm, and a fall back rate of 450 gpm. The meter is to be tested with regular gasoline at 150 gpm, 450 gpm and 650 gpm; and with premium gasoline at 150 gpm, 450 gpm and 650 gpm.**

**The official with statutory authority has the discretion to determine the flow rates and products at which a meter will be tested on subsequent verifications.**

**UR.2.6.UR.2.5.1. Initial Verification Proving Reports**

Initial verification proving reports for wholesale liquid measuring devices equipped with means to electronically program flow rates shall be attached to and sent with placed-in-service reports when the regulatory agency with statutory authority requires placed-in-service reports

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.

NEWMA recommends 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.

CWMA received a presentation to clarify the purpose of this item. A regulatory official voiced support for this item. CWMA recommended amendments to the Item Under Consideration as shown below. CWMA appreciates the efforts of the work group and believes this item is sufficiently developed. CWMA recommended it as a Voting Item as amended below.

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

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



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

*A wholesale liquid measuring device not equipped with means to electronically program its flow rates and **calibration linearization** factors shall be tested at a low and high flow rate with all products delivered prior to placing it into commercial service for the first time or after being repaired or replaced.*

*Example: A meter is electronically programmed to deliver regular and premium gasoline at a startup/shutdown flow rate of 150 gpm, a normal operating flow rate of 650 gpm, and a fall-back rate of 450 gpm. The meter is to be tested with regular gasoline at 150 gpm, 450 gpm and 650 gpm; and with premium gasoline at 150 gpm, 450 gpm and 650 gpm.*

*The official with statutory authority has the discretion to determine the flow rates and products at which a meter will be tested on subsequent verifications.*

#### **UR.2.5.1. Initial Verification Proving Reports**

*Initial verification proving reports for wholesale liquid measuring devices equipped with means to electronically program flow rates shall be attached to and sent with placed- in-service reports when the regulatory agency with statutory authority requires placed-in-service reports*

SWMA commented that, if adopted, this item would result in extensive additional work required by inspectors; increased downtime for businesses; questionable gain when compared to existing tolerances and result in the approval of devices for each product type. The Committee doesn't believe the Handbooks are the proper place for examples. SWMA did not forward this item to NCWM.

NEWMA did not receive comments and recommended that the item be Withdrawn.

<b>NEWMA Action: Item 330-4</b>
<b>Summary of comments considered by the regional committee (in writing or during the open hearings):</b>
No comments were heard.
<b>Item as proposed by the regional committee: (If different than agenda item)</b>
Item is combined with 331-2.
<b>Committee recommendation to the region:</b>
<input type="checkbox"/> Voting Item on the NCWM Agenda <input type="checkbox"/> Information Item on the NCWM Agenda <input type="checkbox"/> Withdraw the Item from the NCWM Agenda <i>(In the case of new items, do not forward to NCWM)</i> <input checked="" type="checkbox"/> Developing Item on the NCWM Agenda <i>(To be developed by source)</i>
<b>Reasons for the committee recommendation:</b>
Committee recommends leaving the item as Developing pending further information.
<b>COMPLETE SECTION BELOW FOLLOWING VOTING SESSION</b>
<b>Final updated or revised proposal from the region: (If different than regional committee recommendation)</b>

<b>Regional recommendation to NCWM for item status:</b> <input type="checkbox"/> Voting Item on the NCWM Agenda <input type="checkbox"/> Information Item on the NCWM Agenda <input type="checkbox"/> Withdraw the Item from the NCWM Agenda ( <i>In the case of new items, do not forward to NCWM</i> ) <input checked="" type="checkbox"/> Developing Item on the NCWM Agenda ( <i>To be developed by source</i> ) <input type="checkbox"/> Unable to consider at this time ( <i>Provide explanation in the "Additional Comments" section below</i> )
<b>Regional Report to NCWM:</b> NEWMA recommends leaving the item as developing pending further information.

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

### 331 VEHICLE-TANK METERS

#### 331-1 D N.4.1.4. Normal Tests on Wholesale Multi-Point Calibration Devices.

**Source:**

NCWM Multi-Point Calibration Group (2015)

**Purpose:**

Update the Liquid Measuring Device Code to reflect advances in meter calibration technology.

**Item Under Consideration:**

Add a new paragraph to the NIST Handbook 44 Liquid Measuring Devices Code as follows:

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

**Background / Discussion:**

New technology makes it possible to use linearization factors to optimize accuracy at every flow rate for which a vehicle-tank meter is programmed to deliver. A special tolerance has traditionally been applied to slow flow tests on vehicle-tank meters with mechanical single-point calibrators because accuracy could only be optimized at one flow rate. A vehicle-tank multi-point calibrated meter does not require a special tolerance at any flow rate since every flow rate can be adjusted as close to zero as practicable.

This supports the principle expressed in G-UR.4.3. that adjustments shall be made so as to bring performance errors as close to zero as possible. It also reduces the amount of bias error which startup and shutdown rates introduce into the proving process by reducing performance errors at slow-flow startup and shutdown flow rates. 3. Applies only to meters which are actually configured with multiple calibration points. Meter owners who do not want to take the time to calibrate at multiple flow rates may configure their meters for single point calibration.

This allows meters with single point calibration to have a larger tolerance at slow-flow rates than meters with multi-point calibration. Multi-point calibrated devices are increasingly used as commercial meters. The question of whether they should be treated differently than devices with single-point calibration needs to be addressed.

**2015 NCWM Interim Meeting**

Agenda items 330-3, 331-1 and 360-2 were grouped together and comments taken simultaneously as the Committee considered them related. See Agenda Item 330-3 for a summary of the comments heard on all three of these agenda items.

The Committee agreed this item should move forward as a Developing item based on the comments received and the submitter's recommendation that it remain Developing because additional work is needed.

**Regional Association Comments:**

CWMA received a presentation to clarify the purpose of this item. A regulatory official voiced support for this item. The CWMA appreciates the efforts of the work group and believes this item is sufficiently developed. CWMA forwarded the item to NCWM, recommending it as a Voting Item.

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

SWMA commented that, if adopted, this item would result in extensive additional work required by inspectors; increased downtime for businesses; questionable gain when compared to existing tolerances and result in the approval of devices for each product type. SWMA did not forward this item to NCWM.

NEWMA Commented that the item has merit but more information was required before any further judgment could be made. NEWMA forwarded the item to NCWM and recommended it as an Informational item.

<b>NEWMA Action: Item 331-1</b>
<b>Summary of comments considered by the regional committee (in writing or during the open hearings):</b>
This item is grouped with 330-3, 331-1, & 360-2 *See comments see item 330-3.
<b>Item as proposed by the regional committee: (If different than agenda item)</b>
<b>Committee recommendation to the region:</b> <input type="checkbox"/> Voting Item on the NCWM Agenda <input type="checkbox"/> Information Item on the NCWM Agenda <input type="checkbox"/> Withdraw the Item from the NCWM Agenda ( <i>In the case of new items, do not forward to NCWM</i> ) <input checked="" type="checkbox"/> Developing Item on the NCWM Agenda ( <i>To be developed by source</i> )
<b>Reasons for the committee recommendation:</b>
<b>COMPLETE SECTION BELOW FOLLOWING VOTING SESSION</b>
<b>Final updated or revised proposal from the region: (If different than regional committee recommendation)</b>
<b>Regional recommendation to NCWM for item status:</b> <input type="checkbox"/> Voting Item on the NCWM Agenda <input type="checkbox"/> Information Item on the NCWM Agenda <input type="checkbox"/> Withdraw the Item from the NCWM Agenda ( <i>In the case of new items, do not forward to NCWM</i> ) <input checked="" type="checkbox"/> Developing Item on the NCWM Agenda ( <i>To be developed by source</i> ) <input type="checkbox"/> Unable to consider at this time ( <i>Provide explanation in the "Additional Comments" section below</i> )
<b>Regional Report to NCWM:</b>
This item is grouped with 330-3, 331-1, & 360-2. NEWMA recommends these items remain developing.

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

### **331-2 D N.4.2.1. Determination of Error on Vehicle-Tank Meters with Multiple Flow Rates and Calibration Factors**

**Source:**

Minnesota Weights and Measures Division (2014)

**Purpose:**

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

**Item Under Consideration:**

Amend NIST Handbook 44 Vehicle Tank Meter Code as follows:

#### **N.4.6. Initial Verification**

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

**A vehicle tank meter not equipped with means to electronically program its flow rates and calibration factors shall be tested at a low and high flow rate with all products delivered prior to placing it into commercial service for the first time or after being repaired or replaced.**

**Example: A vehicle tank meter is electronically programmed to deliver regular and premium gasoline at a startup/shutdown flow rate of 20 gpm, a normal operating flow rate of 100 gpm, and an intermediate rate of 65 gpm. The meter is to be tested with regular gasoline at 20 gpm, 65 gpm and 100 gpm; and with premium gasoline at 20 gpm, 65 gpm and 100 gpm.**

**The official with statutory authority has the discretion to determine the flow rates and products at which a vehicle tank meter will be tested on subsequent verifications.**

#### **UR.1.5. Initial Verification Proving Reports**

**Initial verification proving reports for vehicle tank meters equipped with means to electronically program flow rates shall be attached to and sent with placed-in-service reports when the regulatory agency with statutory authority requires placed-in-service reports.**

**Background / Discussion:**

Many terminals and refineries want to maximize the accuracy of their liquid-measuring devices by optimizing the calibration factors at typical delivery speeds and some bulk delivery companies are beginning to utilize the capabilities of electronic registers with multiple calibration factors to optimize their accuracy at flow rates that are customarily used. Just like registers on wholesale liquid measuring devices, these meters can be configured for a standard initial "start-up" and ending "shut-down" quantity delivered at a slower speed than is used for the remainder of the delivery. Service agents are expected to calibrate devices as close to zero as possible, but spending time calibrating normal delivery rates to a high degree of accuracy is wasted if the error introduced into the measurement by the start-up and shut-down quantities is unknown. On the other hand, an unscrupulous operator could also use the known error introduced by the start-up and shut-down errors to calibrate the normal delivery rates so that all the errors on typical deliveries work predominantly in the user's favor. Officials should be aware that

when delivered quantities are greater than the prover used at calibration, start-up and shut-down errors have a counter-intuitive effect. Underregistration, which normally operates in the consumers' favor, may actually create shortages in the total delivery if calibration of the normal rate was adjusted to compensate for that underregistration. While these errors should be well within tolerance if the start-up and shut-down error are in tolerance, an official who is trying to determine predominance of error should be aware of this effect and know how to calculate the expected error in a typical delivery. Operators need to understand the importance of knowing and accounting for the effects of start-up and shut-down errors. Officials need to be aware of the potential for misusing that knowledge.

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

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

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

At the 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 that, at least initially, work needs to be focused 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 (MN), 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 that 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.

At the 2014 Annual Meeting, the Committee heard comments from Ms. Juana Williams (NIST OWM) who commented that, like the S&T Committee, OWM believes that 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. 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 above in "Item Under Consideration."

### 2015 NCWM Interim Meeting

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

#### Regional Association Comments:

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

#### N.4.6. Initial Verification

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

(b) A vehicle tank meter not equipped with means to electronically program its flow rates and calibration linearization factors shall be tested at a low and high flow rate with all products delivered prior to placing it into commercial service for the first time or after being repaired or replaced.

Example: A vehicle tank meter is electronically programmed to deliver regular and premium gasoline at a startup/shutdown flow rate of 20 gpm, a normal operating flow rate of 100 gpm, and an intermediate rate of 65 gpm. The meter is to be tested with regular gasoline at 20 gpm, 65 gpm and 100 gpm; and with premium gasoline at 20 gpm, 65 gpm and 100 gpm.

The official with statutory authority has the discretion to determine the flow rates and products at which a vehicle tank meter will be tested on subsequent verifications.

#### UR.1.5. Initial Verification Proving Reports

Initial verification proving reports for vehicle tank meters equipped with means to electronically program flow rates shall be attached to and sent with placed-in-service reports when the regulatory agency with statutory authority requires placed-in-service reports.

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.

NEWMA revisited their position on this item from the 2013 Interim meeting, in turn recommends this item be withdrawn for lack of merit because 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.

CWMA supported this item as a Developing item.

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

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

**calibration linearization** factor has been electronically programmed prior to placing it into commercial service for the first time or after being repaired or replaced.

A vehicle tank meter not equipped with means to electronically program its flow rates and **calibration linearization** factors shall be tested at a low and high flow rate with all products delivered prior to placing it into commercial service for the first time or after being repaired or replaced.

Example: A vehicle tank meter is electronically programmed to deliver regular and premium gasoline at a startup/shutdown flow rate of 20 gpm, a normal operating flow rate of 100 gpm, and an intermediate rate of 65 gpm. The meter is to be tested with regular gasoline at 20 gpm, 65 gpm and 100 gpm; and with premium gasoline at 20 gpm, 65 gpm and 100 gpm.

The official with statutory authority has the discretion to determine the flow rates and products at which a vehicle tank meter will be tested on subsequent verifications.

#### **UR.1.5. Initial Verification Proving Reports**

Initial verification proving reports for vehicle tank meters equipped with means to electronically program flow rates shall be attached to and sent with placed-in-service reports when the regulatory agency with statutory authority requires placed-in-service reports.

SWMA commented that, if adopted, this item would result in extensive additional work required by inspectors; increased downtime for businesses; questionable gain when compared to existing tolerances and result in the approval of devices for each product type. SWMA doesn't believe the Handbooks are the proper place for examples. SWMA did not forward this item to NCWM.

NEWMA did not receive any comments on this item and recommended that it be Withdrawn.

<b>NEWMA Action: Item 331-2</b>
<b>Summary of comments considered by the regional committee (in writing or during the open hearings):</b>
This item was grouped with 330-4. See 330-4 for comments.
<b>Item as proposed by the regional committee: (If different than agenda item)</b>
<b>Committee recommendation to the region:</b>
<input type="checkbox"/> Voting Item on the NCWM Agenda <input type="checkbox"/> Information Item on the NCWM Agenda <input type="checkbox"/> Withdraw the Item from the NCWM Agenda ( <i>In the case of new items, do not forward to NCWM</i> ) <input checked="" type="checkbox"/> Developing Item on the NCWM Agenda ( <i>To be developed by source</i> )
<b>Reasons for the committee recommendation:</b>
No further comments were heard during open hearings. The committee recommends keeping this item as developing.
<b>COMPLETE SECTION BELOW FOLLOWING VOTING SESSION</b>
<b>Final updated or revised proposal from the region: (If different than regional committee recommendation)</b>

<b>Regional recommendation to NCWM for item status:</b> <input type="checkbox"/> Voting Item on the NCWM Agenda <input type="checkbox"/> Information Item on the NCWM Agenda <input type="checkbox"/> Withdraw the Item from the NCWM Agenda ( <i>In the case of new items, do not forward to NCWM</i> ) <input checked="" type="checkbox"/> Developing Item on the NCWM Agenda ( <i>To be developed by source</i> ) <input type="checkbox"/> Unable to consider at this time ( <i>Provide explanation in the "Additional Comments" section below</i> )
<b>Regional Report to NCWM:</b> This item is grouped with item 330-4. NEWMA has recommended the item remain developing.

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

## 332 LPG AND ANHYDROUS AMMONIA LIQUID-MEASURING DEVICES

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

**Source:**

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

**Purpose:**

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

**Item Under Consideration:**

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

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

**S.1.4.1. Indication of Delivery (No Change)**

**S.1.4.2. Return to Zero (No Change)**

**S.1.4.3. Provisions for Power Loss.**

**S.1.4.3.1. Transaction Information.**

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

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



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

**S.1.5. For Stationary Retail Devices Only.**

**S.1.5.1. Display of Unit Price and Product Identity. –** ~~In a device of the computing type, means shall be provided for displaying on each face of the device the unit price at which the device is set to compute or to deliver as the case may be, and there shall be conspicuously displayed on each side of the device the identity of the product that is being dispensed. If a device is so designed as to dispense more than one grade, brand, blend, or mixture of product, the identity of the grade, brand, blend, or mixture being dispensed shall also be displayed on each face of the device.~~

**S.1.5.1.1. Unit Price.**

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

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

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

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

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

**S.1.5.1.2. Product Identity.**

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

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

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

**S.1.6.1. Zero-Set-Back Interlock, Retail Motor-Fuel Devices. – A device shall be constructed so that:**

(a) after a delivery cycle has been completed by moving the starting lever to any position that shuts off the device, an automatic interlock prevents a subsequent delivery until the

indicating elements, and recording elements if the device is equipped and activated to record, have been returned to their zero positions;

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

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

**S.1.6.2. Provisions for Power Loss.**

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

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

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

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

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

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

**UR.2.7. Unit Price and Product Identity.**

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

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

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

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

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

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

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

The following exceptions apply:

- (a) Fleet sales and other price contract sales are exempt from this requirement.
- (b) A truck stop dispenser used exclusively for refueling trucks is exempt from this requirement provided that:
  - (1) all purchases of fuel are accompanied by a printed receipt of the transaction containing the applicable price per gallon, the total gallons delivered, and the total price of the sale; and (Added 1993)
  - (2) unless a dispenser complies with S.1.6.4.1. Display of Unit Price, the price posted on the dispenser and the price at which the dispenser is set to compute shall be the highest price for any transaction which may be conducted. (Added 1993)
- (c) A dispenser used in an application where a price per unit discount is offered following the delivery is exempt from this requirement, provided the following conditions are satisfied:
  - (1) the unit price posted on the dispenser and the unit price at which the dispenser is set to compute shall be the highest unit price for any transaction;
  - (2) all purchases of fuel are accompanied by a printed receipt recorded by the system for the transaction containing:
    - a. the product identity by name, symbol, abbreviation, or code number;
    - b. transaction information as shown on the dispenser at the end of the delivery and prior to any post-delivery discount including the:
      - 1. total volume of the delivery;
      - 2. unit price; and
      - 3. total computed price of the fuel sale prior to post-delivery discounts being applied.
    - c. an itemization of the post-delivery discounts to the unit price; and
    - d. the final total price of the fuel sale.

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

#### **Background / Discussion:**

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

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

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

Existing retail LPG dispensers can be adapted to fuel LPG-powered motor vehicles by adding a simple adaptor which attaches to the LPG nozzle on the dispensers hose. There are currently 5 active and 2 inactive NTEP Certificates of Conformance for LPG retail motor-fuel dispensers listed in the NCWM Database.

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

**Nonretroactive Status:**

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

**S.1.4.3. Provisions for Power Loss:**

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

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

**S.1.4.3. Provisions for Power Loss.**

**S. 1.4.3.1. Transaction Information.**

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

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

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

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

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

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

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

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

**[Nonretroactive as of January 1, 2006]**

**(Amended 2014)**

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

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

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

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

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

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

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

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

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

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

At the 2014 NCWM Annual Meeting there were numerous comments indicating that additional work is needed on this item. The Committee agreed to recommend this item remain a “Developing” Item.

### **2015 NCWM Interim Meeting**

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

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

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

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

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

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

Consideration should be given to moving this paragraph (which addresses power loss requirements) to section “S.1.5. For Stationary Retail Devices Only.” While it makes sense for the paragraph to fall under requirements for “indicators,” comments from industry have questioned its applicability to vehicle-mounted, retail meters. Industry has pointed out that other vehicle-mounted applications, as addressed in the Vehicle-Tank Meters Code, do not include such provisions for retail deliveries. Thus, restricting its application to stationary retail devices in the LPG & NH<sub>3</sub> Code would eliminate this concern.

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

### **S.1.4. For Retail Devices Only**

#### **S.1.4.1. Indication of Delivery:**

Modify S.1.4.1 as shown in OWM's original, 2014 comments so that it mirrors the corresponding paragraph (S.1.6.1. Indication of Delivery) in the LMD Code, both in language and in the requirement for electronic devices to inhibit indications until fueling conditions ensure that the delivery starts on zero.

**S.1.4.3. Zero-Set-Back interlock for Retail Motor-Fuel Dispensers:**

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

**S.1.5. For Stationary Retail Devices Only:**

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

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

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

**S.1.5. For Stationary Retail Devices Only:**

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

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

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

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

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

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

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

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

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

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

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

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

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

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

S.1.4. For Retail Devices Only.

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

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

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

[Nonretroactive as of January 1, 2006]

(Amended 2014)

...

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

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

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

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

[Nonretroactive as of January 1, 201X]

(Added 201X)

S.1.5. For Stationary Retail Devices Only.

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



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

- (1) For a system that applies a discount prior to the delivery, all unit prices shall be displayed or shall be capable of being displayed on the dispenser through a deliberate action of the purchaser prior to the delivery of the product. It is not necessary that all of the unit prices be simultaneously displayed prior to the delivery of the product.
- (2) For a system that offers post-delivery discounts on fuel sales, display of pre-delivery unit price information is exempt from (1) above, provided the system complies with S.1.5.5. Recorded Representations for Transactions Where a Post-Delivery Discount(s) is Provided.

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

[Nonretroactive as of January 1, 201X]

(Added 201X)

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

- ~~(a) — the total volume of the delivery;~~
- ~~(b) — the unit price;~~
- ~~(c) — the total computed price; and~~
- ~~(d) — the product identity by name, symbol, abbreviation, or code number.~~

~~(Added 2014)~~

S.1.5.3. Agreement Between Indications.

- (a) When a quantity value indicated or recorded by an auxiliary element is a derived or computed value based on data received from a device, the value may differ from the quantity value displayed on the dispenser, provided that the following conditions are met:
  - (1) all total values for an individual sale that are indicated or recorded by the system agree, and

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

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

[Nonretroactive as of January 1, 201X]

(Added 201X)

S.1.5.4. Recorded Representations. – Except for fleet sales and other price contract sales and for transactions where a post-delivery discount is provided, a receipt providing the following information shall be available through a built-in or separate recording element for all transactions conducted with point-of-sale systems or devices activated by debit cards, credit cards, and/or cash:

- (a) the total volume of the delivery;
- (b) the unit price;
- (c) the total computed price; and
- (d) the product identity by name, symbol, abbreviation, or code number.

(Added 2016)

S.1.5.5. Recorded Representations for Transactions Where a Post-Delivery Discount(s) is Provided. – Except for fleet sales and other price contract sales, a printed receipt providing the following information shall be available through a built-in or separate recording element that is part of the system for transactions involving a post-delivery discount:

- (a) the product identity by name, symbol, abbreviation, or code number;
- (b) transaction information as shown on the dispenser at the end of the delivery and prior to any post-delivery discount(s), including the:
  - (1) total volume of the delivery;
  - (2) unit price; and
  - (3) total computed price of the fuel sale.
- (c) an itemization of the post-delivery discounts to the unit price; and
- (d) the final total price of the fuel sale after all post-delivery discounts are applied.

(Added 201X)

S.1.5.6. Transaction Information, Power Loss. In the event of a power loss, the information needed to complete

any transaction in progress at the time of the power loss (such as the quantity and unit price, or sales price) shall be determinable for at least 15 minutes at the device or other onsite device accessible to the customer.

[Nonretroactive as of January 1, 201X]

(Added 201X)

S.1.5.7. Totalizers for Retail Motor-Fuel Dispensers. – Retail motor-fuel dispensers shall be equipped with a nonresettable totalizer for the quantity delivered through the metering device.

[Nonretroactive as of January 1, 201X]

(Added 201X)

UR.2. Use Requirements.

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

UR.2.7.1. Unit Price and Product Identity.

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

- (1) except for unit prices resulting from any post-delivery discount and dispensers used exclusively for fleet sales, other price contract sales, and truck refueling (e.g., truck stop dispensers used only to refuel trucks), all of the unit prices at which the product is offered for sale; and
- (2) in the case of a computing type device or money-operated type device, the unit price at which the dispenser is set to compute.

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

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

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

(Added 201X)

UR.2.7.2. Computing Device. – Any computing device used in an application where a product or grade is offered for sale at one or more unit prices shall be used only for sales for which the device computes and displays the sales price for the selected transaction.

The following exceptions apply:

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

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

that:

- (1) all purchases of fuel are accompanied by a printed receipt of the transaction containing the applicable price per unit of measure, the total quantity delivered, and the total price of the sale; and
  - (2) unless a dispenser complies with S.1.5.1. Display of Unit Price, the price posted on the dispenser and the price at which the dispenser is set to compute shall be the highest price for any transaction which may be conducted.
- (c) A dispenser used in an application where a price per unit discount is offered following the delivery is exempt from this requirement, provided the following conditions are satisfied:
- (1) the unit price posted on the dispenser and the unit price at which the dispenser is set to compute shall be the highest unit price for any transaction;
  - (2) all purchases of fuel are accompanied by a receipt recorded by the system for the transaction containing:
    - a. the product identity by name, symbol, abbreviation, or code number;
    - b. transaction information as shown on the dispenser at the end of the delivery and prior to any post-delivery discount including the:
      1. total volume of the delivery;
      2. unit price; and
      3. total computed price of the fuel sale prior to post-delivery discounts being applied.
    - c. an itemization of the post-delivery discounts to the unit price; and
    - d. the final total price of the fuel sale after all post-delivery discounts are applied.

(Added 201X)

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

**Regional Associations Comments:**

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

**S.1.3. Indicators.**

**S.1.3.6. Transaction Information. In the event of a power loss, the information needed to complete any transaction in progress at the time of the power loss (such as the quantity and unit**

price, or sales price) shall be determinable for at least 15 minutes at the device or other onsite device accessible to the customer.

[Nonretroactive as of January 1, 201X]

(Added 201X)

#### **S.1.4. For Retail Devices Only.**

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

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

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

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

[Nonretroactive as of January 1, 201X]

(Added 201X)

#### **S.1.5. For Stationary Retail Devices Only.**

**S.1.5.1. Display of Unit Price and Product Identity.** – In a device of the computing type, means shall be provided for displaying on each face of the device the unit price at which the device is set to compute or to deliver as the case may be, and there shall be conspicuously displayed on each side of the device the identity of the product that is being dispensed. ~~If a device is so designed as to dispense more than one grade, brand, blend, or mixture of product, the identity of the grade, brand, blend, or mixture being dispensed shall also be displayed on each face of the device.~~

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

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

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

(2) For a system that offers post-delivery discounts on fuel sales, display of predelivery unit price information is exempt from (b)(1), provided the system complies with S.1.5.7. Recorded Representations for Transactions Where a Post-Delivery Discount(s) is Provided.

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

[Nonretroactive as of January 1, 201X]

(Added 201X)

S.1.5.4. Agreement Between Indications.

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

- (1) all total values for an individual sale that are indicated or recorded by the system agree, and
- (2) Within each element, the values indicated or recorded meet the formula (quantity x unit price = total sales price) to the closest cent.

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

[Nonretroactive as of January 1, 201X]

(Added 201X)

S.1.5.5. Recorded Representations. – Except for fleet sales and other price contract sales and for transactions where a post-delivery discount is provided, a receipt providing the following information shall be available through a built-in or separate recording element for all transactions conducted with point-of-sale systems or devices activated by debit cards, credit cards, and/or cash:

- (a) the total volume of the delivery;
- (b) the unit price;
- (c) the total computed price; and
- (d) the product identity by name, symbol, abbreviation, or code number.

[Nonretroactive as of January 1, 201X]

(Added 201X)

S.1.5.6. Recorded Representations for Transactions Where a Post-Delivery Discount(s) is Provided. – Except for fleet sales and other price contract sales, a receipt providing the following information shall be available through a built-in or separate recording element that is part of the system for transactions involving a post-delivery discount:

- (a) the product identity by name, symbol, abbreviation, or code number;
- (b) transaction information as shown on the dispenser at the end of the delivery and prior to any post-delivery discount(s), including the:
  - (1) total volume of the delivery;

(2) unit price; and

(3) total computed price of the fuel sale.

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

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

[Nonretroactive as of January 1, 201X]

(Added 201X)

S.1.5.7. Totalizers for Retail Motor-Fuel Dispensers. – Retail motor-fuel dispensers shall be equipped with a nonresettable totalizer for the quantity delivered through the metering device.

[Nonretroactive as of January 1, 201X]

(Added 201X)

**UR.2. Use Requirements.**

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

**UR.2.7.1. Unit Price and Product Identity.**

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

- (3) except for unit prices resulting from any post-delivery discount and dispensers used exclusively for fleet sales, other price contract sales, and truck refueling (e.g., truck stop dispensers used only to refuel trucks), all of the unit prices at which the product is offered for sale; and
- (4) in the case of a computing type device or money-operated type device, the unit price at which the dispenser is set to compute.

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

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

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

(Added 201X)

**UR.2.7.2. Computing Device. – Any computing device used in an application where a product or grade is offered for sale at one or more unit prices shall be used only for sales for which the device computes and displays the sales price for the selected transaction.**

**The following exceptions apply:**

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

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

- (3) all purchases of fuel are accompanied by a printed receipt of the transaction containing the applicable price per unit of measure, the total quantity delivered, and the total price of the sale; and
- (4) unless a dispenser complies with S.1.6.4.1. Display of Unit Price, the price posted on the dispenser and the price at which the dispenser is set to compute shall be the highest price for any transaction which may be conducted.
- (c) A dispenser used in an application where a price per unit discount is offered following the delivery is exempt from this requirement, provided the following conditions are satisfied:
- (3) the unit price posted on the dispenser and the unit price at which the dispenser is set to compute shall be the highest unit price for any transaction;
- (4) all purchases of fuel are accompanied by a receipt recorded by the system for the transaction containing:
- a. the product identity by name, symbol, abbreviation, or code number;
- b. transaction information as shown on the dispenser at the end of the delivery and prior to any post-delivery discount including the:
1. total volume of the delivery;
2. unit price; and
3. total computed price of the fuel sale prior to post-delivery discounts being applied.
- c. an itemization of the post-delivery discounts to the unit price; and
- d) the final total price of the fuel sale after all post-delivery discounts are applied.

**(Added 201X)**

SWMA was informed that there is new language from the submitter and encourages the NCWM S&T Committee to review this language. SWMA recommended that this item be a Developing Item.

CWMA received comments supporting the need for this item. The CWMA believes this item is sufficiently developed and recommended that the item be a Voting Item.

NEWMA did not receive comments on the item and recommended that it remain as a Developing item due to concerns from the OWM regarding some of the language in the proposal.

<b>NEWMA Action: Item 332-1</b>	
<b>Summary of comments considered by the regional committee (in writing or during the open hearings):</b>	
No comments were heard on this item.	
<b>Item as proposed by the regional committee: (If different than agenda item)</b>	
<b>Committee recommendation to the region:</b>	
<input type="checkbox"/> Voting Item on the NCWM Agenda <input checked="" type="checkbox"/> Information Item on the NCWM Agenda <input type="checkbox"/> Withdraw the Item from the NCWM Agenda ( <i>In the case of new items, do not forward to NCWM</i> ) <input type="checkbox"/> Developing Item on the NCWM Agenda ( <i>To be developed by source</i> )	



<b>Reasons for the committee recommendation:</b>
Committee recommends that OWM continue to work with Mr. Dmitri Karimov representing Liquid Controls to further refine the language. This item should continue as informational.
<b>COMPLETE SECTION BELOW FOLLOWING VOTING SESSION</b>
<b>Final updated or revised proposal from the region: (If different than regional committee recommendation)</b>
<b>Regional recommendation to NCWM for item status:</b> <input type="checkbox"/> Voting Item on the NCWM Agenda <input checked="" type="checkbox"/> Information Item on the NCWM Agenda <input type="checkbox"/> Withdraw the Item from the NCWM Agenda ( <i>In the case of new items, do not forward to NCWM</i> ) <input type="checkbox"/> Developing Item on the NCWM Agenda ( <i>To be developed by source</i> ) <input type="checkbox"/> Unable to consider at this time ( <i>Provide explanation in the "Additional Comments" section below</i> )
<b>Regional Report to NCWM:</b>
NEWMA recommends this item remain informational as work continues on developing the proposal.

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

### 332-2 D N.3. Test Drafts.

**Source:**

Endress + Hauser Flowtec AG USA (2015)

**Purpose:**

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

**Item Under Consideration:**

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

**N.3. Test Drafts. –**

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

(Amended 1982)

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

**Background / Discussion:**

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

traditional field provers and standards. Recognition in Handbook 44 will enable States to allow transfer standard meters to place systems into service and for field enforcement.

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

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

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

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

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

### **2015 NCWM Interim Meeting**

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

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

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

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

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

- the accuracy of the standard (or the degree of accuracy that one can expect to achieve from using the standard) in relation to the tolerances that apply to the device being tested;

- HB 44 Fundamental Considerations – Tolerances for Standards;
- proper training and procedures for using the standard;
- training of laboratory personnel and the capability of the labs to verify the adequacy of the standard for use in testing another device; and
- collection and analysis of data obtained from having used the standard repeatedly over time.

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

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

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

#### **Regional Association Comments:**

CWMA received comments questioning the accuracy of a meter used as a mobile standard. CWMA forwarded the item to NCWM, recommending it as a Developing Item.

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

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

NEWMA believed that this item has merit but it needs further Development before being sent to a vote. NEWMA forwarded the item to NCWM and recommended that it be a Developing Item. NEWMA also recommended that this item be combined with items 332-2 and 337-3 as a single agenda item.

<b>NEWMA Action: Item 332-2</b>
<b>Summary of comments considered by the regional committee (in writing or during the open hearings):</b>
The committee heard comments that this item be withdrawn with the intent to resubmit once clarification has been provided regarding the accuracy of the transfer standard meters.
<b>Item as proposed by the regional committee: (If different than agenda item)</b>
This item is grouped with 337-3.
<b>Committee recommendation to the region:</b> <input type="checkbox"/> Voting Item on the NCWM Agenda <input type="checkbox"/> Information Item on the NCWM Agenda <input type="checkbox"/> Withdraw the Item from the NCWM Agenda ( <i>In the case of new items, do not forward to NCWM</i> ) <input checked="" type="checkbox"/> Developing Item on the NCWM Agenda ( <i>To be developed by source</i> )
<b>Reasons for the committee recommendation:</b>

The committee agrees that additional work is needed on this item. It is recommended that the developing status be maintained pending further clarification from the submitter.
<b>COMPLETE SECTION BELOW FOLLOWING VOTING SESSION</b>
<b>Final updated or revised proposal from the region: (If different than regional committee recommendation)</b>
<b>Regional recommendation to NCWM for item status:</b> <input type="checkbox"/> Voting Item on the NCWM Agenda <input type="checkbox"/> Information Item on the NCWM Agenda <input type="checkbox"/> Withdraw the Item from the NCWM Agenda ( <i>In the case of new items, do not forward to NCWM</i> ) <input checked="" type="checkbox"/> Developing Item on the NCWM Agenda ( <i>To be developed by source</i> ) <input type="checkbox"/> Unable to consider at this time ( <i>Provide explanation in the "Additional Comments" section below</i> )
<b>Regional Report to NCWM:</b>
This item is grouped with item 337-3. NEWMA agrees to leave this item as developing while work continues on the proposal.

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

### 337 MASS FLOW METERS

- 337-1 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**

**Source:**

Clean Vehicle Education Foundation (2014)

**Purpose:**

Since natural gas is sold in the retail market place as compressed natural gas (CNG) and liquefied natural gas (LNG) an alternative fuel to gasoline and diesel fuel, the proposed additions and edits to Handbook 44 will provide definitions for volume units of CNG and LNG that are the energy equivalents for diesel and/or gasoline gallons so that end users can readily compare cost and fuel economy. At present only equivalents for gasoline are included in NIST Handbooks 44 and 130 for CNG as an engine fuel. The proposal also includes modifications to Appendix D relative to the sale of LNG and CNG.

**Item Under Consideration:**

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

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

Amend NIST Handbook 44 Appendix D definitions as follows:

**gasoline gallon equivalent (GGE).** – Gasoline gallon equivalent (GGE) means 5.660 pounds of **compressed** natural gas. [3.37]  
 (Added 1994) **(Amended 2015)**

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

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

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

**S.1.2. Compressed Natural Gas and Liquefied Natural Gas Dispensers.** – Except for fleet sales and other price contract sales, a compressed **or liquefied** natural gas dispenser used to refuel vehicles shall be of the computing type and shall indicate the quantity, the unit price, and the total price of each delivery. The dispenser shall display the mass measured for each transaction either continuously on an external or internal display accessible during the inspection and test of the dispenser, or display the quantity in mass units by using controls on the device.  
 (Added 1994) **(Amended 2015)**

**S.1.3. Units.**

**S.1.3.1.1. Compressed Natural Gas Used as an Engine Fuel.** – When compressed natural gas is dispensed as an engine fuel, the delivered quantity shall be indicated in **“gasoline liter equivalent (GLE) units” or “gasoline gallon equivalent (GGE) units” or diesel gallon equivalent units (DGE), or in mass.** (Also see Appendix D definitions.)  
 (Added 1994) **(Amended 2015)**

**S.1.3.1.2. Liquefied Natural Gas Used as an Engine Fuel.** – **When liquefied natural gas is dispensed as an engine fuel, the delivered quantity shall be indicated in diesel gallon equivalent units (DGE) or in mass. (Also see definitions.)**  
**(Added 2015)**

**S.5.2. Marking of Gasoline Volume Equivalent Conversion Factors for Compressed Natural Gas.** – A device dispensing compressed natural gas shall have either the statement **“1 Gasoline Liter Equivalent (GLE) is Equal to 0.678 kg of Natural Gas” or “1 Gasoline Gallon Equivalent (GGE) is Equal means 5.660 lb of Compressed Natural Gas” or “1 Diesel Gallon Equivalent (DGE) means 6.384 lb of Compressed Natural Gas”** permanently and conspicuously marked on the face of the dispenser according to the method of sale used.  
 (Added 1994)**(Amended 2015)**

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

**(Amended 2015)**

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

**(Added 2015)**

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

**(Added 2015)**

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

**(Added 1998) (Amended 2015)**

#### **Background / Discussion:**

The gasoline gallon equivalent (GGE) unit was defined by NCWM in 1994 to allow users of natural gas vehicles to readily compare costs and fuel economy of light-duty compressed natural gas vehicles with equivalent gasoline powered vehicles. More background on this work is available in the Reports of the 78th and 79<sup>th</sup> NCWM in NIST Special Publication 854 and 870 (see pages 322 and 327, respectively). Natural gas is sold as a vehicle fuel as either Compressed Natural Gas (CNG) or Liquefied Natural Gas (LNG). For medium and heavy duty natural gas vehicles in widespread use today, there is a need to officially define a unit allowing a comparison of cost and fuel economy with diesel powered vehicles. The submitter stated that the official definition of a DLE and a DGE will likely provide justification for California, Wisconsin, and many other states to permit retail sales of CNG for heavy-duty vehicles in these convenient units. The submitter has provided a mathematical justification for the specific quantity (mass) of compressed natural gas in a DLE and DGE which is included in Appendix F.

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

#### ***January 2013 NCWM Interim Meeting***

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

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

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

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

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

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

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

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

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

#### ***July 2013 NCWM Annual Meeting***

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

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

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

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

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

In addition to discussing the proposals in Items 337-1 and 337-2, OWM requested that the Steering Committee specifically discuss and consider whether or not the continued use of the terms “GLE” and “GGE” are appropriate for commercial CNG metering applications. OWM makes this request based on many of the same points made by OWM at the 2013 Interim Meeting and also given that:

- (1) this market is well established and consumer confidence and acceptance of CNG and other alternative fuels are not contingent upon continued comparisons with gasoline;
- (2) there are other methods for comparing relative efficiency and costs with gasoline;
- (3) experience with feedback from the community indicates problems with the application and validity of these units with changing gas supplies;
- (4) the proposal in Items 337-1 and 337-2 proposes language which would address natural gas as a whole



and it is, therefore, appropriate to raise the discussion of whether or not the continued use of non-traceable units is appropriate. Additionally, OWM suggests that a proposal to eliminate the use of the terms “GLE” and “GGE” in favor of indications in mass units be developed and considered by the NCWM to ensure commercial transactions for natural gas are based on NIST traceable units of measurement; and

- (5) as the number of viable alternative fuel options increase, providing a relatively static comparison with only one alternative fuel will not serve the broad needs of consumers and will make it unlikely that the dispenser is the appropriate location to provide comparison information.

The Committee also heard a comment from Mr. Karimov suggesting that volume units be permitted as a method of sale for LNG.

While many people expressed an understanding of the need for consumers to make comparisons with gasoline, comments indicate that such comparisons would typically be made prior to the purchase of a vehicle and possibly for a short time while becoming accustomed to the vehicle. The Committee heard comments indicating that weights and measures officials would be amenable to permitting the posting or displaying of supplemental information regarding gallon equivalent values.

#### ***January 2014 NCWM Interim Meeting***

The Committee met with the L&R Committee to discuss the comments received on Items 337-1 through 337-5 and corresponding items on the L&R Committee’s agenda. Although there were three new proposals on the agenda, several appear to require clarification from the submitter on whether they are replacements for several carryover proposals. The two Committees heard an update from Mr. Albuquerque, speaking as Chairman of the NGSC on the work of that group.

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

- OWM encourages the:
  - Efforts of the NGSC as it works to provide corresponding proposals to the L&R Committee and S&T Committee.
  - Collaboration with FALS on:
    - Fuel properties data
    - The final vetting of data, formulas, etc. used to arrive at any conversion factors that might be recognized for use in supplemental advertising/sales information
- OWM notes that some of the current wording in the 2012 and 2013 proposals is somewhat confusing, in part, because several paragraphs include previous conversion factors no longer under consideration.
- The latest proposal encourages a proliferation of equivalent units of measurement, at least six for the CNG and LNG RMFD applications.
- Measurement accuracy and traceability are not achieved through computation of the sale’s information in equivalent quantity units since the conversion factor is an estimated value.
- OWM suggests input from stakeholders such as the CNG and LNG RMFD OEMs and agencies regulating other sectors (such as the motor fuels taxation departments) in the natural gas infrastructure on the impact of any new proposal.
- The last point that OWM would like to suggest the Committees consider that additional work might be necessary to further modify the code to fully recognize the LNG application. NIST has plans to outline an approach for a similar project.

The S&T Committee and L&R Committee agreed with the suggestions provided by the NGSC for addressing these items. As a result of these discussions, the S&T Committee agreed to the following regarding Items 337-1 through 337-5 on the Committee's 2014 Interim Agenda:

- Withdraw Items 337-1 and 337-4 and consolidate the remaining three items (337-2, 337-3, and 337-5) into a single item.
- Ask that the NGSC rework its proposed changes to NIST Handbook 44 to reflect the comments heard during the Committee's open hearings and in writing.
- Designate the consolidated item as a "Voting" item in anticipation that the NGSC will present a revised version of the proposed changes to NIST Handbook 44 prior to the publication of the Committee's Interim Report.

If the revised version of the code is not presented prior to the publication date or agreement cannot be reached within the NGSC or the S&T Committee on the revised version, the Committee agreed to designate this consolidated item as an "Information" item.

#### ***March 2014 NGSC Report to the L&R and S&T Committees***

The NGSC was formed in July 2013 to help understand and educate the NCWM membership regarding the technical issues surrounding the proposed changes to HB 44 and HB 130 submitted by the Clean Vehicle Education Foundation (CVEF); the anticipated impact of the proposed changes; and issues related to implementation requirements when compressed natural gas (CNG) and liquefied natural gas (LNG) are dispensed and sold as a retail engine fuel in gallon equivalent units.

At the NCWM Interim Meeting in January 2014, Mr. Albuquerque, Chair of the NGSC provided the S&T and L&R Committees with an update from the NGSC, including proposed revisions to the proposals submitted by the CVEF. The NGSC heard comments from the floor related to the proposed revisions and requested additional time to further develop its recommendations. The S&T and L&R Committees agreed to allow the NGSC additional time to meet and develop alternative proposals to those on the S&T and L&R Committee's January 2014 agendas, with the expectation that the NGSC recommendations would be ready for inclusion in Publication 16 and moved forward as a Voting Item at the July 2014 NCWM Annual Meeting. Mr. Albuquerque provided the following summary of the NGSC discussions.

#### ***Summary of NGSC Meeting Discussions***

The NGSC met weekly following the January 2014 Interim Meeting, and focused on modifying the Clean Vehicle Education Foundation (CVEF) 2013 proposals for the recognition of diesel gallon equivalent (DGE) units for CNG/LNG dispenser indications and the method of sale for these two natural gas alternative engine fuels. The NGSC reviewed multiple modifications to those proposals including:

- limiting sales to a single unit of mass measurement enforceable by 2016;
- requiring indications in mass and gasoline and diesel gallon equivalents, while phasing in mass only units;
- require sale by mass as the primary means, but allow for the simultaneous display of volume equivalent units, so long as the purchaser always had access to the mass (traceable) measurement; and
- a proposal from NIST OWM which would allow the posting of supplemental information to assist consumers in making value comparisons and for use by taxation/other agencies, but requiring the phase in of indications in mass

The NGSC received:

- input from DOE on the latest edition of the DOE TRANSPORTATION ENERGY DATA BOOK: EDITION 32 July 2013 available on the Oak Ridge National Laboratory website at: <http://cta.ornl.gov/data/index.shtml>;

- updates from CNG (3) and LNG (1) dispenser manufacturers indicating their dispensing systems comply with the requirements in the handbooks and have the capability to indicate a sale in a single unit of measurement, and any further input on adding displays to the cabinet for additional units would require further cost analysis; one OEM indicated use of their LNG RMFD in a fleet operation where indications are only in the DGE; and
- feedback from NGSC committee members related to the pros and cons of requiring the indication of sale in mass or gallon equivalent units, including traceability, equipment capabilities, marketplace considerations, and units used by state and federal agencies.

Also noted in the NGSC discussions were:

- how a gallon equivalent unit is derived using energy content, and that the gallon equivalent is defined and measured in terms of mass, not volume;
- for the last 20 years, HB44 and 130 have required all dispensing equipment to indicate deliveries of natural gas in GGE units to consumers and in mass units for inspection and testing purposes. CNG RMFD equipment in most states comply with the requirements in the handbooks;
- international practices for indicating CNG and LNG engine fuel deliveries are predominantly mass; Canada requires LNG indications in the kilogram and the corresponding OIML R 139 “Compressed gaseous fuel measuring systems for vehicles” standard requires indication of the measured gas in mass;
- the variations in engine efficiency relative to a single conversion factor based on an averaged energy content for LNG;
- the primary focus of the driving public and fleets is on mileage rather than petroleum products no longer used to fuel their vehicles;
- the work ahead over the next year by ASTM committees to develop current CNG and LNG fuel quality standards which will need to be referenced in HB 130;
- differences in the measurement of the gallon and kilogram -- since the gallon is a volume measurement and not an energy measurement;
- the HB 44 Mass Flow Meters Code includes a requirement for volume-measuring devices with ATC used in natural gas applications to be equipped with an automatic means to make corrections, if the devices is affected by changes in the properties of the product; it was also noted that U.S. gasoline and diesel dispensers are not required to have ATC. whereas ATC does occur in sales at the wholesale level;
- how traceability applies to the measurement results at each level of the custody chain (to include the determination of the uncertainty of all calibrations and use of an appropriate unit of measurement); and
- the capabilities of equipment in the marketplace.

A DOE representative supported the use of gallon equivalents and pointed out that they are used in the DOE Transportation Energy Data Book. The DOE representative also pointed out that other federal agencies including the IRS were requiring use of gallon equivalent units for reporting.

Industry representatives on the NGSC indicated that they are actively campaigning to their state and federal offices, encouraging each government branch to recognize sales of CNG and LNG in gasoline and diesel volume equivalent units. Industry sectors represented on the NGSC indicated that their customers are satisfied with the averaged fuel energy values that correspond to the conversion factors for CNG and LNG, with only one exception. The exception was a truck stop chain indicating their customers would be amenable to a single conversion factor for both fuels.

The CVEF also provided a comparison of GTI's 1992 study results and preliminary data from a 2013 study. The CVEF reported the constituents in natural gas as basically unchanged over 21 years since the NCWM first recognized the GGE. Industry unanimously opposed a recommendation for phasing in mass as the only unit of measurement, noting also that U.S. drivers would be confused by SI units while acknowledging that the U.S. is in the minority of countries whereby delivery and sales are by equivalent units. At the conclusion of the NGSC deliberations NGV America provided the following statement:

"One of the major advantages of the proposal as currently drafted with inclusion of the DGE and GGE units for natural gas is that this is a proposal that the natural gas industry can support. It further recognizes what is already the preferred practice for how natural gas is measured and dispensed. The latest proposal with DGE and GGE units provides a pathway forward toward a national consensus approach. If the proposal were to instead require use of kilograms or even pounds as the primary method of sale, industry would not support that proposal and likely would strongly oppose it this summer if NCWM were to consider it as a voting issue. Also, if NCWM finalizes on a standard that does not include DGE or GGE, industry is committed to pursuing adoption of an alternative standard on a state by state basis, which could lead to different treatment across the country. Several states have already introduced legislation to recognize the DGE standard (CA, IL, MO, and VA) and I expect more will do so later this year. And you know Colorado and Arkansas already have put in place standards that recognize the DGE units."

**NGSC Recommendations:**

After consideration of all of the above, the NGSC recommends alternate proposals to the L&R and S&T Committee Agenda Items which further modify and consolidate the Clean Vehicle Education Foundation 2013 proposals to include:

- 1) requirements for measurement in mass and indication in gallon equivalent units (HB 44 paragraphs S.1.3.1.1. and S.1.3.1.2.; and HB 130 paragraphs 3.11.2.1. and 3.12.2.1.);
- 2) posting of a label that has both the GGE and DGE or the GLE and DLE for CNG applications (HB 44 paragraphs S.5.2., S.5.3., UR.3.1.1., and UR.3.1.2; and HB 130 paragraphs 3.11.2.2.2. and 3.12.2.2.2.);
- 3) expression of all equivalent conversion factors expressed in mass units to 3 significant places beyond the decimal point for consistency (HB 44 paragraphs S.5.2., S.5.3., UR.3.1.1., and UR.3.1.2 and Appendix D and HB 130 Section 1, paragraphs 3.11.2.2.2. and 3.12.2.2.2.);
- 4) correction of the temperatures in the LNG definition (HB 130 Section 1);
- 5) addition of 16 CFR Part 309 for CNG automotive fuel rating (HB 130 paragraph 3.11.2.2.5.); and
- 6) reference to NFPA 52 (HB 130 paragraph 3.12.2.2.4.)

With regards to Handbook 44, the NGSC recommends withdrawing S&T Agenda Items 337-1 and 337-4 and the consolidation of Agenda Items 337-2, 337-3, and 337-5 into a newly revised single Voting Item designated as 337-2. The NGSC also recommends further modifications to corresponding HB 130 proposals to align the definitions of related terms and method of sale with definitions, indicated delivery and dispenser labeling requirements being proposed for HB 44.

With regards to Handbook 44, the NGSC also recommends consideration of new a Developing Item addressing proposed changes to paragraph S.3.6 Automatic Density Correction designated as 360-4. This new proposal is consistent with the NGSC decision to encourage further work beyond the current scope of its work on the CVEF's proposals to fully address all LNG applications.

Representatives of the NGSC and the S&T and L&R Committees met in March 2014, all agreed on the course of action outlined above.

Additional Contacts: Clean Energy, Seal Beach, CA, NGV America, Washington, DC, Clean Vehicle Education Foundation, Acworth, GA. Regional Association Comments: (Fall 2013 Input on the Committee's 2014 Interim

Agenda Items 337-1 through 337-5)
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Based on the NGSC's recommendation, the Committee agreed to modify the original proposal and present the following for a vote at the 2014 NCWM Annual Meeting:

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

**diesel gallon equivalent (DGE). – means 6.380 pounds of compressed natural gas or 6.060 pounds of liquefied natural gas. [3.37]**  
**(Added 2014)**

**diesel liter equivalent (DLE). – means 0.765 kilograms of compressed natural gas or 0.726 kilograms of liquefied natural gas. [3.37]**  
**(Added 2014)**

Amend NIST Handbook 44 Appendix D definitions as follows:

**gasoline gallon equivalent (GGE).** – Gasoline gallon equivalent (GGE) means 5.660 pounds of **compressed** natural gas.[3.37]  
**(Added 1994)(Amended 2014)**

**gasoline liter equivalent (GLE).** – Gasoline liter equivalent (GLE) means 0.678 kilograms of **compressed** natural gas.[3.37]  
**(Added 1994)(Amended 2014)**

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

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

**(Added 1994)(Amended 2014)**

S.1.3. Units

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

**(Added 1994)(Amended 2014)**

**S.1.3.1.2. Liquefied Natural Gas Used as an Engine Fuel.** – When liquefied natural gas is dispensed as an engine fuel, the delivered quantity shall be **measured in mass and indicated in “diesel liter equivalent (DLE) units” or “diesel gallon equivalent (DGE) units”** (Also see definitions).  
**(Added 2014)**

**S.5.2. Marking of Equivalent Conversion Factor for Compressed Natural Gas.** – A device dispensing compressed natural gas shall have either the statements “1 Gasoline Liter Equivalent (GLE) is **Approximately** Equal to 0.678 kg of **Compressed** Natural Gas” **and “1 Diesel Liter Equivalent (DLE) is Approximately Equal**

**to 0.765 kg of Compressed Natural Gas” or the statements “1 Gasoline Gallon Equivalent (GGE) is Approximately Equal to 5.660 lb of Compressed Natural Gas” and “1 Diesel Gallon Equivalent (DGE) is Approximately Equal to 6.380 lb of Compressed Natural Gas” permanently and conspicuously marked on the face of the dispenser according to the method of sale used.**  
(Added 1994, **amended 2014**)

**S.5.3. Marking of Diesel Volume Equivalent Conversion Factor for Liquefied Natural Gas. – A device dispensing liquefied natural gas shall have either the statement “1 Diesel Liter Equivalent (DLE) is Approximately Equal to 0.726 kg of Liquefied Natural Gas” or “1 Diesel Gallon Equivalent (DGE) is Approximately Equal to 6.060 lb of Liquefied Natural Gas” permanently and conspicuously marked on the face of the dispenser according to the method of sale used.**  
(Added 2014)

**UR.3.1.1. Marking of Equivalent Conversion Factor for Compressed Natural Gas. – A device dispensing compressed natural gas shall have either the statements “1 Gasoline Liter Equivalent (GLE) is Approximately Equal to 0.678 kg of Compressed Natural Gas” and “1 Diesel Liter Equivalent (DLE) is Approximately Equal to 0.765 kg of Compressed Natural Gas” or the statements “1 Gasoline Gallon Equivalent (GGE) is Approximately Equal to 5.660 lb of Compressed Natural Gas” and “1 Diesel Gallon Equivalent (DGE) is Approximately Equal to 6.380 lb of Compressed Natural Gas” permanently and conspicuously marked on the face of the dispenser according to the method of sale used.**  
(Added 2014)

**UR.3.1.2. Marking of Equivalent Conversion Factor for Liquefied Natural Gas. - A device dispensing liquefied natural gas shall have either the statement “1 Diesel Liter Equivalent (DLE) is Approximately Equal to 0.726 kg of Liquefied Natural Gas” or “1 Diesel Gallon Equivalent (DGE) is Approximately Equal to 6.060 lb of Liquefied Natural Gas” permanently and conspicuously marked on the face of the dispenser according to the method of sale used.**  
(Added 2014)

**UR.3.8. Return of Product to Storage, Retail Compressed Natural Gas and Liquefied Natural Gas Dispensers. – Provisions at the site shall be made for returning product to storage or disposing of the product in a safe and timely manner during or following testing operations. Such provisions may include return lines, or cylinders adequate in size and number to permit this procedure.**  
(Added 1998)(**Amended 2014**)

### ***July 2014 Annual Meeting***

At the July 2014 NCWM Annual Meeting, the Committee considered the revised proposal shown above. There were numerous comments in both opposition and support of the proposal as follows:

#### ***Support:***

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

**Opposition:**

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

**Other technical points that were raised include the following:**

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

The Committee received an alternative proposal from NIST that would require dispensers to measure, indicate, and calculate the total selling price based on mass units (pounds or kilograms), but permit the posting of supplemental information regarding approximate equivalents to other fuels for use by consumers when making value comparisons or for use by tax agencies. The proposed changes that appear in this alternative proposal are shown below; the Committee was also provided with a draft of the entire Section 3.37. Mass Flow Meters Code showing these changes incorporated into the code. This draft is available upon request from NIST OWM.

**S.1. Indicating and Recording Elements.**

...

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

(Added 1994)(Amended 2015)

**S.1.3. Units.**

**S.1.3.1. Units of Measurement.** – Deliveries shall be indicated and recorded in grams, kilograms, metric tons, pounds, tons, and/or liters, gallons, quarts, pints and decimal subdivisions thereof. The indication of a delivery shall be on the basis of apparent mass versus a density of 8.0 g/cm<sup>3</sup>. The volume indication shall be based on the mass measurement and an automatic means to determine and correct for changes in product density.

(Amended 1993 and 1997)

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

(a) Effective and Nonretroactive as of January 1, 2016, the delivered quantity shall be

indicated in mass units in terms of kilograms or pounds and decimal subdivisions thereof.

(b)

This paragraph will become retroactive on January 1, 2017.

(Added 2015)

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

(Added 1994)(Amended 2015)

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

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

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

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

For compressed natural gas:

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

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

For liquefied natural gas:

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

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

...



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

- (a) The maximum value of the quantity-value division for liquids shall not be greater than 0.2 % of the minimum measured quantity.
- (b) Effective and nonretroactive as of January 1, 2016, the maximum value of the mass division for dispensers of natural gas used to refuel vehicles shall not exceed 0.001 kg or 0.001 lb.

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

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

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

(Amended 1994 **and 2015**)

...

**S.5. Markings. ...**

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

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

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

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

...

**UR.3. Use of Device.**

...

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

(Added 1998)(**Amended 2015**)

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

The Committee identified the method of sale by mass versus equivalent volumetric units as the most significant concern based on comments heard on this proposal. In addition to support for this proposal, there were also concerns regarding the use of the word “approximately” for labeling purposes; “multiple equivalent units” labeled on the same dispenser; “tax issues;” and other less commonly expressed issues. It was decided to eliminate the labeling altogether and not delay the effective date, thereby, addressing all three concerns. Consequently, the Committee agreed to delete paragraphs S.5.2., S.5.3., UR.3.1.1., and UR.3.1.2. in their entirety from the proposal and paragraph S.5.2. from NIST Handbook 44.

Based upon the comments received and its deliberations, the Committee agreed to modify the Item Under Consideration shown in Publication 16 by deleting the following language:

~~**S.5.2. Marking of Equivalent Conversion Factor for Compressed Natural Gas.**—A device dispensing compressed natural gas shall have either the statements “1 Gasoline Liter Equivalent (GLE) is Approximately Equal to 0.678 kg of Compressed Natural Gas” and “1 Diesel Liter Equivalent (DLE) is Approximately Equal to 0.765 kg of Compressed Natural Gas” or the statements “1 Gasoline Gallon Equivalent (GGE) is Approximately Equal to 5.660 lb of Compressed Natural Gas” and “1 Diesel Gallon Equivalent (DGE) is Approximately Equal to 6.384 lb of Compressed Natural Gas” permanently and conspicuously marked on the face of the dispenser according to the method of sale used. (Added 1994, amended 2014)~~

~~**S.5.3. Marking of Diesel Volume Equivalent Conversion Factor for Liquefied Natural Gas.**—A device dispensing liquefied natural gas shall have either the statement “1 Diesel Liter Equivalent (DLE) is Approximately Equal to 0.726 kg of Liquefied Natural Gas” or “1 Diesel Gallon Equivalent (DGE) is Approximately Equal to 6.059 lb of Liquefied Natural Gas” permanently and conspicuously marked on the face of the dispenser according to the method of sale used. (Added 2014)~~

~~**UR.3.1.1. Marking of Equivalent Conversion Factor for Compressed Natural Gas.**—A device dispensing compressed natural gas shall have either the statements “1 Gasoline Liter Equivalent (GLE) is Approximately Equal to 0.678 kg of Compressed Natural Gas” and “1 Diesel Liter Equivalent (DLE) is Approximately Equal to 0.765 kg of Compressed Natural Gas” or the statements “1 Gasoline Gallon Equivalent (GGE) is Approximately Equal to 5.660 lb of Compressed Natural Gas” and “1 Diesel Gallon Equivalent (DGE) is Approximately Equal to 6.384 lb of Compressed Natural Gas” permanently and conspicuously marked on the face of the dispenser according to the method of sale used. (Added 2014)~~

~~**UR.3.1.2. Marking of Equivalent Conversion Factor for Liquefied Natural Gas.**—A device dispensing liquefied natural gas shall have either the statement “1 Diesel Liter Equivalent (DLE) is Approximately Equal to 0.726 kg of Liquefied Natural Gas” or “1 Diesel Gallon Equivalent (DGE) is Approximately Equal to 6.059 lb of Liquefied Natural Gas” permanently and conspicuously marked on the face of the dispenser according to the method of sale used. (Added 2014)~~

The Item Under Consideration, absent the language that had been deleted by the Committee, was then offered for vote, but returned to Committee for further consideration due to a split vote. The following proposal is that which was voted on at the 2014 Annual NCWM Meeting and returned to Committee.

***Proposal presented for vote and returned to Committee at the 2014 NCWM Annual Meeting:***

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

**diesel gallon equivalent (DGE). – means 6.384 pounds of compressed natural gas or 6.059 pounds of liquefied natural gas. [3.37]**  
**(Added 2014)**

**diesel liter equivalent (DLE).** – means 0.765 kilograms of compressed natural gas or 0.726 kilograms of liquefied natural gas. [3.37]  
(Added 2014)

Amend NIST Handbook 44 Appendix D definitions as follows:

**gasoline gallon equivalent (GGE).** – Gasoline gallon equivalent (GGE) means 5.660 pounds of **compressed** natural gas.[3.37]  
(Added 1994)(Amended 2014)

**gasoline liter equivalent (GLE).** – Gasoline liter equivalent (GLE) means 0.678 kilograms of **compressed** natural gas.[3.37]  
(Added 1994)(Amended 2014)

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

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

(Added 1994)(Amended 2014)

### S.1.3. Units

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

(Added 1994)(Amended 2014)

**S.1.3.1.2. Liquefied Natural Gas Used as an Engine Fuel.** – **When liquefied natural gas is dispensed as an engine fuel, the delivered quantity shall be measured in mass and indicated in “diesel liter equivalent (DLE) units” or “diesel gallon equivalent (DGE) units” (Also see definitions).**  
(Added 2014)

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

(Added 1998)(Amended 2014)

### 2015 NCWM Interim Meeting

During the 2015 NCWM Interim Meeting, the S&T and L&R Committees took comments on S&T Item 337-1 and L&R Items 232-4 and 237-1 collectively during a special joint open hearing session. There were two proposals offered for consideration concerning the appropriate method of sale (MOS) for natural gas and it was stated that comments would be taken on both to determine which proposal best represents the body of the NCWM. Proposal 1, titled “The Volume Equivalent Compromise Proposal” would require natural gas to be measured in mass and indicated in equivalent gallon units or mass. Proposal 2, titled “The Mass Compromise Proposal” would require natural gas to be measured and indicated in mass and supplemental equivalent information be displayed on the dispenser for value comparison only.

Comments in support of Proposal 1 were primarily heard from representatives of the gas industry, manufacturers of natural gas retail motor fuel dispensers, natural gas refueling station owners, fuel marketers, and other industry representatives. Two state weights and measures directors, Mr. Albuquerque and Mr. Joe Gomez (NM), also provided comments in support of Proposal 1. The following list includes the primary comments heard in support of Proposal 1 (this list is not all inclusive of every comment, but intended to capture the key points raised):

- Volume equivalent units recognize what's already in the marketplace – acceptance would put all retailers on the same footing.
- The first proposal provides the best chance of having a national standard.
- The proposal was submitted because of LNG; not CNG. There is no MOS specified for LNG. LNG is a fuel that will mostly be used in trucks.
- The feedback we're hearing from our customers is that they want to make value comparisons using gallon equivalent units.
- We can build dispensers that measure in mass. Providing both indications (mass and equivalent gallons) would be very expensive to build. Our customers like gallon equivalents. It would create confusion if you put two values there. These are two different units of measurement; unlike cash/credit pricing.
- It would be considered an unfair trade practice to advertise on the street in one unit of measure and dispense product in another unit of measure. The advertised unit price should match the unit price on the dispenser.
- We want to hear feedback from our customers. They value the comparison of LNG to diesel because it is a quick and easy determination. We talk to our customers. They want to make comparisons by using DGE.
- Universally, our customers want, ask, and purchase gallon equivalent units. We can provide an indication in mass units. Is it worth changing a twenty year industry MOS to something industry doesn't want? Our equipment measures in mass and indicates in gallon equivalents.
- Support gallon equivalent units for three reasons:
  - 1) uniformity,
  - 2) clarity in the marketplace (there have been no complaints...customers want it), and
  - 3) verification for fairness – both will be verified in mass (not BTU)

Comments heard in support of Proposal 2 were predominantly made by weights and measures officials. The following list includes the primary comments heard in support of Proposal 2 (this list also is not all inclusive of every comment, but intended to capture the key points raised):

- We're a standards organization. Equivalent units are not a standard. This is a marketing tool. Allowing equivalent units would provide industry a competitive advantage.
- Equipment is capable of providing mass indications.
- There is a general lack of support for DGE and GGE units among regulators.
- Label equivalent units on the front of the dispenser and measure and indicate in mass.
- Which method would provide the most value comparison to the customer? Many products offered for sale provide supplemental information. Examples given: fertilizer sold by weight provides square footage coverage information; paint sold by gallon provides spread dimensions, etc.
- Need to sell by a quantifiable measurement – mass.
- Proliferation of "equivalent units" is a real concern.
- There are questions concerning the validity of the equivalent values being proposed. Natural gas composition fluctuates, as does the composition of gasoline. How accurate are the numbers? We're not comfortable that the study on BTU by the Energy Department provides accurate enough information. Industry reported specific gravities change by as much as 12%.

- We stand to face the same mistake made 20 years ago. It was a mistake then and it would be a mistake now.
- There are new fuels coming onboard. The same argument can be made for equivalent units. How do you tell the next group “no?”
- Products need to be sold by a recognizable unit of measure.
- We are a standard organization – the best way to sell is the way it’s actually measured.
- Consumers have purchased propane by weight for years and years. They’ve never asked how much they were receiving in gallon equivalent units.
- We are not the world. There are not liter equivalent units in Canada, Europe, or Japan.
- Consumers learn what the measurement is and then they do the calculations. Consumers will know before they purchase a vehicle what their cost per mile will be.
- On January 1, 2015 a California law added DGE and GGE. It is a very bad law. I urge the Conference not to follow that course. Support the second proposal.

Mr. Constantine Cotsoradis (Flint Hills Resources) commented that he would be opposed to moving forward to satisfy the marketing of one industry. He noted that Flint Hills Resources sells LNG by weight using a truck scale to weigh it. If equivalent units were required, the weight would need to be converted to equivalent gallon units. He suggested that Proposal 1 be modified to apply to retail stations rather than retail sales. However, when the Committee modified Proposal 1 after the open hearings to allow natural gas to be sold by equivalent gallon units or mass as shown in Item Under Consideration, Mr. Cotsoradis indicated his concern had been satisfied.

Following the open hearings, the S&T and L&R Committees met jointly in an open work session to decide which proposal would be presented to the NCWM for vote given the comments heard during the open hearings. Several members of the NGSC were in attendance and provided feedback during the meeting. In considering this issue, two or three members of the S&T and L&R Committees led a discussion in favor of putting forward Proposal 1 for vote by emphasizing that proposal’s flexibility in allowing jurisdictions to make the decision on which MOS is appropriate. Mr. Richard Harshman, NIST Technical Advisor to the S&T, acknowledged that during the open hearings, the comments heard from industry representatives overwhelmingly supported Proposal 1, but that industry representatives were not permitted to vote. Mr. Harshman pointed out that during Sunday’s joint meeting of the NGSC, S&T, and L&R Committees, it was stated that the goal for this Interim Meeting was to select the proposal that best represents the body of, and, therefore most likely to be adopted by, the NCWM. He also provided a count of the number of weights and measures officials who commented in support of each proposal during the open hearings, noting that they represented the group that could vote. Officials commenting in support of Proposal 2 numbered five. Officials commenting in support of Proposal 1 numbered two. It was then stated by Mr. Louis Sakin (Town of Hopkinton/Northbridge, MA), a member of the L&R Committee, that this tally was not a true representation of all in the room who could vote and that many who could vote had not spoken during the open hearings. Mr. Sakin concluded that most of these “silent officials” (i.e., officials who did not provide testimony during the open hearings) would be in favor of Proposal 1. Some others in the room agreed and consequently, the two Committees voted in favor of putting forth Proposal 1 for a July vote by NCWM.

There were mixed positions amongst the S&T Committee members as to the method of sale, but overall the Committee and in conjunction with the L&R Committee elected to put forth a version of Proposal 1 (volume equivalents) and recommend a Voting status for this version. The S&T Committee’s modification to Proposal 1 included deleting the words “if required by the weights and measures authority having jurisdiction” in paragraphs S.1.3.1.1 and S.1.3.1.2. The Committee also agreed to reinsert the current HB 44 definition of “gasoline liter equivalent” shown as completely struck out into the Item Under Consideration with the understanding that the intent of the NGSC is to eliminate all references to “GLE” from HB 44. The Committee recognizes that “GLE” is referenced throughout the Mass Flow Meters Code and that these references are an issue still needing to be addressed. A final action agreed to by the Committee was to add the following option for marking supplemental information in Proposal 2 of the two proposals considered at the 2015 NCWM Interim Meeting:

### **A Diesel Gallon Equivalent means 6.059 pounds (2.748 kg) of LNG**

The Item Under Consideration includes the Committee's modification to the S&T portion of Proposal 1 and replaces the previous Item Under Consideration proposal that was voted on and returned to Committee during the 2014 NCWM Annual Meeting due to a split vote.

#### **Regional Associations Comments:**

During open hearing at the 2014 WWMA Annual Meeting, an update on the NGSC was provided and comments were heard (pro and con) for this item, similar to what has been offered previously. The WWMA agrees that this topic needs to be addressed and resolved; therefore, it should remain as an Information Item on the NCWM Agenda. The WWMA S&T Committee offers the recommendations of: 1) Consideration of the NIST Proposal; 2) Possibility of a customer selectable unit; and 3) Determination of GGE to low volume sales and DGE to high volume sales. During the S&T Committee voting session it was motioned, seconded, and approved that comments presented during the L&R Committee voting session be adopted. The comments included a call for vote by those in support of sale in mass versus those in support of sale by equivalent unit. A show of hands was recorded by the Parliamentarian and indicated those in favor of mass to be 23 and those in favor of equivalent unit to be 12.

At its 2014 Annual Meeting, SWMA recommended deferring to the NGSC which will provide recommendations at the 2015 NCWM Interim Meeting.

At its 2014 Interim Meeting, NEWMA recommended that S&T items 337-1 and 232-3 and L&R item 237-1 remain Informational items pending final language from the NGSC at the NCWM 2015 Interim Meeting. It was further recommended that the Steering Committee consider changing the method of sale to mass and that the NIST proposal to modify section 3.37, Mass Flow Meters in Handbook 44 (2014 edition) be considered. (The draft NIST proposal is on the NEWMA web site as a supporting document.).

At its 2014 Interim Meeting, CWMA reported that a segment of the industry supports this item. The majority of the regulatory body does not support the item as written. Based on the comments received, the CWMA recommended that the item be an Informational item. CWMA recommends that the commodity shall be measured in mass units and indicated in mass units. Equivalency units may be included as supplemental information.

#### ***January 2015 – Separate Compromise Proposals Offered by the NGSC***

In January 2015 and prior to the 2015 NCWM Interim Meeting, the Committee received a recommendation from the NGSC that the weights and measures community consider two separate proposals as alternatives to the proposal voted on at the 2014 NCWM Annual Meeting. The Steering Committee noted that the two proposals reflect compromises on viewpoints within the NGSC: (1) on the recognition of the LNG motor-fuel application; (2) to replace the term "equal" with the term "means" to establish the relationship of mass units to supplemental units; and (3) to eliminate from use liter equivalent units of measurement in natural gas motor-fuel applications since this is a newly created unit that is not recognized in jurisdictions using SI units.

The first compromise proposal titled "The Volume Equivalent Compromise Proposal" proposes modifications to NIST HB 44 Section 3.37 MFM Code and corresponding NIST HB 130 MOS requirements to:

1. Recognize the indication of natural gas fuel sales in values of either volume equivalent units or mass units based on legislative policy within a jurisdiction;
2. Mandate labeling the equivalent unit conversion factor on a natural gas motor-fuel dispenser, and
3. No longer recognize SI mass units in favor of U.S. Customary mass units (i.e., lb).

The second proposal, originally titled "Natural Gas Motor-Fuel Proposal to Phase-In Mass Indications While Recognizing Supplemental Fuel Information," but later changed to "The Mass Compromise Proposal" is intended to replace the NIST OWM fall 2014 compromise proposal. This alternate proposal was a joint collaboration of work by Mr. Ron Hayes (Missouri) and NIST OWM to further modify the HB 44 3.37 Mass Flow Meters Code where this proposal:

1. Keeps the suggested *new* phase in period where mass indications for all sales of natural gas motor-fuel will be of a specified maximum value and required for all dispensers effective January 1, 2017 as shown in amended paragraphs S.1.3.1.1. Compressed Natural Gas Used as an Engine Fuel, and S.1.3.3. Maximum Value of Quantity-Value Divisions;
2. Continues to recognize the use of *new* supplemental fuel information for use in making value comparisons and taxation purposes as well as prescribe the format for stating this information as shown in the proposed *new* Definition of diesel gallon equivalent (DGE) and *new* paragraph S.1.3.1.2. Natural Gas Used as an Engine Fuel, Supplemental Information and modifications to paragraph S.5.2. Marking of Gasoline Volume Equivalent Conversion Factor. This information might be provided in the form of placards, or on the kiosk, or as dispenser indications or labeling on the cabinet when it is clear that this is not the required transaction information; and
3. Recognizes the existing compressed natural gas motor-fuel application and includes the proposed *new* liquefied natural gas motor-fuel application as shown in modified paragraphs S.1.2. Compressed Natural Gas Dispensers and UR.3.8. Return of Product to Storage.

Both proposals are included in their entirety in the boxes below.

***Proposal 1- The Volume Equivalent Compromise Proposal***

**Handbook 44**

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

**diesel gallon equivalent (DGE). – Diesel gallon equivalent (DGE) means 6.384 pounds of compressed natural gas or 6.059 pounds of liquefied natural gas. [3.37]**  
**(Added 2014)**

Amend NIST Handbook 44 Appendix D definitions as follows:

**gasoline gallon equivalent (GGE). – Gasoline gallon equivalent (GGE) means 5.660 pounds of compressed natural gas. [3.37]**  
**(Added 1994) (Amended 2014)**

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

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

(Added 1994) **(Amended 2014)**

**S.1.3. Units.**

**S.1.3.1.1. Compressed Natural Gas Used as an Engine Fuel.** – When compressed natural gas is dispensed as an engine fuel, the delivered quantity shall be indicated in **“gasoline liter equivalent (GLE) units” or “gasoline gallon equivalent (GGE) units,” or diesel gallon equivalent units (DGE), or in mass if required by the weights and measures authority having jurisdiction.** (Also see definitions.)

(Added 1994) (Amended 2014)

**S.1.3.1.2. Liquefied Natural Gas Used as an Engine Fuel. – When liquefied natural gas is dispensed as an engine fuel, the delivered quantity shall be indicated in diesel gallon equivalent units (DGE), or in mass if required by the weights and measures authority having jurisdiction (Also see definitions.)**

**(Added 2014)**

**S.5.2. Marking of ~~Gasoline Volume~~ Equivalent Conversion Factors for Compressed Natural Gas. –** A device dispensing compressed natural gas shall have either the statement **~~“1 Gasoline Liter Equivalent (GLE) is Equal to 0.678 kg of Natural Gas” or “1 Gasoline Gallon Equivalent (GGE) is Equal to means~~** 5.660 lb of **Compressed** Natural Gas” **or “1 Diesel Gallon Equivalent (DGE) means 6.384 lb of Compressed Natural Gas”** permanently and conspicuously marked on the face of the dispenser according to the method of sale used.

(Added 1994) (Amended 2014)

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

**(Amended 2014)**

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

**(Added 2014)**

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

**(Amended 2014)**

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

(Added 1998)

#### **Handbook 130**

Amend NIST Handbook 130, Uniform Engine Fuels and Automotive Lubricants Regulation as follows:

**1.XX. Diesel Gallon Equivalent (DGE). – Diesel Gallon Equivalent (DGE) means 6.384 pounds of compressed natural gas or 6.059 pounds of liquefied natural gas.**

**1.25. Gasoline Gallon Equivalent (GGE). – Gasoline Gallon Equivalent (GGE) means ~~to 2.567~~(5.660 lb) of compressed natural gas.**

**1.26. Gasoline Liter Equivalent (GLE). Equivalent to 0.678 kg (1.495 lb) of natural gas.**



**1.35. Liquefied Natural Gas (LNG).** – Natural gas that has been liquefied at – ~~126.4~~ 162°C (– ~~259~~260 °F) and stored in insulated cryogenic tanks for use as an engine fuel.

### **3.11. Compressed Natural Gas (CNG).**

**3.11.1. How Compressed Natural Gas is to be Identified.** – For the purposes of this regulation, compressed natural gas shall be identified by the term “Compressed Natural Gas” or “CNG.”

#### **3.11.2. Retail Sales of Compressed Natural Gas Sold as a Vehicle Fuel.**

**3.11.2.1. Method of Retail Sale.** – All CNG kept, offered, or exposed for sale or sold at retail as a vehicle fuel shall be either in terms of the gasoline ~~liter equivalent (GLE) or gasoline~~-gallon equivalent (GGE), the diesel gallon equivalent (DGE), or in mass if required by the weights and measures authority having jurisdiction.

##### **3.11.2.2. Retail Dispenser Labeling.**

**3.11.2.2.1. Identification of Product.** – Each retail dispenser of CNG shall be labeled as “Compressed Natural Gas.”

**3.11.2.2.2. Conversion Factor.** – All retail CNG dispensers shall be labeled with the conversion factor in terms of ~~kilograms or~~ pounds. The label shall be permanently and conspicuously displayed on the face of the dispenser and shall have either the statement ~~“1 Gasoline Liter Equivalent (GLE) is equal to 0.678 kg of Natural Gas or”~~ “1 Gasoline Gallon Equivalent (GGE) ~~is equal to means~~ 5.660 lb of Compressed Natural Gas,” or “1 Diesel Gallon Equivalent (DGE) means 6.384 lb of Compressed Natural Gas.” consistent with the method of sale used.

**3.11.2.2.3. Pressure.** – CNG is dispensed into vehicle fuel containers with working pressures of ~~16 574 kPa–20 684 kPa~~ (3,000 psig), or 24 821 kPa (3,600 psig). The dispenser shall be labeled ~~16 574 kPa–20 684 kPa~~ (3,000 psig), or 24 821 kPa (3,600 psig) corresponding to the pressure of the CNG dispensed by each fueling hose.

**3.11.2.2.4. NFPA Labeling.** – NFPA Labeling requirements also apply. (Refer to NFPA 52.)

**3.11.3. Nozzle Requirements for CNG.** – CNG fueling nozzles shall comply with ANSI/AGA/CGA NGV 1.

### **3.12. Liquefied Natural Gas (LNG).**

**3.12.1. How Liquefied Natural Gas is to be Identified.** – For the purposes of this regulation, liquefied natural gas shall be identified by the term “Liquefied Natural Gas” or “LNG.”

#### **3.12.2. Retail Sales of Liquefied Natural Gas Sold as a Vehicle Fuel.**

**3.12.2.1. Method of Retail Sale.** – All LNG kept, offered, or exposed for sale or sold at retail as a vehicle fuel shall be in terms of the diesel gallon equivalent (DGE), or in mass if required by the weights and measures authority having jurisdiction.

##### **3.12.2.3. Labeling of Retail Dispensers of Liquefied Natural Gas Sold as a Vehicle Fuel Labelling.**

**3.12.2.3.1. Identification of Product.** – Each retail dispenser of LNG shall be labeled as “Liquefied Natural Gas.”

**3.12.2.3.2. Conversion Factor.** – All retail LNG dispensers shall be labeled with the conversion factor in terms of pounds. The label shall be permanently and conspicuously displayed on the face of the dispenser and shall have the statement “1 Diesel Gallon Equivalent (DGE) means 6.059 lb of

**Liquefied Natural Gas.”**

**3.12.23.23. Automotive Fuel Rating.** – LNG automotive fuel shall be labeled with its automotive fuel rating in accordance with 16 CFR Part 306.

**3.12.23.34. NFPA Labeling.** – NFPA Labeling requirements also apply. (Refer to NFPA ~~57~~52.)

***Proposal 2 – The Mass Compromise Proposal***

Consider the following modifications to HB 44 3.37 Mass Flow Meters Code:

**S.1.3. Units.**

**S.1.3.1. Units of Measurement.**

...

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

**(a) Effective and nonretroactive as of January 1, 2016, the delivered quantity shall be indicated in mass units in terms of kilograms or pounds and decimal subdivisions thereof.**

**This paragraph will become retroactive on January 1, 2017.**  
**(Added 2015)**

**(b) For dispensers manufactured prior to January 1, 2016:**

**The dispenser shall display the mass measured for each transaction, either continuously on an external or internal display accessible during the inspection and test of the dispenser, or display the quantity in mass units by using controls on the device.**

**The delivered quantity shall be indicated in mass or in “gasoline liter equivalent (GLE) units” or “gasoline gallon equivalent (GGE) units.” (Also see ~~d~~Definitions.)**  
**(Added 1994)(Amended 2015)**

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

**S.1.3.2. Numerical Value of Quantity-Value Divisions.** – The value of a scale interval shall be equal to:

...

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

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

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

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

(c) For dispensers of ~~compressed~~ natural gas used to refuel vehicles **and manufactured prior to January 1, 2016,** the value of the division for the ~~gasoline liter equivalent shall not exceed 0.01~~

~~GLE; the division for~~ gasoline gallon equivalent (GGE) shall not exceed 0.001 GGE. The maximum value of the mass division shall not exceed 0.001 kg or 0.001 lb.

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

(Amended 1994 and 2015)

Include a new definition for the supplemental term diesel gallon equivalent as follows:

**A Diesel Gallon Equivalent (DGE) means 6.384 pounds (2.895 kg) of CNG or 6.059 pounds (2.748 kg) of LNG**  
**(Added 2015)**

Add a new paragraph S.1.3.1.2. as shown below:

**S.1.3.1.2. Natural Gas Used as an Engine Fuel, Supplemental Information. – Dispensers of natural gas dispensed as an engine fuel may include supplemental information to assist consumers in making value comparisons with gasoline and diesel fuel and for use by taxation departments and other agencies that may need an approximation thereof. Quantity, unit price, and total price for the transaction must be clearly designated and distinguished from any supplemental information to ensure that the customer understands the basis for the transaction.**

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

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

**For compressed natural gas:**

**1 kg of Compressed Natural Gas means 0.3896 Gasoline Gallon Equivalent (GGE)**

**1 kg of Compressed Natural Gas means 0.3455 Diesel Gallon Equivalent (DGE)**

**1 lb of Compressed Natural Gas means 0.177 Gasoline Gallon Equivalent (GGE)**

**1 lb of Compressed Natural Gas means 0.157 Diesel Gallon Equivalent (DGE)**

**A Gasoline Gallon Equivalent (GGE) means 5.660 pounds (2.567 kg) of CNG**

**For liquefied natural gas:**

**1 kg of Liquefied Natural Gas means 0.3638 Diesel Gallon Equivalent (DGE)**

**1 lb of Liquefied Natural Gas means 0.165 Diesel Gallon Equivalent (DGE)**

**A Diesel Gallon Equivalent means 6.059 pounds (2.748 kg) of LNG**

Modify paragraph S.5.2. as follows:

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

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

**Paragraph S.5.2. will be removed from the 2017 edition of NIST Handbook 44 when paragraph S.1.3.1.1.(a) becomes retroactive.**  
(Added 1994)(**Amended 2015**)

Amend the following HB 44 paragraphs as recommended in Fall 2014:

**S.1. Indicating and Recording Elements.**

...

**S.1.2. ~~Compressed Natural Gas Dispensers.~~** – Except for fleet sales and other price contract sales, a ~~compressed~~ natural gas dispenser used to refuel vehicles shall be of the computing type and shall indicate the quantity, the unit price, and the total price of each delivery. ~~The dispenser shall display the mass measured for each transaction either continuously on an external or internal display accessible during the inspection and test of the dispenser, or display the quantity in mass units by using controls on the device.~~  
(Added 1994)(**Amended 2015**)

**UR.3. Use of Device.**

...

**UR.3.8. Return of Product to Storage, Retail Compressed Natural Gas and Liquefied Natural Gas Dispensers.** – Provisions at the site shall be made for returning product to storage or disposing of the product in a safe and timely manner during or following testing operations. Such provisions may include return lines, or cylinders adequate in size and number to permit this procedure.  
(Added 1998)(**Amended 2015**)

The NGSC representatives ask that the “Natural Gas Motor Fuel Proposal to Phase-In Mass Indications While Recognizing Supplemental Fuel Information” shown above be considered on its merits for adhering to basic weights and measures philosophy and principles of measurement; that is, transactions are clear, transparent, verifiable, protect all consumers, and promote fair competition in the marketplace. This proposal is an opportunity for a uniform method of sale by mass units and is aligned with practices adhered to globally for this application. The proposal shown above might be made more palatable by including some corresponding NIST HB 130 language to address street price signage requirements; it is highly possible to develop, distribute, and vet a set of minimal modifications to HB 130 before July 2015, if deemed necessary.

NEWMA Action: Item 337-1
<b>Summary of comments considered by the regional committee (in writing or during the open hearings):</b>
A state official commented that the state of Maine believes that mass is the appropriate unit of measure for this product. They will not support any proposal with an equivalency measure because it is not a traceable unit. A New York county official asked how many states had proposed or accepted new laws with equivalencies. NG Steering Committee Chair Ethan Bogren indicated there were six states who had adopted equivalency language or something similar. Several other states are also moving in that direction. A retired official commented that he suggested looking at the model law of Uniform Weights & Measures – while directors can determine and issue regulations regarding method of sale, it is not the directors who should initiate the unit of measure. Buyers and sellers should determine the unit for the method of sale. He believes that we have an obligation to listen to the stakeholders who have made it clear that they want – equivalency units.
<b>Item as proposed by the regional committee: (If different than agenda item)</b>
This item was grouped with L&R agenda items 237-1 & 237-3 as combined committee agenda items.
<b>Committee recommendation to the region:</b> <ul style="list-style-type: none"> <li><input checked="" type="checkbox"/> Voting Item on the NCWM Agenda</li> <li><input type="checkbox"/> Information Item on the NCWM Agenda</li> <li><input type="checkbox"/> Withdraw the Item from the NCWM Agenda (<i>In the case of new items, do not forward to NCWM</i>)</li> <li><input type="checkbox"/> Developing Item on the NCWM Agenda (<i>To be developed by source</i>)</li> </ul>

<b>Reasons for the committee recommendation:</b>
The committee recommends that this item be sent to vote.
<b>COMPLETE SECTION BELOW FOLLOWING VOTING SESSION</b>
<b>Final updated or revised proposal from the region: <i>(If different than regional committee recommendation)</i></b>
<b>Regional recommendation to NCWM for item status:</b>
<input type="checkbox"/> Voting Item on the NCWM Agenda <input type="checkbox"/> Information Item on the NCWM Agenda <input type="checkbox"/> Withdraw the Item from the NCWM Agenda <i>(In the case of new items, do not forward to NCWM)</i> <input type="checkbox"/> Developing Item on the NCWM Agenda <i>(To be developed by source)</i> <input checked="" type="checkbox"/> Unable to consider at this time <i>(Provide explanation in the "Additional Comments" section below)</i>
<b>Regional Report to NCWM:</b>
This item was grouped with L&R Items 232-4 & 237-1. A motion was made but not seconded and the items are therefor returned to committee.

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

### **337-2      W      S.3.6. Automatic Density Compensation.**

**Source:**

NCWM Natural Gas Steering Committee (2014 Interim Meeting)

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 HB 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 and 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  $\pm 0.1$  %. The restrictions on composition of the liquefied natural gas are:**

<b>methane</b>	<b>60 % or greater</b>
<b>nitrogen</b>	<b>less than 4 %</b>
<b><i>n</i>-butane</b>	<b>less than 4 %</b>
<b><i>i</i>-butane</b>	<b>less than 4 %</b>
<b>pentanes</b>	<b>less than 2 %</b>

Mr. Karimov also referenced excerpts from past NCWM Final Reports from 1994 and 1997. These excerpts are found in Appendix G to the Committee's 2014 Interim Report.

Listed below 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 <sup>1</sup> (K)	Pressure (psia)	Density (lb <sub>MASS</sub> /gal)	% Density Difference <sup>2</sup>
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%
120	195	3.4314	-0.310%
120	200	3.4317	-0.319%
<sup>1</sup> 120 K (-153 °C) (-243 °F) <sup>2</sup> 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.

At the 2014 NCWM Annual Meeting, there were numerous comments suggesting the proposal remain in a Developing status. Consequently the Committee agreed to recommend this item remain Developing.

### **2015 NCWM Interim Meeting**

At the 2015 NCWM Interim Meeting, the Committee agreed to withdraw this item from its agenda at the request of the item's submitter.

### **Regional Associations Comments:**

CWMA did not receive comments and recommended that the item be an Informational Item.

During open hearing at the 2014 WWMA Annual Meeting a member of the NGSC offered testimony that the submitter requested this item be withdrawn. WWMA recommends this item be a Withdrawn Item.

SWMA recommended this item to be withdrawn from the agenda at the request of the submitter.

NEWMA recommended that this item remain developing. Further clarification is needed as to the intent to move forward with this item from the submitter.

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

## **337-3 D N.3. Test Drafts.**

### **Source:**

Endress + Hauser Flowtec AG USA (2015)

### **Purpose:**

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

### **Item Under Consideration:**

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

### **N.3. Test Drafts. –**

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

(Amended 1982)

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

**Background / Discussion:**

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

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

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

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

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

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

**2015 NCWM Interim Meeting**

At the 2015 NCWM Interim Meeting, the Committee agreed to group together Agenda Items 330-2 and 337-3 since these items are related and announced that comments on both items would be taken together during the open hearings. Refer to Agenda Item 330-2 for a summary of the comments heard concerning these two items. The Committee agreed this item has merit and recommends the submitter of these items work with OWM by providing data for the WG to consider in determining the suitability of the master meter transfer standard as a standard in testing another device.

**Regional Association Comments:**

CWMA received comments questioning the accuracy of a meter used as a mobile standard. CWMA forwarded the item to NCWM, recommending it as a Developing Item.

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

SWMA heard questions and concerns that need to be addressed by the submitter. SWMA also recommended that NIST OWM continue to develop a standard for this equipment to development standards and other guidance documents necessary to recognize their use. Additionally, SWMA recommended the submitter work with NIST

OWM to address these concerns. SWMA recommended that items 332-2 and 337-3 be combined into one agenda item since they are both related to test drafts. Comments were heard for both of these agenda items at the same time.

NEWMA believes that this item has merit but that further development will be necessary before being sent to a vote. The Committee suggests that item 332-2 and 337-3 be combined as a single agenda item.

<b>NEWMA Action: Item 337-3</b>
<b>Summary of comments considered by the regional committee (in writing or during the open hearings):</b>
This item was grouped with 332-2. *See 332-2 for comments.
<b>Item as proposed by the regional committee: (If different than agenda item)</b>
<b>Committee recommendation to the region:</b> <input type="checkbox"/> Voting Item on the NCWM Agenda <input type="checkbox"/> Information Item on the NCWM Agenda <input type="checkbox"/> Withdraw the Item from the NCWM Agenda ( <i>In the case of new items, do not forward to NCWM</i> ) <input checked="" type="checkbox"/> Developing Item on the NCWM Agenda ( <i>To be developed by source</i> )
<b>Reasons for the committee recommendation:</b>
<b>COMPLETE SECTION BELOW FOLLOWING VOTING SESSION</b>
<b>Final updated or revised proposal from the region: (If different than regional committee recommendation)</b>
<b>Regional recommendation to NCWM for item status:</b> <input type="checkbox"/> Voting Item on the NCWM Agenda <input type="checkbox"/> Information Item on the NCWM Agenda <input type="checkbox"/> Withdraw the Item from the NCWM Agenda ( <i>In the case of new items, do not forward to NCWM</i> ) <input checked="" type="checkbox"/> Developing Item on the NCWM Agenda ( <i>To be developed by source</i> ) <input type="checkbox"/> Unable to consider at this time ( <i>Provide explanation in the "Additional Comments" section below</i> )
<b>Regional Report to NCWM:</b>
This item is grouped with item 332-2. NEWMA recommends these items remain developing.

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

## 354 TAXIMETERS

### 354-1 V S.1.1.1. Recording Elements.

**Source:**

NIST USNWG on Taximeters (2015)

**Purpose:**

Ensure that customers can receive a printed receipt detailing charges for taximeters put in service after a specified date.

**Item Under Consideration:**

Amend NIST Handbook 44 Taximeter Code as follows:

S.1.1. General. – A taximeter shall be equipped with a primary indicating element ~~and may be equipped with a recording element.~~  
(Amended 1988 and 20XX)

*S.1.1.1. Recording Elements. – A receipt providing information as required in S.1.9. Recorded Representations shall be available from a taximeter or taximeter system through an integral or separate recording element for all transactions conducted.*

*[Nonretroactive January 1, 2016]*

*(Added 201X)*

**Background / Discussion:**

Transactions involving for-hire vehicles may include multiple charges and as a result be somewhat complex. Total charges resulting from taxi services in some jurisdictions can include the fare based on time and distance traveled) as well as extras and other additional charges. Those extras and additional charges may include charges for additional passengers, transportation of luggage, tolls, surcharges, and taxes. In some locations, passenger(s) are presented with offers for other services unrelated to the taxi service during the trip, such as the purchase of tickets for theater or shows. If purchased, the cost of these services may be included as part of the overall charge in the transaction.

The USNWG on Taximeters has noted that in many instances the interchange between passenger and the taxi driver is brief and that the passenger may not immediately comprehend fully all the details regarding a transaction. With a potential total cost to the passenger comprised of numerous charges, it is considered important that the customer (passenger) be able to receive a record of those charges as evidence of what was paid for. Requiring that a form of receipt (printed or electronic) be made available to the passenger when desired, will help to ensure that the customer is provided a record of expenses paid for, and as necessary documentation in cases where charges may be disputed.

Amending paragraph S.1.1. as shown will remove the existing *optional* provision for a recording element associated with a taximeter and the addition of a new S.1.1.1. will require that a form of receipt is capable of being produced by the taximeter system for all transactions (non-retroactively). Taximeter systems manufactured and placed in service prior to the effective date of the new paragraph S.1.1.1. will still be permitted, and will not be required to include a recording element however, those manufactured and placed into service after the effective date will be required to make a receipt available to the customer. It is intended that the non-retroactive status will provide device manufacturers ample time to comply with the proposed requirement.

Requiring receipts from all taximeters may be considered onerous to taxi owners/operators that operate in areas that have very simple rate structures and where the total charges to the customer would possibly only include a fare based on distance and/or time. This burden will be mitigated however, by the non-retroactive status of the proposed new requirement.

**2015 NCWM Interim Meeting**

During the 2015 NCWM Interim Meeting, the Committee agreed to group together all of the “354” Taximeter Items (i.e., Agenda Items 354-1 through 354-6, inclusive) since it considered these items related and announced that comments on all six items would be taken together during the open hearings.

Mrs. Tina Butcher (OWM) noted that Taximeter Items 354-1 through 354-5, inclusive, were submitted by the USNWG on Taximeters to address the emergence of new technology associated with taximeters by amending some current requirements and developing new requirements where needed. Because they are related, OWM agrees with the Regional Associations that these items could be combined into a single Voting Item. Mrs. Butcher also

summarized the following update concerning Item 354-6, which was provided to the Committee in OWM's analysis of the item:

*Update from the NIST Technical Advisor to the USNWG on Taximeters:*

During the same time period that the USNWG on Taximeters was being formed, reports from regulatory officials in the U.S. were being received that described transportation-for-hire services using cellular telephone software applications ("apps") in conjunction with global positioning satellite (GPS) service to calculate fare charges for their passengers. The USNWG, which had been formed to update HB 44 Taximeters Code in response to advances in taximeter design and operation agreed also to include in the HB 44 update, the use of GPS service as a commercial source of time and distance measurement in conjunction with the use of cellular telephone apps.

Since the use of GPS in a commercial type of application had not been addressed previously there were numerous technical and practical issues to be considered in the development of standards and regulatory policies. This was the motivation for the formation of a subcommittee from within the USNWG that would focus specifically on the use of "smart-phone" apps and GPS. This GPS Subcommittee would be responsible for analyzing the many issues involved with the use of these technologies in a legal metrology context and report their conclusions to the USNWG on Taximeters. The USNWG would then assemble the data from the GPS Subcommittee to develop possible changes to HB 44 that would allow the existing HB 44 Taximeters Code to be applied to GPS-based services or possibly to conclude that the use of GPS in this manner would best be regulated under a separate HB 44 code.

Very shortly after the formation of the GPS Subcommittee, the Chair position of that subcommittee was vacated. The loss of the Chair created a situation where the work of the subcommittee was suspended indefinitely due to the loss of that leadership role. The GPS Subcommittee was dormant for an extended period until NIST OWM was able to fill the Chair position again. This position was filled in September 2014.

On November 20, 2014, the GPS Subcommittee met via web-conference to revive its efforts. Since this meeting included some changes in the subcommittee's membership roster, the focus of the meeting was to establish the scope and the mission of the subcommittee and to provide an orientation for new members. Subsequent meetings are being planned and are expected to be held at regular intervals (every 2-3 months) in the form of web-conferences, teleconference or simply through email exchanges among the members. A report to the USNWG on Taximeters will be made by the GPS Subcommittee following the subcommittee meetings and whenever significant conclusions or revelations are made that will impact the efforts of the USNWG.

Mr. James Cassidy (Cambridge, Ma), a member of the USNWG on Taximeters, stated that he supported the proposals (Items 354-1 through 354-5) moving forward as Voting Items.

Mr. Ross Andersen (NY Retired) expressed concern regarding use of the term "Advancement of Indicating Elements" in Agenda Item 354-2 as it applies to "flat rate" fares. He noted that when a fare is based on a flat rate, there is no advancement of the indicating elements as there is with the measurements associated with time and distance. For this reason, it would be inappropriate to address charges associated with a flat rate fare in paragraph S.1.2., Advancement of Indicating Elements. With regard to Item 354-5, he reported that in the State of NY there are unregulated taxis that are not equipped with ticket printers. These taxis simply charge a "fare" and "extras." A NY ordinance allows for this (i.e. to operate with no ticket printer and charges based on a "fare" with "extras" added)

With respect to Item 354-6, Ms. Kristin Macey (Ca) urged the USNWG to develop a new code to address GPS based systems if it's determined that requirements applicable to these systems can't be inserted into the existing HB 44 Taximeter Code. She also requested the USNWG not prevent these systems from calculating fare on time and distance at the same time. She reported that Ca is currently evaluating software provided by the company, "Lyft."

Mr. Jim Truex (NTEP) noted that there may be an issue concerning the effective date of nonretroactive requirements. The issue has to do with basing the application of nonretroactive requirements on the date of manufacture **or** the date of NTEP certification and may necessitate a change to G-A.6. Nonretroactive Requirements.

With respect to this particular item (354-1), the Committee agreed to assign the effective enforcement date of January 1, 2016 to proposed new paragraph S.1.1.1. Recording Elements and recommend the item for vote at the July NCWM Annual Meeting.

**Regional Association Comments:**

CWMA received comments supporting further development of this item. This item has been developed for two years by the NIST USNWG on Taximeters. Multiple jurisdiction voiced support for this item. CWMA thinks this is sufficiently developed and forwarded the item to NCWM, recommending it as a Voting Item.

During open hearings at the 2014 WWMA Annual Meeting a member of the USNWG on Taxi Meters have been in development for 3 years and is ready to be a Voting Item. Further, he stressed that it is imperative that these changes be adopted to ensure the W&M community stay current with today's environment. No opposition to this item was presented. The WWMA recognizes the amount of work that has been done on this item and forwarded it to NCWM, recommending that it be a Voting Item. Further, the WWMA recommends that 2014 WWMA S&T Committee items 354-1, 354-2, 354-3, 354-4, and 354-5 be combined into one proposal.

SWMA did not hear any comments in opposition to this item. SWMA recommended that items 354-1 through 354-5 be combined into one agenda item since they are all related to taximeters. Comments were heard for all five of these agenda items at the same time. SWMA forwarded this item to NCWM, recommending it as a Voting Item.

NEWMA received comment from a member of the USNWG on Taximeters that the language has been cleaned up in the taxi code as new technology and point-of-sale systems are becoming more prevalent in all the states. As there was no opposition to this item it was recommended that the item move forward to a vote. It was suggested that related items 354-1, 354-2, 354-3, 354-4, and 354-5 be combined into a single item. NEWMA forwarded the item to NCWM recommending it as a Voting Item.

<b>NEWMA Action: Item 354-1</b>	
<b>Summary of comments considered by the regional committee (in writing or during the open hearings):</b>	
Comments were made in support of the 354 group items by work group members. Ross Anderson (NYS retired) expressed concern regarding the need to include a printed receipt as part of the HB44 code. With regard to item 354-2 Mr. Anderson does not believe that flat fares would advance the indicating element. A Taxi Meter Work Group member commented that printed receipts are absolutely needed and should be made available to customers.	
<b>Item as proposed by the regional committee: (If different than agenda item)</b>	
The committee agreed to group together 354-1 through 354-5 Taximeter items since it considered all of these items related.	
<b>Committee recommendation to the region:</b> <input checked="" type="checkbox"/> Voting Item on the NCWM Agenda <input type="checkbox"/> Information Item on the NCWM Agenda <input type="checkbox"/> Withdraw the Item from the NCWM Agenda ( <i>In the case of new items, do not forward to NCWM</i> ) <input type="checkbox"/> Developing Item on the NCWM Agenda ( <i>To be developed by source</i> )	
<b>Reasons for the committee recommendation:</b>	
Following completion of the S&T open hearings, the committee was approached by a NY State official who raised two concerns regarding the proposals to amend the Taximeter Code as follows. <ul style="list-style-type: none"> <li>With respect to agenda item 354-1, the concern noted was that the proposed paragraph would allow printed receipts to be mailed to customers rather than require they be provided to them at time of transaction. An additional related concern was that proposed paragraph S.1.1.1. should be a "User Requirement" instead of a "Specifications" requirement because the intent of the paragraph is that customers be provided a receipt at time of transaction. After questioning a member of the U.S. National Work Group on Taximeters regarding the differences in a taximeter and taximeter system, the NIST Technical Advisor noted that he did not believe mailing a printed receipt to the customer would satisfy what's required by proposed paragraph S.1.1.1. The committee agreed that proposed paragraph S.1.1.1. should appear as a "Specifications" requirement in HB 44 because it addresses the design of equipment (i.e., the proposed</li> </ul>	

<p>paragraph would require a Taximeter or Taximeter System to provide transaction information on a receipt). The Committee noted that if the intent of the Taximeter WG is to require a receipt be provided to customers, the WG should consider proposing a new “User Requirement” to address this concern.</p> <ul style="list-style-type: none"> <li>With regard to agenda item 354-2 the concern noted was that proposed subparagraph S.1.2.(d) is in conflict with the title of paragraph S.1.2. Advancement of Indicating Elements in that flat rate transactions are not based on any advancement of the indicating elements. It was also noted that current Taximeter Code paragraph S.2. requires fares to be based on distance traveled, time elapsed, or a combination of both.</li> </ul> <p>The committee recommended the State of NY work with the U.S National Work Group (WG) on Taximeters, including participating in an upcoming WG teleconference, to try and resolve these, and any other, remaining issue in time that providing changes are deemed appropriate by the WG, they could be completed prior to these two agenda items being called for Vote at the upcoming NCWM Annual Meeting in July 2015.</p>
<b>COMPLETE SECTION BELOW FOLLOWING VOTING SESSION</b>
<b>Final updated or revised proposal from the region: <i>(If different than regional committee recommendation)</i></b>
<p><b>Regional recommendation to NCWM for item status:</b></p> <p><input checked="" type="checkbox"/> Voting Item on the NCWM Agenda</p> <p><input type="checkbox"/> Information Item on the NCWM Agenda</p> <p><input type="checkbox"/> Withdraw the Item from the NCWM Agenda <i>(In the case of new items, do not forward to NCWM)</i></p> <p><input type="checkbox"/> Developing Item on the NCWM Agenda <i>(To be developed by source)</i></p> <p><input type="checkbox"/> Unable to consider at this time <i>(Provide explanation in the “Additional Comments” section below)</i></p>
<b>Regional Report to NCWM:</b>
Items 354-1 through 354-5 were addressed as group items. NEWMA agrees to maintain the voting status of these items.

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

### **354-2     V     S.1.2.   Advancement of Indicating Elements.**

**Source:**

NIST USNWG on Taximeters (2015)

**Purpose:**

Allow for the advancement of fare indication by the input of a flat rate where the local authority permits the use of flat rates and provides clarification that charges displayed on the taximeter other than fare may occur by a manual input or by an automatic means.

**Item Under Consideration:**

Amend NIST Handbook 44 Taximeter Code as follows:

**S.1.2. Advancement of Indicating Elements.** – Except when a taximeter is being cleared, the **fare charges displayed on the** primary indicating and recording elements shall **advance** ~~be susceptible of advancement~~ only by:

- a) the movement of the vehicle;
- b) by the time mechanism;
- c) the movement of the vehicle and by the time mechanism but shall not occur by both of these means operating simultaneously (see also S.4. Interference).; or**
- d) the entry of a monetary amount associated with a flat rate or negotiated rate where permitted.**

**Advancement of the indications for charges, other than fare may occur through manual or automatic means.**

(Amended 1988, **and 201X**)

**Background / Discussion:**

The USNWG on Taximeters has determined that in some jurisdictions, alternative types of fare charges such as flat rate-based fares are permitted by local authorities. These flat rate charges are not dependent on the calculation of distance and/or time via a taximeter but are based instead on established fixed amounts charged for trips between common origins and destinations (e.g., airports, hotels, and business districts). The intent of this proposed amendment is to allow for the advancement of fare indication by the input of a flat rate where the local authority permits the use of flat rates. Where the use of flat rates (and negotiated flat rates) is permitted, a display of the flat rate on the taximeter provides the passenger with verification of the charge applied to the service.

In addition, while this type of rate is not based on calculations by the taximeter, in some cases, taxi companies will track transactions and revenue by way of the data processed through the taximeter. These companies will therefore want all transactions to be processed through the taximeter as a means to account for all activity of the taxi.

The existing S.1.2. requirement only allows the primary indications of a taximeter to be advanced through the motion of the vehicle or by the time mechanism and does not allow for the advancement of the indication of fare to be advanced by the input of a flat rate amount. This proposed amendment clarifies that the requirement only specifies the means of advancement for the indication of *fare* charges and *not* extras charges or other displayed indications. Because other types of charges that will be displayed on the taximeter (i.e., extras and additional charges) can be either entered manually into the taximeter or may be automatically entered, the proposed amendment also provides clarification that charges displayed on the taximeter other than fare may occur by a manual input or by an automatic means.

The reformatting of the existing paragraph through the use of bullets (a-d) is believed to improve the structure and the clarity of the requirement.

**2015 NCWM Interim Meeting**

During the 2015 NCWM Interim Meeting, the Committee agreed to group together all of the “354” Taximeter Items (i.e., Agenda Items 354-1 through 354-6, inclusive) since it considered these items related and announced that comments on all six items would be taken together during the open hearings. See Agenda Item 354-1 for a summary of comments received during the open hearings relating to these items.

With respect to this particular item (354-2), the Committee agreed to replace the language in the original proposal (shown in the box below), with that recommended by the SWMA, shown in “Item Under Consideration,” and recommend the item for vote at the July NCWM Annual Meeting.

*Original Proposal:*

**S.1.2. Advancement of Indicating Elements.** – Except when a taximeter is being cleared, the **fare charges displayed on the** primary indicating and recording elements shall be susceptible of advancement only by:

- a). the movement of the vehicle;
- b). by the time mechanism;
- c). **a combination of both a) and b\*); or**
- d). **the entry of a monetary amount associated with a flat rate or negotiated rate where permitted.**

**Advancement of the indications for charges, other than fare may occur through manual or automatic means.**

**\* The advancement of fare may occur by either the movement of the vehicle or by the time mechanism but shall not occur by both of these means operating simultaneously (see also S.4. Interference).**

(Amended 1988, **and 201X**)



**Regional Association Comments:**

CWMA received comments supporting further development of this item. This item has been developed for two years by the NIST USNWG on Taximeters. Multiple jurisdiction voiced support for this item. CWMA thinks this is sufficiently developed and forwarded the item to NCWM, recommending it as a Voting Item.

During open hearings at the 2014 WWMA Annual Meeting a member of the USNWG on Taxi Meters have been in development for 3 years and is ready to be a Voting Item. Further, he stressed that it is imperative that these changes be adopted to ensure the W&M community stay current with today's environment. No opposition to this item was presented. The WWMA recognizes the amount of work that has been done on this item and forwarded it to NCWM, recommending that it be a Voting Item. Further, the WWMA recommends that 2014 WWMA S&T Committee items 354-1, 354-2, 354-3, 354-4, and 354-5 be combined into one proposal.

SWMA did not hear any comments in opposition to this item and made recommendations based on confusion during review of the item. The Committee recommended that items 354-1 through 354-5 be combined into one agenda item since they are all related to taximeters. Comments were heard for all five of these agenda items at the same time. SWMA forwarded this item to NCWM, recommending it as a Voting Item with the changes shown below:

**S.1.2. Advancement of Indicating Elements.** – Except when a taximeter is being cleared, the fare charges displayed on the primary indicating and recording elements shall ~~advance be susceptible of advancement~~ only by:

- a) the movement of the vehicle;
- b) by the time mechanism;
- c) the movement of the vehicle and by the time mechanism but shall not occur by both of these means operating simultaneously (see also S.4. Interference).; or**
- d) the entry of a monetary amount associated with a flat rate or negotiated rate where permitted.**

**Advancement of the indications for charges, other than fare may occur through manual or automatic means.**

(Amended 1988, **and 201X**)

NEWMA received comment from a member of the USNWG on Taximeters that the language has been cleaned up in the taxi code as new technology and point-of-sale systems are becoming more prevalent in all the states. As there was no opposition to this item it was recommended that the item move forward to a vote. It was suggested that related items 354-1, 354-2, 354-3, 354-4, and 354-5 be combined into a single item. NEWMA forwarded the item to NCWM recommending it as a Voting Item.

<b>NEWMA Action: Item 354-2</b>
<b>Summary of comments considered by the regional committee (in writing or during the open hearings):</b>
354-1 through 354-5 were grouped together during testimony at open hearings. *See 354-1 for comments pertaining to these items.
<b>Item as proposed by the regional committee: (If different than agenda item)</b>
<b>Committee recommendation to the region:</b>
<input checked="" type="checkbox"/> Voting Item on the NCWM Agenda <input type="checkbox"/> Information Item on the NCWM Agenda <input type="checkbox"/> Withdraw the Item from the NCWM Agenda ( <i>In the case of new items, do not forward to NCWM</i> ) <input type="checkbox"/> Developing Item on the NCWM Agenda ( <i>To be developed by source</i> )
<b>Reasons for the committee recommendation:</b>
<b>COMPLETE SECTION BELOW FOLLOWING VOTING SESSION</b>
<b>Final updated or revised proposal from the region: (If different than regional committee recommendation)</b>

<b>Regional recommendation to NCWM for item status:</b> <input checked="" type="checkbox"/> Voting Item on the NCWM Agenda <input type="checkbox"/> Information Item on the NCWM Agenda <input type="checkbox"/> Withdraw the Item from the NCWM Agenda ( <i>In the case of new items, do not forward to NCWM</i> ) <input type="checkbox"/> Developing Item on the NCWM Agenda ( <i>To be developed by source</i> ) <input type="checkbox"/> Unable to consider at this time ( <i>Provide explanation in the "Additional Comments" section below</i> )
<b>Regional Report to NCWM:</b> Items 354-1 through 354-5 were addressed as group items. NEWMA agrees to maintain the voting status of these items.

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

### 354-3 V S.1.3.3. Passenger Indications.

**Source:**

NIST USNWG on Taximeters (2015)

**Purpose:**

Require that: when a supplementary customer display is present in a taxi, the accruing total charge shall be evident to the passenger; and that an itemized listing of the details for charges incurred is made available to the customer.

**Item Under Consideration:**

Amend NIST Handbook 44 Taximeters Code as follows:

**S.1.3.3. Passenger's Indications. – A supplementary indicating element installed in a taxi to provide information regarding the taxi service to the passenger, shall clearly display the current total of all charges incurred for the transaction. The accruing total of all charges must remain clearly visible on the passenger's display (unless disabled by the passenger) at all times during the transaction.**

**S.1.3.3.1. Additional information – Additional information shall be displayed or made available through a passenger's indicating element (as described in S.1.3.3. Passenger's Indications) and shall be current and reflect any charges that have accrued. This additional information shall include:**

**(a) an itemized account of all charges incurred including fare, extras, and other additional charges; and**

**(b) the rate(s) in use at which any fare is calculated.**

**Any additional information made available must not obscure the accruing total of charges for the taxi service. This additional information may be made accessible through clearly identified operational controls (e.g., key pad, button, menu, touch-screen).**

**S.1.3.3.2. Fare and extras charges – The indication of fare and extras charges on a passenger's indicating element shall agree with similar indications displayed on all other indicating elements in the system.**

**[Nonretroactive as of January 1, 2016]**

**(Added 201X)**

**Background / Discussion:**

The USNWG on Taximeters recognizes that supplementary indicating elements that are installed in the passenger's area in a taximeter are becoming more prevalent. At this time there are no specific requirements that address this type of device (sometimes referred to as passenger information monitors or PIMs) although they are being installed in taximeter systems in increasing numbers. Because these devices are commonly used to provide the passenger with details and information pertaining to the taxi service, the USNWG agreed that there must be appropriate requirements in NIST Handbook 44 that address the manner in which this information is presented.

The addition of the proposed new requirements S.1.3.3., S.1.3.3.1., and S.1.3.3.2. in the Taximeters Code provides specification requirements for this type of indicating element. These new paragraphs provide manufacturers with design criteria for new devices and provide regulatory authorities with requirements to ensure that the passenger is supplied with sufficient information necessary to verify the cost of the transportation service provided.

The USNWG on Taximeters considered the most important single data item for the passenger is the accruing total of all charges during the trip. In this proposal, this information is required to be clearly visible on the passenger's display at all times during the trip. Itemized details of individual charges and other information of importance must be made available to the passenger via these passenger's indicating elements. In consideration of the limited size of the typical display area on this type of device, information other than the accruing total of charges need not be displayed constantly but must be available to the customer by clearly marked means through the operational controls on the device.

Because the primary indicating element in a system (the taximeter) will display the fare and extras indications, any supplemental device that also displays these indications must be in agreement with the taximeter. To address this, the proposed new S.1.3.3.2. would require that the display of fare and extras charges is in agreement with those same indications as displayed on other indicating elements in the system.

**2015 NCWM Interim Meeting**

During the 2015 NCWM Interim Meeting, the Committee agreed to group together all of the "354" Taximeter Items (i.e., Agenda Items 354-1 through 354-6, inclusive) since it considered these items related and announced that comments on all six items would be taken together during the open hearings. See Agenda Item 354-1 for a summary of comments received during the open hearings relating to these items.

With respect to this particular item (354-3), the Committee agreed to assign the effective enforcement date of January 1, 2016 to proposed new paragraph S.1.3.3. Passenger's Indications and recommend the item for vote at the July NCWM Annual Meeting.

**Regional Association Comments:**

CWMA received comments supporting further development of this item. This item has been developed for two years by the NIST USNWG on Taximeters. Multiple jurisdiction voiced support for this item. CWMA thinks this is sufficiently developed and forwarded the item to NCWM, recommending it as a Voting Item.

During open hearings at the 2014 WWMA Annual Meeting a member of the USNWG on Taxi Meters have been in development for 3 years and is ready to be a Voting Item. Further, he stressed that it is imperative that these changes be adopted to ensure the W&M community stay current with today's environment. No opposition to this item was presented. The WWMA recognizes the amount of work that has been done on this item and forwarded it to NCWM, recommending that it be a Voting Item. Further, the WWMA recommends that 2014 WWMA S&T Committee items 354-1, 354-2, 354-3, 354-4, and 354-5 be combined into one proposal.

SWMA did not hear any comments in opposition to this item. SWMA recommended that items 354-1 through 354-5 be combined into one agenda item since they are all related to taximeters. Comments were heard for all five of these agenda items at the same time. SWMA forwarded this item to NCWM and recommended it as a Voting Item.

NEWMA received comment from a member of the USNWG on Taximeters that the language has been cleaned up in the taxi code as new technology and point-of-sale systems are becoming more prevalent in all the states. As there was no opposition to this item it was recommended that the item move forward to a vote. It was suggested that related items 354-1, 354-2, 354-3, 354-4, and 354-5 be combined into a single item. NEWMA forwarded the item to NCWM recommending it as a Voting Item.

<b>NEWMA Action: Item 354-3</b>
<b>Summary of comments considered by the regional committee (in writing or during the open hearings):</b>
354-1 through 354-5 were grouped together during testimony at open hearings. *See 354-1 for comments pertaining to these items.
<b>Item as proposed by the regional committee: (If different than agenda item)</b>
<b>Committee recommendation to the region:</b>
<input checked="" type="checkbox"/> Voting Item on the NCWM Agenda <input type="checkbox"/> Information Item on the NCWM Agenda <input type="checkbox"/> Withdraw the Item from the NCWM Agenda ( <i>In the case of new items, do not forward to NCWM</i> ) <input type="checkbox"/> Developing Item on the NCWM Agenda ( <i>To be developed by source</i> )
<b>Reasons for the committee recommendation:</b>
<b>COMPLETE SECTION BELOW FOLLOWING VOTING SESSION</b>
<b>Final updated or revised proposal from the region: (If different than regional committee recommendation)</b>
<b>Regional recommendation to NCWM for item status:</b>
<input checked="" type="checkbox"/> Voting Item on the NCWM Agenda <input type="checkbox"/> Information Item on the NCWM Agenda <input type="checkbox"/> Withdraw the Item from the NCWM Agenda ( <i>In the case of new items, do not forward to NCWM</i> ) <input type="checkbox"/> Developing Item on the NCWM Agenda ( <i>To be developed by source</i> ) <input type="checkbox"/> Unable to consider at this time ( <i>Provide explanation in the "Additional Comments" section below</i> )
<b>Regional Report to NCWM:</b>
Items 354-1 through 354-5 were addressed as group items. NEWMA agrees to maintain the voting status of these items.

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

#### **354-4     V     S.1.8.   Protection of Indications.**

**Source:**

NIST USNWG on Taximeters (2015)

**Purpose:**

Update specifications to reflect present day technology.

**Item Under Consideration:**

Amend NIST Handbook 44 Taximeters Code as follows:

**S.1.8.   Protection of Indications.** – All indications of fare and extras shall be ~~displayed through and entirely protected by glass or other suitable transparent material securely attached to the housing of the taximeter~~ protected from unauthorized alteration or manipulation.  
**(Amended 20XX)**

**Background / Discussion:**

This requirement was drafted when taximeters consisted of mechanical-type meters whose displays were much more susceptible to manipulation and are rarely (if ever) found to be still in service. The proposed amendment of S.1.8. serves to update this requirement with respect to current technology. Paragraph S.1.8. requires that taximeter indications should be protected from manipulation (accomplished relatively easily on mechanical-type indications) through physical means. Electronic/digital type indications are less subject to physical manipulation although; those indications could potentially be manipulated through electronic means.

**2015 NCWM Interim Meeting**

During the 2015 NCWM Interim Meeting, the Committee agreed to group together all of the “354” Taximeter Items (i.e., Agenda Items 354-1 through 354-6, inclusive) since it considered these items related and announced that comments on all six items would be taken together during the open hearings. See Agenda Item 354-1 for a summary of comments received during the open hearings relating to these items.

With respect to this particular item (354-4) the Committee agreed to recommend the item for vote at the July NCWM Annual Meeting.

**Regional Association Comments:**

CWMA received comments supporting further development of this item. This item has been developed for two years by the NIST USNWG on Taximeters. Multiple jurisdiction voiced support for this item. CWMA thinks this is sufficiently developed and forwarded the item to NCWM, recommending it as a Voting Item.

During open hearings at the 2014 WWMA Annual Meeting a member of the USNWG on Taxi Meters have been in development for 3 years and is ready to be a Voting Item. Further, he stressed that it is imperative that these changes be adopted to ensure the W&M community stay current with today’s environment. No opposition to this item was presented. The WWMA recognizes the amount of work that has been done on this item and forwarded it to NCWM, recommending that it be a Voting Item. Further, the WWMA recommends that 2014 WWMA S&T Committee items 354-1, 354-2, 354-3, 354-4, and 354-5 be combined into one proposal.

SWMA did not hear any comments in opposition to this item. SWMA recommended that items 354-1 through 354-5 be combined into one agenda item since they are all related to taximeters. Comments were heard for all five of these agenda items at the same time. SWMA forwarded this item to NCWM and recommended it as a Voting Item.

NEWMA received comment from a member of the USNWG on Taximeters that the language has been cleaned up in the taxi code as new technology and point-of-sale systems are becoming more prevalent in all the states. As there was no opposition to this item it was recommended that the item move forward to a vote. It was suggested that related items 354-1, 354-2, 354-3, 354-4, and 354-5 be combined into a single item. NEWMA forwarded the item to NCWM recommending it as a Voting Item.

<b>NEWMA Action: Item 354-4</b>
<b>Summary of comments considered by the regional committee (in writing or during the open hearings):</b>
354-1 through 354-5 were grouped together during testimony at open hearings. *See 354-1 for comments pertaining to these items.
<b>Item as proposed by the regional committee: (If different than agenda item)</b>
<b>Committee recommendation to the region:</b>
<input checked="" type="checkbox"/> Voting Item on the NCWM Agenda <input type="checkbox"/> Information Item on the NCWM Agenda <input type="checkbox"/> Withdraw the Item from the NCWM Agenda ( <i>In the case of new items, do not forward to NCWM</i> ) <input type="checkbox"/> Developing Item on the NCWM Agenda ( <i>To be developed by source</i> )
<b>Reasons for the committee recommendation:</b>

COMPLETE SECTION BELOW FOLLOWING VOTING SESSION
<b>Final updated or revised proposal from the region:</b> <i>(If different than regional committee recommendation)</i>
<b>Regional recommendation to NCWM for item status:</b> <input checked="" type="checkbox"/> Voting Item on the NCWM Agenda <input type="checkbox"/> Information Item on the NCWM Agenda <input type="checkbox"/> Withdraw the Item from the NCWM Agenda <i>(In the case of new items, do not forward to NCWM)</i> <input type="checkbox"/> Developing Item on the NCWM Agenda <i>(To be developed by source)</i> <input type="checkbox"/> Unable to consider at this time <i>(Provide explanation in the "Additional Comments" section below)</i>
<b>Regional Report to NCWM:</b> Items 354-1 through 354-5 were addressed as group items. NEWMA agrees to maintain the voting status of these items.

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

### 354-5 V S.1.9. Recorded Representation.

**Source:**

NIST USNWG on Taximeters (2015)

**Purpose:**

Ensure that taximeter systems can generate receipts with the clear detail of the various charges.

**Item Under Consideration:**

Amend NIST Handbook 44 Taximeter Code as follows:

***S.1.9. Recorded Representation.*** – A printed receipt issued from a taximeter, whether through an integral or separate recording element, shall include as a minimum, the following information when processed through the taximeter system:

- (a) date;
- (b) unique vehicle identification number, such as the medallion number, taxi number, vehicle identification number (VIN), ~~or~~ permit number, or other identifying information as specified by the statutory authority.\*
- (c) start and end time of trip;\*
- (d) distance traveled, maximum increment of 0.1 kilometer (0.1 mile);\*
- (e) fare in \$;
- (f) ~~for multi-rate taximeters~~, each rate at which fare was computed and the associated fare at that rate;\*
- (g) additional charges in \$ where permitted such as extras any surcharges, ~~telephone use telecommunications charges, tip~~ and taxes shall be identified and itemized; ~~and~~
- (h) total ~~fare charge for service~~ in \$ (~~total charge inclusive of fare, extras, and all additional charges~~);.\*
- (i) trip number, if available; \*\* and
- (j) telephone number (or other contact information) for customer assistance. \*\*

**Note:**

*When processed through the taximeter or taximeter system, any adjustments (in \$) to the total charge for service including discounts, credits, and tips shall also be included on the receipt\*\**

*[Nonretroactive as of January 1, 1989] \*[Nonretroactive as of January 1, 2000] **\*\*[Nonretroactive as of January 1, 2016]***

(Added 1988) (Amended 1999 **and 201X**)

**Background / Discussion:**

Upon reviewing the existing requirement, S.1.9. Recorded Representation, the USNWG on Taximeters agreed that additional information provided on a receipt issued by a taximeter or taximeter system would be a benefit by providing more detail for the passenger to interpret charges for that type of service or to provide assistance to the passenger in the case of any disputed charges involved in a transaction.

The work group also recognized that there may be some details involved in a transaction that may not be processed through the taximeter or taximeter system. An example of this could be when the charge for taxi service is paid by credit card and the passenger elects to give the driver a cash tip afterwards. Another example could be when a credit or discount is accepted but the taximeter is not capable of processing the adjustment to the total charge. To account for this type of alteration of charges, the proposed amendment specifies that information required to be included on the receipt must be information that is capable of being processed through the taximeter or taximeter system.

Other proposed changes include the allowance for the statutory authority to specify other information needed to positively identify a particular vehicle, the deletion of extraneous language (e.g., “for multi-rate taximeters”), and the replacement of obsolete language with more relevant terms (i.e., “telecommunications charges”). Also added to the list of required information was contact information for the passenger to seek customer assistance.

**2015 NCWM Interim Meeting**

During the 2015 NCWM Interim Meeting, the Committee agreed to group together all of the “354” Taximeter Items (i.e., Agenda Items 354-1 through 354-6, inclusive) since it considered these items related and announced that comments on all six items would be taken together during the open hearings. See Agenda Item 354-1 for a summary of comments received during the open hearings relating to these items.

With respect to this particular item (354-5), the Committee agreed to assign the effective enforcement date of January 1, 2016 to those portions of the paragraph identified using two asterisks (\*\*) and recommend the item as shown in “Item Under Consideration” for vote at the July NCWM Annual Meeting.

**Regional Association Comments:**

CWMA received comments supporting further development of this item. This item has been developed for two years by the NIST USNWG on Taximeters. Multiple jurisdiction voiced support for this item. CWMA thinks this is sufficiently developed and forwarded the item to NCWM, recommending it as a Voting Item.

During open hearings at the 2014 WWMA Annual Meeting a member of the USNWG on Taxi Meters have been in development for 3 years and is ready to be a Voting Item. Further, he stressed that it is imperative that these changes be adopted to ensure the W&M community stay current with today’s environment. No opposition to this item was presented. The WWMA recognizes the amount of work that has been done on this item and forwarded it to NCWM, recommending that it be a Voting Item. Further, the WWMA recommends that 2014 WWMA S&T Committee items 354-1, 354-2, 354-3, 354-4, and 354-5 be combined into one proposal.

SWMA did not hear any comments in opposition to this item. SWMA recommended that items 354-1 through 354-5 be combined into one agenda item since they are all related to taximeters. Comments were heard for all five of these agenda items at the same time. SWMA forwarded this item to NCWM and recommended it as a Voting Item.

NEWMA received comment from a member of the USNWG on Taximeters that the language has been cleaned up in the taxi code as new technology and point-of-sale systems are becoming more prevalent in all the states. As there was no opposition to this item it was recommended that the item move forward to a vote. It was suggested that related items 354-1, 354-2, 354-3, 354-4, and 354-5 be combined into a single item. NEWMA forwarded the item to NCWM recommending it as a Voting Item.

<b>NEWMA Action: Item 354-5</b>
<b>Summary of comments considered by the regional committee (in writing or during the open hearings):</b>
354-1 through 354-5 were grouped together during testimony at open hearings. *See 354-1 for comments pertaining to these items.
<b>Item as proposed by the regional committee: (If different than agenda item)</b>
<b>Committee recommendation to the region:</b>
<input checked="" type="checkbox"/> Voting Item on the NCWM Agenda <input type="checkbox"/> Information Item on the NCWM Agenda <input type="checkbox"/> Withdraw the Item from the NCWM Agenda ( <i>In the case of new items, do not forward to NCWM</i> ) <input type="checkbox"/> Developing Item on the NCWM Agenda ( <i>To be developed by source</i> )
<b>Reasons for the committee recommendation:</b>
<b>COMPLETE SECTION BELOW FOLLOWING VOTING SESSION</b>
<b>Final updated or revised proposal from the region: (If different than regional committee recommendation)</b>
<b>Regional recommendation to NCWM for item status:</b>
<input checked="" type="checkbox"/> Voting Item on the NCWM Agenda <input type="checkbox"/> Information Item on the NCWM Agenda <input type="checkbox"/> Withdraw the Item from the NCWM Agenda ( <i>In the case of new items, do not forward to NCWM</i> ) <input type="checkbox"/> Developing Item on the NCWM Agenda ( <i>To be developed by source</i> ) <input type="checkbox"/> Unable to consider at this time ( <i>Provide explanation in the "Additional Comments" section below</i> )
<b>Regional Report to NCWM:</b>
Items 354-1 through 354-5 were addressed as group items. NEWMA agrees to maintain the voting status of these items.

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

### **354-6 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](mailto:john.barton@nist.gov).

The USNWG is considering proposals to modify the sealing requirements in the Taximeters Code to reflect more advanced sealing methods (see 2012 NCWM Final S&T Report); to amend the Taximeters Code to specifically recognize GPS-based time and distance measuring systems; and to amend other sections of the Taximeters Code to reflect current technology and business practices while ensuring accuracy and transparency for customers and a level playing field for transportation service companies.

**Background / Discussion:**

The Committee has received multiple proposals over the past several years related to updating the current NIST Handbook 44 Taximeters Code to reflect current technology as well as a request to establish criteria for GPS-based time and distance measuring systems. In April 2012, NIST OWM established a U.S. National Working Group to work on these issues. The USNWG has met multiple times since it was established. For details of those meetings as well as the current proposals being developed by the USNWG, please contact Mr. Barton as noted in the “Item Under Consideration” above.

At the 2014 NCWM 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 HB44 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 system 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.

At the 2014 NCWM Annual Meeting, the NIST Technical Advisor provided the following progress report of the Work Group:

The latest meetings of the USNWG on Taximeters, occurring in 2014 were held on March 4 and May 20. 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 HB44. 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.

Additional information and background on this item can be found in the Committee’s 2013 and earlier final reports.

**2015 NCWM Interim Meeting**

During the 2015 NCWM Interim Meeting, the Committee agreed to group together all of the “354” Taximeter Items (i.e., Agenda Items 354-1 through 354-6, inclusive) since it considered these items related and announced that

comments on all six items would be taken together during the open hearings. See Agenda Item 354-1 for a summary of comments received during the open hearings relating to these items.

With respect to this particular item (354-6) the Committee agreed to assign it a “Developing” status based on the update provided by the NIST Technical Advisor to the USNWG on Taximeters indicating the item is still being developed.

**Regional Associations Comments:**

During open hearings at the 2014 WWMA Annual Meeting a NIST representative stated that NIST is currently in the process of contracting a chair for the sub-committee. The WWMA recommends that this item remain as a Developing Item to allow more work to be completed in this area.

SWMA expressed support for the work of the USNWG on Taximeters.

CWMA did not receive comments on this item. Based on the lack of comments received, CWMA recommended that the item be a Developing Item.

NEWMA received comments from members of the USNWG that an updated proposal was near completion. NEWMA recommended that this item remain a Developing item.

<b>NEWMA Action: Item 354-6</b>
<b>Summary of comments considered by the regional committee (in writing or during the open hearings):</b>
No comments were made.
<b>Item as proposed by the regional committee: (If different than agenda item)</b>
<b>Committee recommendation to the region:</b>
<input type="checkbox"/> Voting Item on the NCWM Agenda <input type="checkbox"/> Information Item on the NCWM Agenda <input type="checkbox"/> Withdraw the Item from the NCWM Agenda ( <i>In the case of new items, do not forward to NCWM</i> ) <input checked="" type="checkbox"/> Developing Item on the NCWM Agenda ( <i>To be developed by source</i> )
<b>Reasons for the committee recommendation:</b>
Committee supports further development of this item.
<b>COMPLETE SECTION BELOW FOLLOWING VOTING SESSION</b>
<b>Final updated or revised proposal from the region: (If different than regional committee recommendation)</b>
<b>Regional recommendation to NCWM for item status:</b>
<input type="checkbox"/> Voting Item on the NCWM Agenda <input type="checkbox"/> Information Item on the NCWM Agenda <input type="checkbox"/> Withdraw the Item from the NCWM Agenda ( <i>In the case of new items, do not forward to NCWM</i> ) <input checked="" type="checkbox"/> Developing Item on the NCWM Agenda ( <i>To be developed by source</i> ) <input type="checkbox"/> Unable to consider at this time ( <i>Provide explanation in the “Additional Comments” section below</i> )
<b>Regional Report to NCWM:</b>
NEWMA supports further development of this item.

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

## 358 MULTIPLE DIMENSION MEASURING DEVICES

### 358-1 W 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.

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

At the 2014 NCWM 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 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 that there is not yet a specific proposal to consider and that 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 that 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 that 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 the 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 Handbook 44”) that provided additional information and supporting arguments for addressing this issue, along with some recommended changes to NIST Handbook 44. The Committee included these documents as appendices in its 2014 Interim Report. Refer to Appendices F and G of the 2014 S&T Interim Report to view this information.

At the 2014 NCWM Annual Meeting, The NIST Technical Advisor reported he had contacted LoadScan, Ltd and was provided the following update:

“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 stage we request only to retain our ‘developing item’ status.”

### **2015 NCWM Interim Meeting**

At the 2015 NCWM Interim Meeting, no one was present to provide an update on the development of this item. OWM reported that the submitter of the item had not been in contact with OWM for more than a year; nor had any Committee members been contacted. In summarizing OWM’s analysis of the item, Mrs. Tina Butcher (OWM) reported that OWM believes the “LoadScan” equipment measures volume, which is different from a multiple dimensioning measuring device, which measures dimensions to calculate volume. Mr. Darrell Flocken (NTEP) reported that the MDMD Work Group, in considering this item during its November 2014 meeting, considered the device a “profiler” (i.e., it provides a volume measurement by profiling the load) and not a “dimensional measuring device.”

There were a couple of comments heard in support of continuing development of the item. There were also comments expressing concern over the potential cost of making the reference standards that would be needed to test the device and the minimum value of its increment.

The Committee agreed to withdraw the item because it had remained on its agenda for more than a year with no progress being reported on its development by the submitter. In withdrawing the item, members of the Committee agreed that the submitter could always submit a new proposal should he decide to do so for future consideration.

### **Regional Associations Comments:**

SWMA looks forward to further development of the item by the submitter.

CWMA received comments indicating that the submitter will continue developing this item. CWMA supports the continued development of this item.

During open hearings at the 2014 WWMA Annual Meeting a regulator expressed concern over the accuracy of these types of devices in certain weather conditions (fog and rain). Based on background information in the agenda it was noted that the item is still developing. WWMA recommends that this item remain a Developing Item to allow the submitter time to address concerns of the W&M community.

NEWMA believes that further development is necessary to specify the logistics of how test standards would be developed for this type of device. NEWMA recommended that the item remain as a Developing item.

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

## **360 OTHER ITEMS**

### **360-1 W Appendix D – Definitions: batching system.**

#### **Source:**

KSI Conveyors Inc. (2015)

#### **Purpose:**

Eliminate some confusion in the market place and will aid field officials in making appropriate decisions on the classification of devices they encounter.

**Item Under Consideration:**

Amend NIST Handbook 44 Appendix D – Definitions as follows:

**batching system. – One in which raw materials are measured in pre-determined quantities by weight and/or liquid measure. The value of the final product may be determined on the basis of the measurement of some or all of the raw material. The unit of measure for the final product may be different from any of the units of measure for the raw materials.**

**Background / Discussion:**

KSi Conveyors Inc. manufactures and distributes systems for treating agricultural seed in 31 states and 3 providences. The system weighs hybrid seed, applies treatment chemicals and delivers a finished product that is normally sold on the basis of seed count. Because the system utilizes hopper scale(s) that typically make multiple drafts of a predetermined quantity one state tried to categorize the systems as an automatic bulk weighing system under Handbook 44 Section 2.22 Automatic Bulk Weighing Systems. It is our contention that the system is really a batch weighing system and should fall under Section 2.20 Scales. Even though there are numerous NTEP Certificates of Conformance for systems that perform batch weighing functions (including KSi's) there is no definition for a "batching system" in Handbook 44.

There are a variety of systems used in commerce that provide a finished product based on the measurement of raw materials. The raw materials may be weighed or measured directly by the system, such as a ready mixed concrete batching system. Others may have some raw material measure by a device separate from the batch weighing system such as the drugs added to feed produced by a livestock feed batching system. The final unit of measure for the finished product may be in different terms than that used to measure the raw materials. Charges may be based on a formula for the final product and not actually in the measurements of each ingredient in the recipe.

As examples a ready mixed concrete system will weigh the aggregate, sand, and cement. Water added to the mix may be weighed or measured. In some cases other concrete additives, such as hardeners or drying agents are also added. The various amounts of raw materials needed are determined by a "recipe" or the desired end product. Regardless of how the raw materials are measured the final sale of concrete is based on a measurement of Cubic Yards that is transferred from the system into a ready mix truck for delivery. The seed treatment system weighs seed that is fed into a treatment drum where treatment chemicals are applied based on the recipe for the desired end product. The treated seed is then transferred into a conveyance means (truck, wagon, or seed box) for delivery to the farmer. The final transaction is based on the number of seeds delivered.

There are numerous NTEP Certificates of Conformance, including those held by KSi for systems that operate as batch weighing systems. Some examples are attached.

Adding a definition for batch weighing systems will help eliminate some confusion in the market place and will aid field officials in making appropriate decisions on the classification of devices they encounter.

Some states evaluate the weighing systems used in the determination of the final quantity delivered by a batch weighing system even though the final product is delivered in a different unit of measure. Testing the weighing elements provides a reasonable assurance of the accuracy of the final product without having to measure the actual cubic yards in the case of concrete or counting the seeds in the case of the seed treatment systems.

Just as the concrete consumer is only interested in the cubic yards of concrete received the agricultural consumer is actually interested in the count of the seeds received not the weight. Modern equipment plants seeds by population per acre based on count not by weight.

In 1985 the Specifications and Tolerances Committee, in its final report, reminded the Conference that the Automatic Bulk Weighing Systems Code does not apply to batching systems, for which the Scale Code applies.

The USDA affirms that when seed is treated it is no longer considered "grain" and has a separate definition for treated seed.

### **2015 NCWM Interim Meeting**

The Committee agreed to group Agenda Items 320-1, 324-1, 330-1, and 360-1 together since these items are related and announced that comments on all four items would be taken together during the open hearings. The Committee agreed to withdraw these items in consideration of the comments and analysis that were provided. Refer to Agenda Item 320-1 for a summary of the comments provided concerning these four items and the reasons why they were withdrawn.

### **Regional Association Comments:**

CWMA reported that an industry representative suggested this be moved forward as a Voting Item. Regulatory officials agreed that this item has merit but would like to include a definition of a batch scale. It was noted that there is a definition for a batch meter. CWMA forwarded the item to NCWM, recommending it as a Voting Item. The submitter plans to add references to Sections 2.20, 2.22, and 3.30.

SWMA did not hear any comments in opposition to this item and recommended merging items 320-1; 324-1; 330-1; and 360-1 as they are all related. Comments were heard for all four of these agenda items at the same time. SWMA forward the item to NCWM, recommending that it be a Voting Item.

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

## **360-2 D Appendix D – Definitions: calibration parameter and multi-point calibrated device.**

### **Source:**

NCWM Multi-Point Calibration Group (MPCG) (2015)

### **Purpose:**

Update the definitions in Appendix D to reflect advances in device calibration technology.

### **Item Under Consideration:**

Amend NIST Handbook 44 Appendix D – Definitions as follows:

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

**multi-point calibrated device – A device equipped with means to electronically program linearization factors at multiple measurement points.**

### **Background / Discussion:**

Calibration parameter - In 2006, “calibration parameter” was added in sections 3.31, 3.32 3.34, and 3.35; these section now need to be added to the reference string in the definition of “calibration parameter”

Multi-point calibrated device - New technology makes it possible to use linearization factors to optimize accuracy at multiple measurement points on devices such as meters, weighing devices, and other devices. This new technology requires a term so that devices capable of being optimized at multiple measurement points can be distinguished from devices with single point calibration. The term is used in proposals already before the Committee, and if those proposals are adopted, the term should be included in the definitions. Multi-point calibrated devices are increasingly used as commercial scales and meters. Whether or not the current meter proposals are adopted, the Conference will need to have a term to describe these devices.

*2015 NCWM Interim Report:*

Agenda items 330-3, 331-1 and 360-2 were grouped together and comments taken simultaneously as the Committee considered them related. See Agenda Item 330-3 for a summary of the comments heard on all three of these agenda items.

The Committee agreed this item should move forward as a Developing item based on the comments received and the submitter's recommendation that it remain Developing because additional work is needed.

**Regional Association Comments:**

CWMA received a presentation to clarify the purpose of this item. CWMA thinks this is sufficiently developed and forwarded the item to NCWM, recommending it as a Voting Item.

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

SWMA commented that, if adopted, this item would result in extensive additional work required by inspectors; increased downtime for businesses; questionable gain when compared to existing tolerances and result in the approval of devices for each product type. Further, SWMA believes the proposed definition is already addressed in the definition of calibration parameter in Appendix D of Handbook 44. SWMA did not forward this item to NCWM.

NEWMA believes this item has merit but more information is required before any further judgment can be made on it. NEWMA forwarded the item to NCWM and recommended it as an Informational item.

<b>NEWMA Action: Item 360-2</b>
<b>Summary of comments considered by the regional committee (in writing or during the open hearings):</b>
The SMA is opposed to the current proposed definition. They look forward to further changes by the work group.
<b>Item as proposed by the regional committee: (If different than agenda item)</b>
This item is grouped with 330-3 & 331-1.
<b>Committee recommendation to the region:</b>
<input type="checkbox"/> Voting Item on the NCWM Agenda <input type="checkbox"/> Information Item on the NCWM Agenda <input type="checkbox"/> Withdraw the Item from the NCWM Agenda ( <i>In the case of new items, do not forward to NCWM</i> ) <input checked="" type="checkbox"/> Developing Item on the NCWM Agenda ( <i>To be developed by source</i> )
<b>Reasons for the committee recommendation:</b>
The committee recommends this item remain developing as the work group intends to amend language in the proposal.
<b>COMPLETE SECTION BELOW FOLLOWING VOTING SESSION</b>
<b>Final updated or revised proposal from the region: (If different than regional committee recommendation)</b>
<b>Regional recommendation to NCWM for item status:</b>
<input type="checkbox"/> Voting Item on the NCWM Agenda <input type="checkbox"/> Information Item on the NCWM Agenda <input type="checkbox"/> Withdraw the Item from the NCWM Agenda ( <i>In the case of new items, do not forward to NCWM</i> ) <input checked="" type="checkbox"/> Developing Item on the NCWM Agenda ( <i>To be developed by source</i> ) <input type="checkbox"/> Unable to consider at this time ( <i>Provide explanation in the "Additional Comments" section below</i> )

<b>Regional Report to NCWM:</b>
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NEWMA supports this item remain developing as the work group amends language in the proposal.
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Additional letters, presentations and data may have been part of the Committee's consideration. Please refer to <http://www.ncwm.net/meetings/annual/publication-16> to review these documents.

### **360-3 V Appendix D – Definitions. point-of-sale-system.**

**Source:**

NIST USNWG on Taximeters (2015)

**Purpose:**

Clarify the term “point-of-sale system” by providing a more detailed definition in Handbook 44, Appendix D.

**Item Under Consideration:**

Amend NIST Handbook 44 Appendix D – Definitions as follows:

**point-of-sale system.** – An assembly of elements including a weighing or measuring element, an indicating element, and a recording element (and may also be equipped with a “scanner”) used to complete a direct sales transaction. **The system components, when operated together must be capable of the following:**

- 1. determining the weight or measure of a product or service offered;**
  - 2. calculating a charge for the product or service based on the weight or measure and an established price/rate structure;**
  - 3. determining a total cost that includes all associated charges involved with the transaction;**
  - and**
  - 4 providing a sales receipt.**
- (Amended 201X)**

**Background / Discussion:**

Stand-alone type of devices are becoming less prevalent in weighing and measuring applications and are evolving into more sophisticated weighing and measuring *systems*. Many different types of devices are now being connected to other components to create systems that are capable of performing all functions required to conduct a complete transaction.

While this proposed amendment does not remove any of the elements listed as *required* components in the existing definition for a POS, the USNWG on Taximeters agreed that the use of the wording “and may also be equipped with a scanner” in the existing definition is archaic, unnecessary and a specific reference to small capacity weighing systems and therefore, should be removed.

The USNWG on Taximeters could not agree upon the terms of classifying various assortments of components as point-of-sale systems (POS) when they are installed in taxis due to the type of components that comprise those systems when compared to the current definition of POS. The difficulty was largely due to the existing definition's description of a POS as being a collection of specific pieces of hardware rather than placing more emphasis on what functions are performed when the system's components operate as a system.

The current Handbook 44 Taximeters Code provides an option for, but does not require that a taximeter be capable of issuing a printed receipt. Because of this, some taximeter systems (that do not include a recording element) would not meet the existing definition of a POS. A taximeter may however, be connected to a sophisticated indicating element referred to as a passenger information monitor (PIM) located in the passenger's area that can be capable of displaying an itemized account of the transaction and may also provide a means to complete the transaction via integral credit card reader. Even though this arrangement did not include a recording element, it was considered by some of the USNWG to constitute a POS. According to the definition, the taximeter and indicating element with a credit card reader as described above would not be considered to be a POS. This proposal would



clarify that only when a system of interconnected components is capable of performing all of the functions listed in the amended definition, is it appropriate for that system to be defined as a POS.

The work group agreed that a POS should be capable of performing at a minimum, the four basic functions listed in the proposal. Rather than describing the hardware components of a POS, the USNWG's proposed method of defining the POS was considered to be more generic and more readily applied to all types of weighing and measuring systems irrespective of the various components that are included within the system.

### 2015 NCWM Interim Meeting

At the 2015 NCWM Interim Meeting, the Committee heard no comments on this item. The Committee agreed to replace the language in the original proposal (shown in the box below) with that recommended by the SWMA as shown in "Item Under Consideration" and recommend the item for vote at the July 2015 NCWM Annual Meeting.

#### *Original Proposal:*

Amend NIST Handbook 44 Appendix D – Definitions as follows:

**point-of-sale system.** – An assembly of interactive elements including a weighing or measuring element, an indicating element, and a recording element ~~(and may also be equipped with a "scanner")~~ used to complete a direct sales transaction. **The system components, when operated together must be capable of the following:**

- 1. determining the weight or measure of a product or service offered;**
  - 2. calculating a charge for the product or service based on the weight or measure and an established price/rate structure;**
  - 3. determining a total cost that includes all associated charges involved with the transaction;**
  - 4 providing a sales receipt.**
- (Amended 201X)**

#### **Regional Association Comments:**

CWMA did not receive comments on this item. This item has been developed for two years by the NIST USNWG on Taximeters. Multiple jurisdiction voiced support for this item. CWMA thinks this is sufficiently developed and forwarded the item to NCWM, recommending it as a Voting Item.

During open hearings at the 2014 WWMA Annual Meeting a member of the USNWG on Taxi Meters reported that this item has been in development for 3 years and is ready to be a Voting Item. Further, he stressed that it is imperative that these changes be adopted to ensure the W&M community stay current with today's environment. No opposition to this item was presented. The WWMA recognizes the amount of work that has been done on this item and agrees that it is developed. WWMA forwarded the item to NCWM and recommended that it be a Voting Item.

SWMA supports the work of the Taximeter Work Group and did not hear any comments in opposition to this item, but has suggested reversal of the proposed changes in the main paragraph of the definition as amended below. The Committee believes that the changes in this section may have unintended consequences for other sectors. The Committee also added the word 'and' after the third numbered bullet. SWMA forwarded the item to NCWM and recommended it as a Voting Item as amended below:

**point-of-sale system.** – An assembly of elements including a weighing or measuring element, an indicating element, and a recording element (and may also be equipped with a "scanner") used to complete a direct sales transaction. **The system components, when operated together must be capable of the following:**

- 1. determining the weight or measure of a product or service offered;**
- 2. calculating a charge for the product or service based on the weight or measure and an established price/rate structure;**
- 3. determining a total cost that includes all associated charges involved with the transaction;**
- and**
- 4 providing a sales receipt.**

**(Amended 201X)**

NEWMA heard support from industry and regulators. NEWMA forwarded the item to NCW, recommending it as a Voting Item.

<b>NEWMA Action: Item 360-3</b>
<b>Summary of comments considered by the regional committee (in writing or during the open hearings):</b>
SMA supports this item. No other comments were heard.
<b>Item as proposed by the regional committee: (If different than agenda item)</b>
<b>Committee recommendation to the region:</b>
<input checked="" type="checkbox"/> Voting Item on the NCWM Agenda <input type="checkbox"/> Information Item on the NCWM Agenda <input type="checkbox"/> Withdraw the Item from the NCWM Agenda ( <i>In the case of new items, do not forward to NCWM</i> ) <input type="checkbox"/> Developing Item on the NCWM Agenda ( <i>To be developed by source</i> )
<b>Reasons for the committee recommendation:</b>
Hearing no comments in opposition, the committee recommends this item as voting.
<b>COMPLETE SECTION BELOW FOLLOWING VOTING SESSION</b>
<b>Final updated or revised proposal from the region: (If different than regional committee recommendation)</b>
<b>Regional recommendation to NCWM for item status:</b>
<input checked="" type="checkbox"/> Voting Item on the NCWM Agenda <input type="checkbox"/> Information Item on the NCWM Agenda <input type="checkbox"/> Withdraw the Item from the NCWM Agenda ( <i>In the case of new items, do not forward to NCWM</i> ) <input type="checkbox"/> Developing Item on the NCWM Agenda ( <i>To be developed by source</i> ) <input type="checkbox"/> Unable to consider at this time ( <i>Provide explanation in the "Additional Comments" section below</i> )
<b>Regional Report to NCWM:</b>
NEWMA supports this as a voting item.

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

**360-4 D Appendix D – Definitions: Remote Configuration Capability****Source:**

NTEP Grain Analyzer Sector (2013)

**Purpose:**

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

**Item Under Consideration:**

This item is under development. Comments and inquiries may be directed to NIST Office of Weights and Measures.

A proposal to modify the definition for “remote configuration capability” as follows is under consideration:

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

(Added 1993, Amended 20XX)

#### **Background / Discussion:**

Removable digital storage devices can be used in GMMs as either data transfer devices that are not necessary to the operation of the GMM or as data storage devices which are necessary to the operation of the GMM. If removable data storage devices are necessary to the operation of the device, they are not covered by the current definition of remote configuration capability.

A USB flash drive is most likely to be used as a data transfer device. In a typical data transfer application, the USB flash drive is first connected to a computer with access to the GMM manufacturer’s web site to download the latest grain calibrations that are then stored in the USB flash drive. The USB flash drive is removed from the computer and plugged into a USB port on the GMM. The GMM is put into remote configuration mode to copy the new grain calibration data into the GMM’s internal memory. When the GMM has been returned to normal operating (measuring) mode the USB flash drive can be removed from the GMM.

Although a Secure Digital (SD) memory card could also be used as a data transfer device it is more likely to be used as a data storage device. In a typical “data storage device” application, the SD memory card stores the grain calibrations used on the GMM. The SD memory card must be plugged into an SD memory card connector on a GMM circuit card for the GMM to operate in measuring mode. To install new grain calibrations the GMM must be turned “off” or put into a mode in which the SD memory card can be safely removed. The SD memory card can either be replaced with an SD memory card that has been programmed with the new grain calibrations or the original SD memory card can be re-programmed with the new grain calibrations in much the same way as that described in the preceding paragraph to copy new grain calibrations into a USB flash drive. In either case, the SD memory card containing the new calibrations must be installed in the GMM for the GMM to operate in measuring mode. In that regard, the SD memory card (although removable) can be considered a permanent part of the GMM in that the GMM cannot operate without it.

**Note:** In the above example SD memory card could be any removable flash memory card such as the Secure Digital Standard-Capacity, the Secure Digital High-Capacity, the Secure Digital Extended-Capacity, and the Secure Digital Input/Output, which combines input/output functions with data storage. These come in three form factors: the original size, the mini size, and the micro size. A Memory Stick is a removable flash memory card format, launched by Sony in 1998, and is also used in general to describe the whole family of Memory Sticks. In addition to the original Memory Stick, this family includes the Memory Stick PRO, the Memory Stick Duo, the Memory Stick PRO Duo, the Memory Stick Micro, and the Memory Stick PRO-HG.

At its 2011 Grain Analyzer Sector Meeting the Sector agreed by consensus that the following changes to Table S.2.5. of §5.56.(a) of NIST Handbook 44 should be forwarded to the S&T Committee for consideration:

- Add a note to Table S.2.5. to recognize the expanded scope of remote capability.
- Delete “remotely” from the second paragraph of Category 3 requirements that begins, “When accessed remotely ...” to make it clear that the requirements of Category 3 apply whether accessed manually using the keyboard or accessed by remote means.
- Add the modified second paragraph of Category 3 requirements to Categories 3a and 3b to make it clear that these requirements apply to all the subcategories of Category 3.

Because a change to the definition of remote configuration capability will apply to other device types, NIST OWM recommended that the changes to Table S.2.5. approved by the Sector in 2011 be separated into two independent proposals. One proposal would deal with the changes to Category 3 and its subcategories. The second would

recommend a modification of the definition of “remote configuration capability” appearing in Appendix D of NIST Handbook 44 to recognize the expanded scope of remote capability; this proposal would be an alternative to adding a note to the bottom of Table S.2.5. to expand the definition for remote configuration for grain moisture meters (as shown in this proposal).

At its 2012 Meeting, the Grain Analyzer Sector agreed to separate its original proposal into two separate proposals and agreed to forward this proposal to change the definition of “remote configuration capability” to the S&T to Committee for consideration. See also August 2012 NTEP Grain Analyzer Sector Summary, Item 5.

During its open hearings at the 2013 NCWM Interim Meeting, the Committee heard comments from Ms. Juana Williams (NIST OWM). OWM suggested the Committee consider this item as a Developing Item to allow other NTEP sectors to discuss how a change to the definition may affect other device types of similar design and to consider changes, if needed. OWM recognizes that 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, 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, 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 77<sup>th</sup> 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.**

The Committee also heard comments from Mr. Dmitri Karimov (Liquid Controls Corporation, LLC), speaking on behalf of the MMA, who made two points: (1) Flow computers may already have these capabilities, thus, it may be more appropriate to consider adding requirements to the General Code so that the requirements will be uniformly applied to all device types; and (2) the Committee should look ahead and consider other capabilities, such as wireless communication and configuration, that may already have emerged.

The Committee acknowledged the comments indicating that the current definition of “remote configuration capability” was developed at a time when certain technologies, such as blue tooth, SD storage devices, flash drives, and other media didn’t exist. The Committee recognized that it may be difficult to modify the existing definition and associated requirements to be flexible enough to address emerging and future technologies without having a significant (and possibly detrimental impact) on existing devices. Consequently, rather than modifying the current definition, the Committee concluded that a better approach might be to develop an entirely separate set of security requirements that would apply to emerging technologies. The Committee believes that additional work is needed to develop proposed definition(s) and associated requirements and decided to designate the item as Developmental. The Committee requests other sectors review the Grain Sector’s proposed modification to the definition as well as OWM’s suggestions and provide input.

At the 2013 NCWM Annual Meeting open hearings, the Committee heard comments from Ms. Williams who reiterated OWM’s comments from the 2013 Interim Meeting, suggesting that it may be appropriate to develop separate requirements to address new and future technologies which can be remotely configured with removable media. OWM plans to develop draft language and ask for input from the various sectors at their upcoming meetings. Ms. Williams also noted the suggestion made at the 2013 NCWM Interim Meeting by Mr. Karimov speaking on behalf of the MMA, that a provision might be added to the General Code to address this type of equipment. Ms. Julie Quinn (MN) agreed with OWM’s comments and indicated support for possibly including

requirements in the General Code to address newer and emerging technologies. Mr. Karimov, speaking on behalf of MMA, concurred with this suggestion.

At the 2014 NCWM 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.” OWM noted that it is continuing to develop this issue and has approached the various NTEP sectors for additional input regarding the capabilities of new technology with regard to metrologically significant adjustments. During their 2013 meeting, the Weighing Sector asked its members to assist OWM in identifying the various types of removable storage media used in weighing equipment.

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

At the 2014 NCWM Annual Meeting, there were several comments suggesting the proposal remain a “Developing” item. Consequently the Committee agreed to recommend this item remain a “Developing” item.

#### **Grain Analyzer Sector**

In consideration of the feedback received from the other sectors, the NTEP Grain Analyzer Sector recommended this item be withdrawn during its 2014 meeting.

#### **Measuring Sector**

At the 2014 Measuring Sector Meeting, the Sector reiterated its comments from its 2013 meeting and concluded that the definition in NIST Handbook 44 for “remote configuration capability” is adequate as currently written.

#### **2015 NCWM Interim Meeting**

At the 2015 NCWM Interim Meeting S&T open hearings, Mrs. Tina Butcher (OWM) requested that the Committee reassign this item to OWM noting that the issue identified by the Grain Analyzer Sector had not been resolved. Mrs. Butcher noted that a gap still exists concerning the sealing of equipment in which the sealable parameters of that equipment can be changed by use of a removable digital storage device. She stated that members of OWM’s Legal Metrology Devices Program (LMDP) have agreed to take up this issue after the 2015 Interim Meeting in hopes of being able to develop a proposal that addresses the issue and be able to report on its progress at the next NCWM Conference.

Mr. Michael Keilty (Endress + Hauser Flowtec AG USA) stated he too would be willing to work with OWM on a proposal to address this issue.

The SMA commented that it looks forward to further clarification of this item.

The Committee agreed to reassign this item to OWM for additional development based on OWM’s assessment there remains an unresolved issue involving the sealing of equipment using removable digital storage devices.

#### **Regional Associations Comments:**

During open hearing at the 2014 WWMA Annual Meeting and industry representative questioned whether or not this item would affect definitions for other device types. An NCWM representative expressed the opinion that it does affect other devices. The WWMA recommended that this item remain as a Developing Item to allow additional input and consideration.

SWMA believes this item is not necessary and the definition currently in Appendix D of Handbook 44 is adequate. SWMA recommended that this item be Withdrawn.

CWMA did not receive comments on this item and believes it is sufficiently developed. CWMA recommended that the item be a Voting Item.

NEWMA believes the existing definition in Appendix D of Handbook 44 is adequate and recommended that this item be a Withdrawn.

<b>NEWMA Action: Item 360-4</b>
<b>Summary of comments considered by the regional committee (in writing or during the open hearings):</b>
No comments were heard.
<b>Item as proposed by the regional committee: (If different than agenda item)</b>
<b>Committee recommendation to the region:</b>
<input type="checkbox"/> Voting Item on the NCWM Agenda <input type="checkbox"/> Information Item on the NCWM Agenda <input type="checkbox"/> Withdraw the Item from the NCWM Agenda ( <i>In the case of new items, do not forward to NCWM</i> ) <input checked="" type="checkbox"/> Developing Item on the NCWM Agenda ( <i>To be developed by source</i> )
<b>Reasons for the committee recommendation:</b>
Committee recommends this item remain developing. The committee looks forward to further progress by OWM.
<b>COMPLETE SECTION BELOW FOLLOWING VOTING SESSION</b>
<b>Final updated or revised proposal from the region: (If different than regional committee recommendation)</b>
<b>Regional recommendation to NCWM for item status:</b>
<input type="checkbox"/> Voting Item on the NCWM Agenda <input type="checkbox"/> Information Item on the NCWM Agenda <input type="checkbox"/> Withdraw the Item from the NCWM Agenda ( <i>In the case of new items, do not forward to NCWM</i> ) <input checked="" type="checkbox"/> Developing Item on the NCWM Agenda ( <i>To be developed by source</i> ) <input type="checkbox"/> Unable to consider at this time ( <i>Provide explanation in the "Additional Comments" section below</i> )
<b>Regional Report to NCWM:</b>
NEWMA recommends this item as developing as work continues by OWM.

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

### 360-5 V Electric Vehicle Fueling and Submetering

**Source:**

Submitted by California Department of Food and Agriculture Division of Measurement Standards and developed by the USNWG on Electric Vehicle Fueling Systems (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 Committee is asked to consider the following changes to NIST Handbook 44:

Adopt the proposed new code for Electric Vehicle Fueling Systems shown in Appendix H as a tentative code in NIST Handbook 44.

Adopt the proposed modifications to Section 5.55. Timing Devices Code shown in Appendix I.

The USNWG for Electric Vehicle Fueling and Submetering has developed a draft code including proposed specifications, tolerances, and other technical requirements for Electric Vehicle Fueling Systems for addition to NIST Handbook 44. This draft is found in Appendix H. The submitter of this Agenda Item has requested that this draft replace earlier versions of the draft code that appeared in the “Item Under Consideration” and that were circulated for comment (and included in the Committee’s 2014 Annual Report).

The USNWG also developed proposed changes to NIST Handbook 44 Section 5.55. Timing Devices Code as shown in Appendix I. These proposed changes are intended to address timing mechanisms found on some electric vehicle recharging systems that are used to determine charges for services (e.g., parking) in addition to the charges for electrical energy. The submitter has also requested that these proposed changes be included in the Item Under Consideration.

Documents in Appendices H and I were also circulated for consideration by the regional weights and measures associations during their fall 2014 meetings. The submitter requests that this item be upgraded to a Voting Item at the 2015 Interim Meeting.

#### **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 U.S. National Work Group on Measuring Systems for Electric Vehicle Fueling and Submetering (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 to 50 miles along Interstate 5 and other major roadways in the Pacific Northwest. In California alone, there are currently 1,387 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.

At the 2014 NCWM Interim Meeting Ms. Juana Williams (NIST OWM), Technical Advisor to the USNWG EVF&S reported that the USNWG 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 Page. The USNWG will hold several meetings over the next six months and plans to submit a final draft in Fall 2014.

Mrs. 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 Work Group 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 Work Group who noted that a limited number of weights and measures officials are members of the Work Group and encouraged more to participate.

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

At the 2014 NCWM Annual Meeting, Mrs. Butcher, speaking as Chair of the USNWG, reported on the progress of the WG and noted that the WG plans to submit a proposal for regional consideration in the fall with a request that it be designated as a Voting Item at that time. Mr. Ted Bohn (Argonne National Laboratory) reported on the progress of the EVSE subcommittee and displayed a sample of a prototype test unit. The Committee heard comments in support of the item. The Committee looks forward to seeing the proposal from the Work Group and recommends that this item remain a “Developing” item until such time that the draft is submitted.

Following the 2014 Annual Meeting, the USNWG developed a revised draft code for Electric Vehicle Fueling Systems to replace earlier drafts of the proposed code. The USNWG also developed proposed changes to NIST Handbook 44 Section 5.55. Timing Devices Code to address timing mechanisms found on some electric vehicle recharging systems that are used to determine charges for services (e.g., parking) in addition to the charges for electrical energy. The USNWG submitted these proposed changes to the regional weights and measures associations and the NCWM for consideration. The submitter has requested that these documents replace earlier proposals in the Item Under Consideration.

#### **2015 NCWM Interim Meeting**

At its 2015 NCWM Interim Meeting open hearings the Committee heard comments from officials and industry alike that the code for Electric Vehicle Fueling Systems shown in Appendix H was ready for adoption as a tentative code in HB 44. The Committee also heard comments in support of the changes to Handbook 44 Section 5.55 Timing Devices Code proposed by the USNWM on EVFS included in Appendix I. Consequently, the Committee agreed to recommend this item for vote at the July 2015 NCWM Annual Meeting.

#### **Regional Associations Comments:**

During open hearing of the 2014 WWMA Annual Meeting several regulators voiced support of this item and stated that it is fully developed and should be a Voting Item. WWMA agrees with this opinion and appreciates the amount of work completed that has been completed. Due to the size of the revision the tentative code will be posted to the NCWM website as an accompanying document for consideration by the NCWM Specifications and Tolerances Committee along with another document with proposed changes to the Timing Device Code. WWMA recommends this item as a Voting Item. *(See Appendix H for a revised version of the proposed tentative code for Electricity Measuring Devices and Appendix I for the USNWG recommendations to amend Handbook 44, Section 5.55 Timing Devices Code.)*

SWMA: The Committee commends the work of the USNWG EVSE workgroup and recommended incorporation into Handbook 44 as tentative code. SWMA recommended that this item be a Voting Item. *(See Appendix H for a revised version of the proposed tentative code for Electricity Measuring Devices and Appendix I for the USNWG recommendations to amend Handbook 44, Section 5.55 Timing Devices Code.)*

CWMA received comment from a regulatory official who indicated that the Committee continues to develop this item. The CWMA believes this is sufficiently developed and recommended that it be a Voting Item. *(See Appendix H for a revised version of the proposed tentative code for Electricity Measuring Devices and Appendix I for the USNWG recommendations to amend Handbook 44, Section 5.55 Timing Devices Code.)*

NEWMA commended the hard work of the USNWG on this timely item and agreed with members of the USNWG that the tentative code is fully developed. NEWMA recommended that the item be a Voting Item. *(See Appendix H*



for a revised version of the proposed tentative code for Electricity Measuring Devices and Appendix I for the USNWG recommendations to amend Handbook 44, Section 5.55 Timing Devices Code.)

<b>NEWMA Action: Item 360-5</b>
<b>Summary of comments considered by the regional committee (in writing or during the open hearings):</b>
Comments were heard in support of this item as tentative code in HB44.
<b>Item as proposed by the regional committee: (If different than agenda item)</b>
<b>Committee recommendation to the region:</b>
<input checked="" type="checkbox"/> Voting Item on the NCWM Agenda <input type="checkbox"/> Information Item on the NCWM Agenda <input type="checkbox"/> Withdraw the Item from the NCWM Agenda ( <i>In the case of new items, do not forward to NCWM</i> ) <input type="checkbox"/> Developing Item on the NCWM Agenda ( <i>To be developed by source</i> )
<b>Reasons for the committee recommendation:</b>
The committee suggests item be moved to vote. No opposition was heard regarding this item.
<b>COMPLETE SECTION BELOW FOLLOWING VOTING SESSION</b>
<b>Final updated or revised proposal from the region: (If different than regional committee recommendation)</b>
<b>Regional recommendation to NCWM for item status:</b>
<input checked="" type="checkbox"/> Voting Item on the NCWM Agenda <input type="checkbox"/> Information Item on the NCWM Agenda <input type="checkbox"/> Withdraw the Item from the NCWM Agenda ( <i>In the case of new items, do not forward to NCWM</i> ) <input type="checkbox"/> Developing Item on the NCWM Agenda ( <i>To be developed by source</i> ) <input type="checkbox"/> Unable to consider at this time ( <i>Provide explanation in the "Additional Comments" section below</i> )
<b>Regional Report to NCWM:</b>
NEWMA recommends this item be sent to vote.

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

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Ms. Jane Zulkiewicz, Town of Barnstable, MA | Committee Chair  
 Mr. Bradford Bachelder, Maine | Member  
 Mr. Ethan Bogren, Westchester County, New York | Member

#### Specifications and Tolerances Committee



## **Appendix A**

### **Item 310-2: G-UR.4.1. Maintenance of Equipment**

#### **Background Information Provided by Mr. Henry Oppermann, Technical Director Seraphin Test Measure Company, A Division of Pemberton Fabricators, Inc.**

To promote a greater understanding and to raise awareness of variables that can affect the test results of meters in retail motor fuel devices, Mr. Oppermann provided the following excerpts from a draft training manual, "Introduction to Liquid Measuring Devices," prepared for the NIST Office of Weights and Measures. This training material explains various sources of temperature effects on the test results for meters, the magnitude of these potential effects, the critical importance to stabilize the temperatures of the product, meter and standard before conducting a test, and the seasonal effects of temperature on the test results. The magnitude of these potential effects on the test results must be considered when assessing the test results for predominance of errors.

#### **The Effects of Temperature**

The effects on temperature on test results for liquid measuring systems are, by far, the largest effects in the test process. Four ways in which temperature affects test results are:

1. The temperature effect on the capacity of the standard;
2. Temperature changes of the fuel from the meter to the volume standard;
3. The lack of a stable temperature of the product in the dispenser and the test system may mean that the initial test of a meter may not be valid indication of meter accuracy; and
4. Seasonal temperature effects on the meter and the test process.

The last three of these effects are related, but there are unique aspects of each effect and how the effects can or cannot be addressed. Consequently, each effect is discussed separately.

#### **Temperature Effect on the Capacity of the Standard**

Below are correction values for provers of different capacities and temperatures.

### Temperature Corrections for Stainless Steel Standards

5-gal		100-gal		1500-gal	
Temp Range (°F)	Adjust prover reading by (in3)	Temp Range (°F)	Adjust prover reading by (in3)	Temp Range (°F)	Adjust prover reading by (in3)
31.5 to 39.5	-0.75	31.5 to 39.5	-15	24.7 to 30.0	-300
				30.1 to 35.4	-250
39.6 to 47.7	-0.5	39.6 to 47.7	-10	35.5 to 40.9	-200
				41.0 to 46.3	-150
47.8 to 55.9	-0.25	47.8 to 55.9	-5	46.4 to 51.8	-100
				51.9 to 57.2	-50
56.0 to 64.0	0	56.0 to 64.0	0	57.3 to 62.7	0
				62.8 to 68.1	50
64.1 to 72.2	0.25	64.1 to 72.2	5	68.2 to 73.6	100
				73.7 to 79.0	150
72.3 to 80.4	0.5	72.3 to 80.4	10	79.1 to 84.5	200
				84.6 to 89.9	250
80.5 to 88.6	0.75	80.5 to 88.5	15	90.0 to 95.3	300
				95.4 to 100.8	350
88.7 to 96.7	1	88.6 to 96.7	20	100.9 to 104.6	400
96.8 to 104.9	1.5	96.8 to 104.9	25		

### Temperature Change of the Fuel

This section will address the situation when the temperature of the product is **not** stabilized before a test is conducted and show how variations in temperature during a test affects the test results. The apparent seasonal effects on test results will be discussed in the next section. The discussions will focus on RMFD meters when tested with 5-gal standards, because considerable data are available to show how temperature changes in the fuel affect the test results. The effects of temperature changes are more apparent in the test of RMFD meters, because the test draft is relatively small. The temperature effects (due to a lack of temperature stability) observed for 5-gal tests of RMFD meters also apply to tests of larger meters, but the larger test drafts tend to reduce these temperature effects.

The Nebraska and Kansas weights and measures programs conducted nine consecutive tests on one day per week on several dispensers over one-year periods. As a result, tests were performed throughout the year under a wide range of air temperatures. The product temperature changed throughout the year as well. The first six 5-gal tests on each meter were fast-flow tests. The last three tests were slow-flow tests. The Nebraska inspectors took the temperature of the fuel in the prover for the first fast-flow test and for the sixth fast-flow tests. The Kansas inspectors took the temperature of the fuel in the prover for each test draft. The meters were not adjusted during these two studies. There were a couple of instances where meters were adjusted near the end of

the one-year test period, but the data after the meters were adjusted were not included in the analysis.

Below is a simple diagram of the main components of the major service station components that can influence the temperature of the gasoline or diesel fuel when the meter in the dispenser is tested for accuracy.

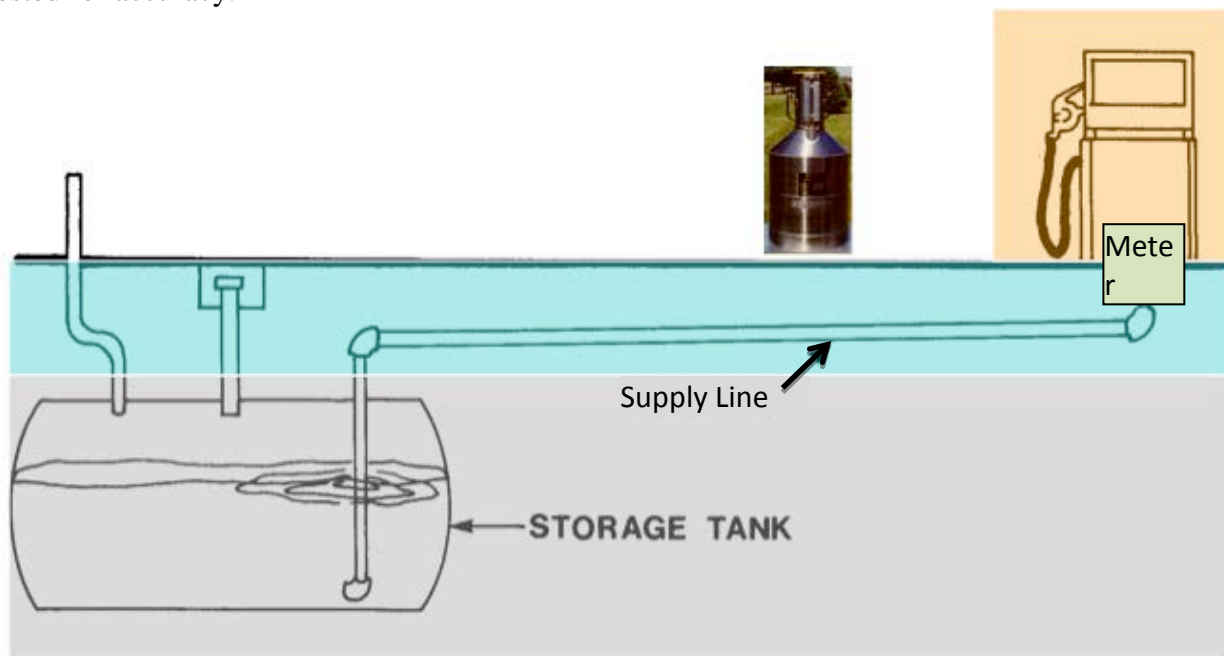


Diagram 6 Modified from the NIST OWM training material for retail motor-fuel devices.

Most service stations have underground storage tanks, but some stations have aboveground storage tanks. There are supply lines that run from the storage tank to each dispenser. The fuel enters the dispenser through the meter, which is usually in the bottom half of the dispenser. The dispenser will have internal piping from the meter, which feeds the fuel to the discharge hose. The fuel is then discharged into the volume standard that is used to test the accuracy of the meter.

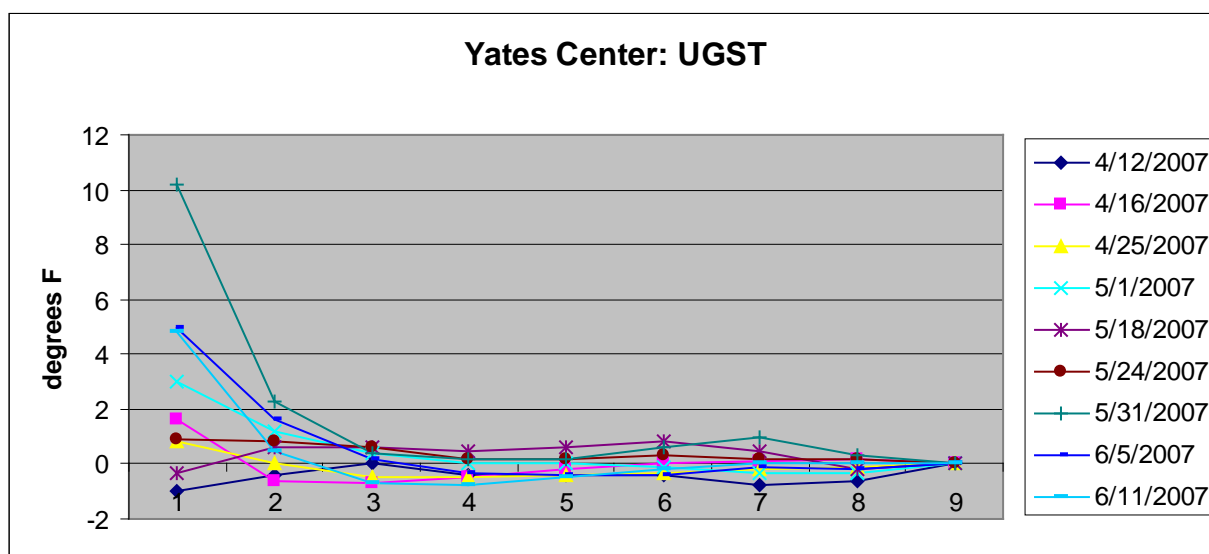
It is critical to understand the following:

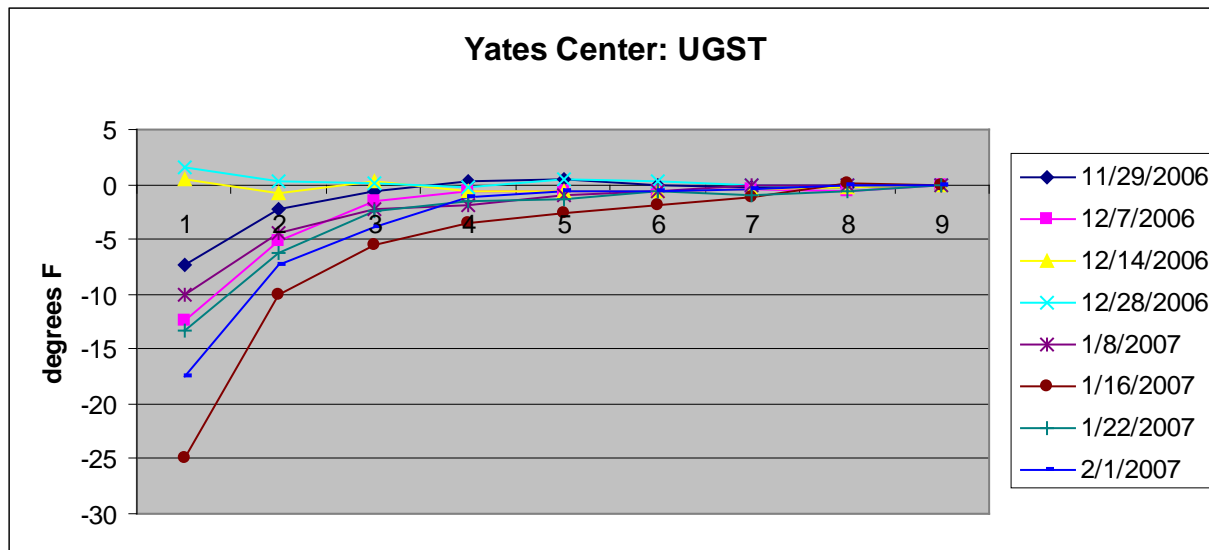
- The temperature of the fuel in the storage tank is usually different from the temperature of the fuel in the supply lines.
- The temperature of the fuel in the supply lines may then be different from the temperature of the fuel that passes through the meter, since the meter is affected by the temperature of the air inside the dispenser shell.
- After the meter measures the fuel, the fuel passes through the internal piping of the dispenser and the discharge hose before the fuel is delivered into the volume standard.
- The temperature of the volume standard may be different from the temperature of the fuel delivered through the discharge hose.
- The temperature of the fuel in the storage tank and the temperature of the air affect the amount of temperature change that the fuel experiences as it passes through all the components of the delivery system.

- Since gasoline and diesel fuel (and LPG) have rather large coefficients of cubical expansion, small changes in temperature of the fuel from the meter to the standard will have significant effects on the volume of the fuel that was measured by the meter and the volume of fuel that is ultimately delivered into and measured in the volume standard.
- The amount of temperature change in the fuel is greatly affected by the air temperature around the dispenser and the volume standard and the air temperature inside the dispenser shell. These effects are most noticeable in very warm and very cold weather, that is, when the difference in the temperature of the air and the product are greatest. Furthermore, the time that the dispenser sits idle between deliveries, especially in very warm or very cold weather, affects the extent to which these temperature differences affect the volume of the fuel as it passes through the dispenser into the volume standard.

A 1 °F change in the temperature of 5 gallons of gasoline changes the volume of the gasoline by 0.8 in<sup>3</sup>. For diesel fuel, a 1 °F change in the temperature causes a change of about 0.55 in<sup>3</sup> in a 5-gal test draft. The temperature changes during a 5-gal test draft and between consecutive 5-gal test drafts for RMFDs can be very large, which causes large variations in test results from one test draft to the next consecutive test draft. It is important to verify test results to ensure that the test results are valid, especially when test results are at or near the tolerance limit or when enforcement action is considered for a predominance of errors. It is critical that actions are taken to ensure that temperature changes are reduced as much as possible to comply with the Handbook 44 test notes. These temperature effects are greatest in very warm and very cold weather when the temperatures of the air and the fuel are very different.

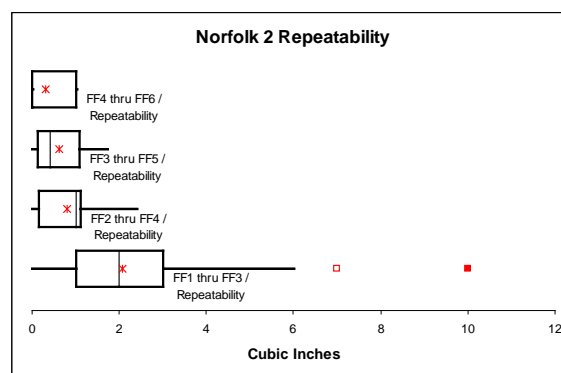
When Kansas Weights and Measures conducted their 52-week survey, the inspectors took the temperatures of the fuel in the 5-gal provers for each consecutive test draft. The charts below show the extent to which the temperatures of the fuel change during the test drafts and between test drafts. The changes in temperature during the initial test drafts of meters can be surprisingly large, especially when tests are conducted in very hot and very cold air. Consequently, these temperature changes cause large variations in the test results.





One can see that the temperature changes are greatest for the first test draft in hot and cold weather (based upon the dates when the tests were conducted). If the dispenser has been sitting idle for some time between deliveries, the hot and cold temperatures can cause changes to the temperatures of the meter, the piping in the dispenser, the discharge hose and the fuel inside these components. If the standard has also been sitting idle and is at a temperature significantly different from the temperature of the fuel used in the test, then the temperature of the fuel will change considerably during a delivery. Furthermore, if the dispenser has been idle for a considerable time in hot or cold weather, it may take several 5-gal deliveries to stabilize the temperature of the fuel, the meter, the dispenser piping, the discharge hose and the volume standard before consistent test results are obtained.

The effect of changing temperatures during three consecutive tests can have a large impact on the repeatability of the meter. The chart at the right shows that the lack of temperature stability for the first test of a meter can have a large impact on the repeatability tests of the first three tests of a RMFD meter. However, if the first test draft is excluded, the repeatability performance is much better for the subsequent sets of three tests.

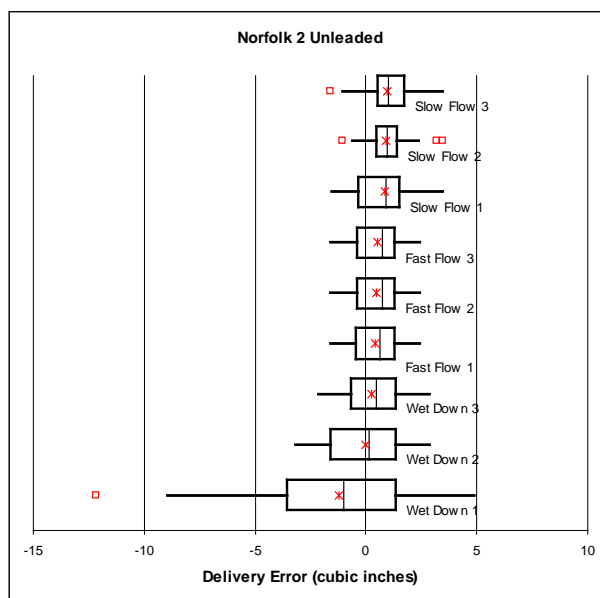


These temperature effects are most observable in 5-gal test drafts used to test RMFD meters, because the sizes of the test drafts are relatively small. When VTMs and loading-rack meters are tested, test drafts must be of volumes equal to at least one minute of the maximum discharge rate of for the meter. Because the sizes of the test drafts are much larger for VTMs and loading-rack meters, the effect of the temperature changes in the first “few” gallons of the test draft are relatively small compared to the total size of the test draft. Consequently, the temperature change on the total volume of the test draft is usually much smaller for large test drafts; however, these relatively small temperature changes can still have a significant effect on the test results. Hence, inspectors must make corrections for any

temperature changes that are observed when the temperature of the fuel can be taken at the meter and when filled prover. Since VTMs usually deliver fuel through a long discharge hose, these temperature differences can be significant. The length of discharge pipe from loading-rack meters to the end of the discharge pipe will vary from installation to installation, so inspectors must be aware of possible changes in the temperature of the fuel temperature from the meter to the prover.

Even if the temperatures of the fuel, the meter, the discharge piping, the discharge hose and the volume standard are stabilized before performing accuracy tests, be aware that when there are significant differences in the temperatures of the fuel and the air during a delivery, the temperature of the fuel can still change as the fuel moves from the meter to the volume standard. If the time periods for and between consecutive tests are consistent, say three consecutive fast-flow tests, the temperatures for the three consecutive tests may be nearly the same. However, it is possible that the temperature of the fuel still changed as it moved from the meter to the volume standard due to the difference in the temperatures of the air and the fuel. Unless an inspector can take the temperature of the liquid at the meter and in the prover, these consistent changes in the temperature of the fuel may not be observable, especially when testing uncompensated meters, since uncompensated meters are not required to have thermometer wells at the meter. It is important that inspectors understand the effects that temperature differences for the air and the fuel can have on test results, especially when there are large differences in the temperature of the air and the fuel.

The box-and-whisker graph is effective to illustrate the variations in the test results of the consecutive tests due to the lack of stabilization of temperature in the tests. The chart at the right shows the results for each of the nine tests conducted on the meter over the course of one year. The width the box and the length of the whiskers indicate the amount of variation in the test results. Obviously, the results of the first test show the greatest variation and the variations are large compared to the maintenance tolerance for the meter. The variations in the test results are much less after the first 5-gal test.



**Recommendation:** It isn't possible to correct for the effects of the lack of temperature stability, so the best course of action is to try to stabilize the temperature of the fuel, the meter, the dispenser piping, the discharge hose and the standard before accuracy tests are conducted. While the best approach is to run a preliminary draft of 5 gal on each meter before conducting an accuracy test, this would significantly increase the time it would take to test RMFD meters at each service station. Hence, the recommendation is that inspectors should repeat any tests that are at or outside (and relatively near the tolerance limit) to verify that the test results are valid and not affected by a lack of temperature stability. Tests should also be repeated when action is considered based on the predominance of errors. The

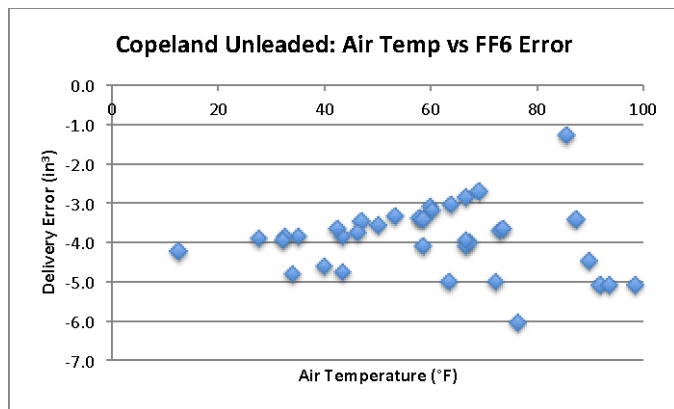
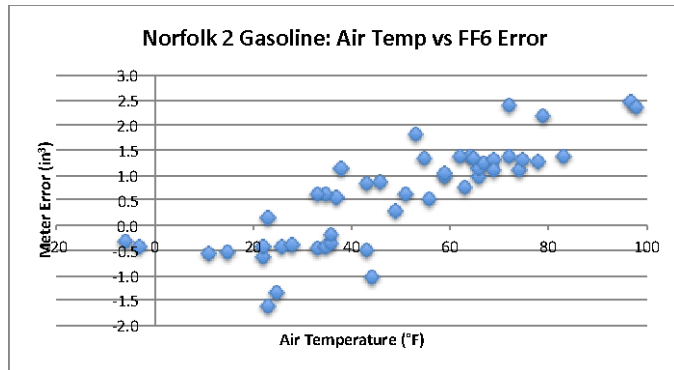


consequences of rejecting meters are much greater than the consequences of passing meters. The inspector should always make the extra effort to ensure that the results of enforcement tests are valid so that meters are not rejected due to the effects of variables that may have influenced the test results.

### Seasonal Temperature Effects

Stabilizing the temperature of the fuel throughout the dispenser and the standard still does not eliminate all of the temperature effects. Differences in test results from summer to winter or, more specifically warmer and colder air temperatures, are still evident. The temperature effect causes the apparent accuracy of the meter to change from summer to winter, even though the meter has not been adjusted.

The chart at the right shows the meter delivery error for the sixth fast-flow test plotted against the air temperature throughout the survey. Although the product temperature was stabilized with five consecutive fast-flow tests before the sixth test, the effect of temperature is still present. The correlation coefficient for the data is 0.82. The difference in delivery errors over the course of the survey has a range of about 4 in<sup>3</sup>. This apparent change in accuracy is probably due (1) in part to the temperature effect on the meter itself and (2) the remainder is due to the temperature effect on the volume of the fuel. **However, not all makes of meters responded the same way as the meter above. (See the chart to the right.) Some meters showed smaller temperature effects, while others showed virtually no temperature effects. There were some meters that actually appeared to deliver less fuel in hot weather than in cold weather.**



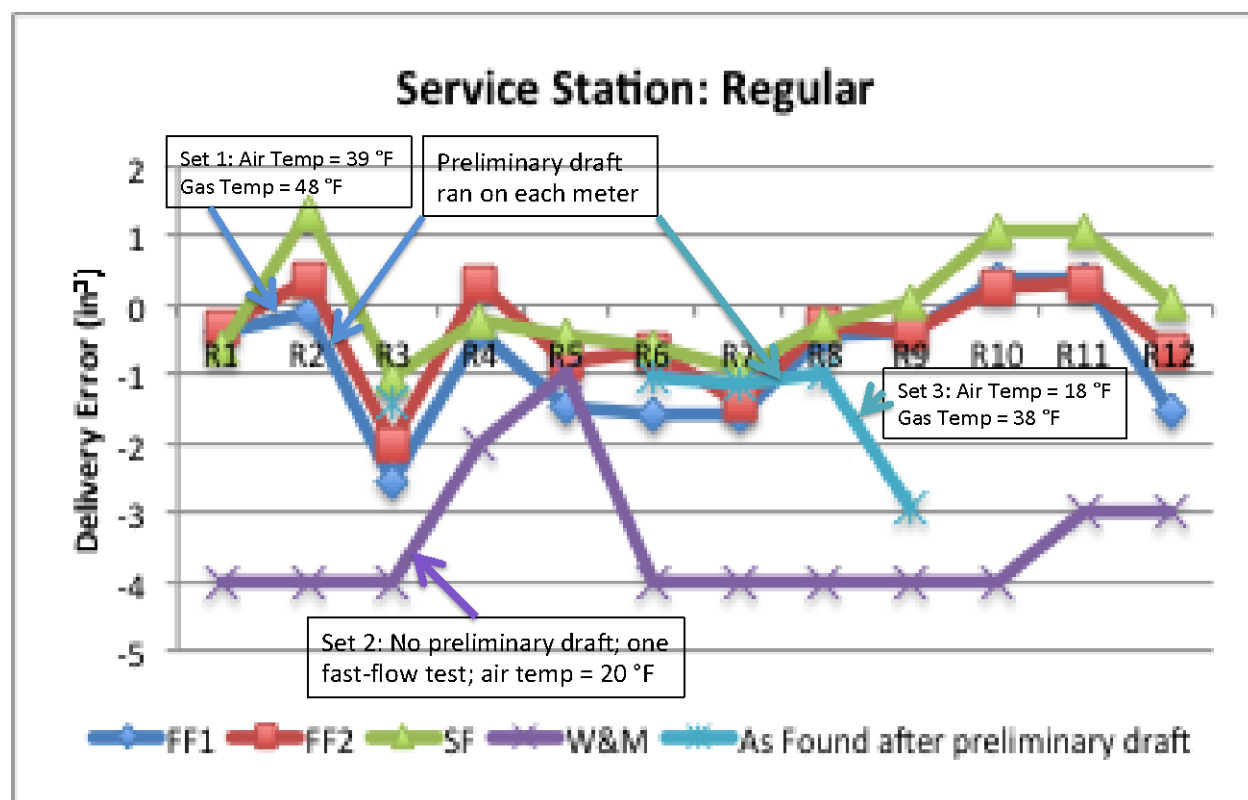
It is important to understand how this remaining temperature effect will affect the test results. If the meter shown in the Norfolk 2 chart above was adjusted to zero error in hot weather, then in cold weather the meter would appear to deliver 3 to 4 in<sup>3</sup> less fuel than in hot weather. Assuming that all of the meters in a single station are of the same model as this one and all of the meters were adjusted to zero error in hot weather, then when tested in cold weather, the test results for all of the meters in the station would appear to under deliver and give the appearance of a predominance of errors in favor of the station. The results of slow-flow tests will be affected to a greater extent than the results of fast-flow tests, because more time is needed to deliver the desired test quantity, so there is more time for the differences in temperature to affect the test results. In this example, these under-delivery errors are not due to a fraudulent action of the part

of the service representative during the adjustment of the meter, but a consequence of the temperature effect on the test results.

If all of the meters were adjusted to zero error in cold weather, then all of the meters would appear to deliver more fuel in warm weather. Weights and measures officials must consider the effects of temperature, especially when considering action for a predominance of errors, since the appearance of the predominance of errors may be due to temperature effects and may not be due to fraudulent adjustment on the part of service representative or the station owner.

### Effect of Temperature on Predominance of Errors

The lack of temperature stability and different temperature conditions can bias the test results for one set of tests versus another. The chart below shows the test results (Set 1) for a service company representative who tested 12 regular gasoline meters in a service station (noted as FF1, FF2 and SF). A couple of months later, a weights and measures inspector conducted one fast-flow test on the meters (Set 2). A few days later, the service company representative retested four of the meters to determine the “as found” condition (Set 3).



The first set of tests run by a service company consisted of a preliminary test draft on each meter, followed by two fast-flow tests and one slow-flow test. The air temperature was 39 °F and the temperature of the gasoline was 48 °F.

Approximately two months later, the local weights and measures inspector conducted one fast-flow test on each meter and concluded that the meters were delivering predominately short

measure. The test results for the weights and measures inspector are shown in the chart above and noted as W&M. No preliminary test drafts were run on the meters. The air temperature was 20 °F. The temperature of the gasoline is not known, but it was probably around 38 °F.

The service company returned a few days after the weights and measures inspector tested the meters and retested four meters to establish the “as found” condition. The air temperature was 18 °F and the temperature of the gasoline was 38 °F. A preliminary draft was run on each meter before a fast-flow test was conducted. The results for three of the four meters were essentially the same as when the service representative tested the meters about two months earlier. One meter delivered about 2.5 in<sup>3</sup> less than two months earlier.

The key aspect of the test results is that the test results for the weights and measures inspector were biased toward under delivery and gave the impression that the meters were delivering short measure gasoline. However, the test results by the weights and measures inspector were affected by temperature and the lack of temperature stability. In fact, the results obtained by the weights and measures inspector were not valid indications of the accuracy of the meters.

These test results are another example that show that the results of the first test of a meter may be invalid when the temperatures of the gasoline, the meter piping inside the dispenser, the dispenser hose and the standard are not stabilized before the meter is tested for accuracy. The results for the service company showed that when a preliminary draft was run on each meter, then the results of the third set of tests were generally consistent with the first set of test results conducted under a different set of test conditions. Since the weights and measures inspector did not stabilize the temperatures of the gasoline, the meter and the standard before running the accuracy tests, the inspector’s test results were biased and gave a false impression that the meters were set predominantly in favor of the seller. This situation illustrates the importance of repeating tests to stabilize temperature and verify test results before rejecting meters for an apparent predominance of errors.



## Appendix B

### Items 320-1, 324-1, 330-1, and 360-1 Comments by Henry Oppermann, Weights and Measures Consulting

#### Topics

<b>POSITION STATEMENT.....</b>	<b>1</b>
<b>DEFINITION OF BATCHING SCALE: ITEM 360-1 .....</b>	<b>1</b>
<b>BATCHING SCALES AND AUTOMATIC BULK WEIGHING SYSTEMS: ITEMS 360-1 AND 320-1 .....</b>	<b>2</b>
<b>SELLING TREATED GRAIN BY THE “SEED UNIT”: ITEM 360-1.....</b>	<b>4</b>
<b>DEFINITION ALLOWS DIFFERENT UNITS OF MEASURE: ITEM 360-1.....</b>	<b>4</b>
<b>NON-AUTOMATIC BATCHING SYSTEMS: ITEM 320-1 .....</b>	<b>4</b>
<b>RETURN TO ZERO TOLERANCE OR SCALE EMPTY TOLERANCE: ITEM 320-1 .....</b>	<b>5</b>
<b>ADDITION TO THE LIQUID MEASURING DEVICES CODE: ITEMS 330-1 AND 360-1 .....</b>	<b>5</b>
<b>ADDITION TO THE AUTOMATIC WEIGHING SYSTEMS CODE: ITEMS 224-1 AND 360-1 .....</b>	<b>5</b>
<b>CONCLUSIONS .....</b>	<b>5</b>
<b>APPENDIX: EXAMPLES OF BATCHING SYSTEMS .....</b>	<b>7</b>

#### Position Statement

This document addresses the four items that are related: 320-1, 324-1, 330-1 and 360-1. The proposals are ill conceived, poorly developed and without merit. The proposed definition in item 360-1 is incorrect, because it does not properly define a batching scale. I encourage the S&T Committee to withdraw these items.

The objective of the proposals is to create a category of scales in the Scales Code for the KSi automatic bulk weighing systems used in the KSi seed treatment process, so that the scales are not classified as automatic bulk weighing systems. Apparently, they want to call the weighing systems “batching scales” so they can circumvent the requirements of the Automatic Bulk Weighing Systems Code, which are needed to ensure accurate weighments.

Furthermore, KSi wants to issue “weigh tickets” in seed units and base the sale of treated seeds in seed units. “Seed units” are not legal units of measurement and should not be used as the basis for commercial transactions.

Even if the NCWM would adopt the proposed definition in 360-1, this will not help KSi, because simply changing what they call their weighing systems does not change how their systems operate. Their scale systems are automatic bulk weighing systems; they are not batching scales.

#### Definition of Batching Scale: Item 360-1

A batching scale weighs two or more materials into a weigh hopper as part of a single weighment, that is, one weighing cycle that starts at zero, goes to a loaded condition by addition two or more materials, and then returns to zero. The proposed definition of a batching scale in item 360-1 has several key points that create problems.

1. The raw material could be a single material. Batching scales weigh two or more materials as part of a batching process.
2. The reference to “predetermined quantities by weight and/or liquid measure” is unclear. What is the purpose of this terminology? Does this mean that every transaction must be by the same predetermined quantity? Can the predetermined quantity vary for each transaction? Are the predetermined quantities based upon specified weights and volumes or may they be set percentages of the weighed product? If this definition is to apply to the KSi systems that automatically weigh multiple drafts of a single commodity in a weigh hopper as part of an automatic bulk weighing system, then how does this definition apply to the last draft of the multiple drafts, which may be a different amount from the previous drafts?
3. The proposed definition addresses a scale that weighs in predetermined quantities, but leaves out the word “automatically.” The KSi scales can weigh some small orders (less than the scale capacity) as single draft and automatically weigh larger orders as multiple drafts. As currently designed, the KSi scales are not required to return to zero before initiating the next weighing cycle. The load and no-load weight values should be recorded, but they are not.
4. The unit of measure for the final product may be different from any of the units of measure for the raw materials. These units are not defined, but they must be legal units of measurement. KSi wants to use “seed units.”

If the S&T Committee believes that a definition of a batching scale is needed, then the definition should be correct and clearly distinguish between batching scales, hopper scales and automatic bulk weighing systems. The following alternate definition of a batching scale is provided for consideration. Clarifying language is included to remove ambiguity regarding different applications for scales and weighing systems.

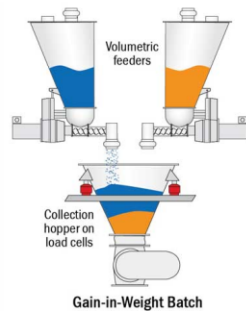
**Batching scale.** – A batching scale is a scale that weighs two or more commodities or materials into a weigh hopper as part of a single weighment. To clarify, a hopper scale or weighing system that weighs a single commodity or material as a single weighment is not a batching scale. Also, a hopper scale or weighing system that automatically weighs a single commodity or material in multiple drafts (either fixed or variable-sized drafts) for a single transaction is not a batching scale, since these scales or systems are automatic bulk weighing systems and must meet the requirements of the Automatic Bulk Weighing Systems Code.

### **Batching Scales and Automatic Bulk Weighing Systems: Items 360-1 and 320-1**

A scale has to weigh two or more materials together or added to the weigh hopper in sequence as part of a weighing process to be a batching scale. Examples are shown below.

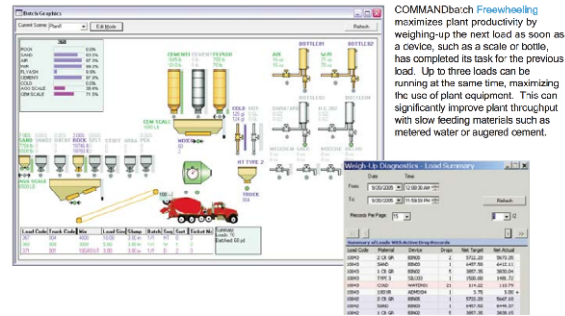
### This is a Batching Scale

<http://www.ktron.com/process-equipment/feeders/technology/gain-in-weight-batching.cfm>



### Command Alkon Batching System

[http://www.commandalkon.com/wp-content/uploads/2014/06/booklet\\_plantaautomation.pdf](http://www.commandalkon.com/wp-content/uploads/2014/06/booklet_plantaautomation.pdf)



The categorization of scales under Handbook 44 are based upon the weighing application, the manner of operation of the scale and, sometimes, upon the commodity that is weighed. Whatever happens to the commodity after it is weighed is immaterial to the categorization of a scale. For example, if an automatic bulk weighing system is used to weigh grain, the application and the categorization of the scale do not depend on if, after weighing, (1) the grain is then transferred into the hold of a ship for export, (2) the grain is ground for use in a food product, or (3) the grain is treated as seed for planting.

Based on the proposed definition in item 360-1, would the automatic bulk weighing systems (scales) used to weigh grains for export and into the hold in a ship now be called batching scales? Do these scales have to meet the requirements of the Automatic Bulk Weighing Systems Code or do they fall under the Scales Code?

There is a difference between batching systems that utilize batching scales and batching systems that utilize hopper scales dedicated to weighing a single material for an individual transaction. A batching scale weighs multiple materials that are delivered into the weigh hopper as part of a single weighmet (i.e., before emptying) based upon a prescribed recipe.

The application section of the Automatic Bulk Weighing Systems Code states the following:

**A.1. General.** – This code applies to automatic bulk weighing systems, that is, **weighing systems adapted to the automatic weighing of a commodity in successive drafts of predetermined amounts automatically recording the no-load and loaded weight values** and accumulating the net weight of each draft. (Emphasis added)

The KSi systems automatically weigh seed grains in successive drafts of predetermined amounts, but they do not record the load and no-load weight values of each draft. For a given customer order, the scales weigh only one seed grain for treatment. They print the accumulated weight of all drafts with the assumption that the scale returned to zero for each draft. Actually, they allow the scale to operate automatically for multiple drafts if the scale returns within the “scale empty tolerance” that can be programmed into the controller. Already, based on the described operation, the scales have several violations of the Automatic Bulk Weighing Systems Code. The “scale empty tolerance” feature also violates a requirement in the Scales Code.

KS i claims that 30 state weights and measures programs classify their system as a hopper scale and one state program calls it an automatic bulk weighing system. The state that classified it as an automatic bulk weighing system has classified the system correctly. The other states should reexamine the operation of these scales in their jurisdictions and, if those scales automatically weigh multiple drafts of grain for some or all of the transactions, then the states should require these systems to meet the requirements of the automatic bulk weighing systems code.

## **Selling Treated Grain by the “Seed Unit”: Item 360-1**

KSi wants to be able to sell **bulk** treated grain in seed units. This is not allowed by the Uniform Weights and Measures Law (UWML) or by the Uniform Regulation for the Method of Sale of Commodities in Handbook 130. The second paragraph in Section 2 of the UWML states, “The definitions of basic units of weight and measure, the tables of weight and measure, and weights and measures equivalents as published by NIST are recognized and shall govern weighing and measuring equipment and transactions in the state.” There isn’t a NIST standard number of seeds per “seed unit” for different grains and never will be.

The Uniform Packaging and Labeling Regulation allows the sale by count of packaged, treated seed for packages with net contents of less than 225 g or 8 oz. The sale by count does not apply to the sale of bulk treated seed.

*Programmable Seed Counts:* Some of the companies using the KSi seed treatment systems sell the treated seed on the basis of seed units. The number of seeds per pound and the number of seeds per unit are programmable through the controller. For transactions based on seed units, the number of seeds per pound and the number of seeds per unit are effectively calibration values and must be sealed. However, the NTEP Certificate says that there are no metrological features in the controller, so it doesn’t have to be sealed. This is a conflict. Either the controllers on the KSi scales installed in the field are not consistent with the “type” that was evaluated by NTEP or the features were not evaluated by NTEP.

*Are they counting scales?* If companies sell treated seed by seed units, are these scales actually counting scales? If they are counting scales, then they should be marked according to Scales Code Table S.6.3.(b) point 13 (below) with the statement, “The counting feature is not legal for trade.” Also, if they are counting scales, then they must meet the requirements for counting scales, utilize proper sampling procedures to determine the seed count per unit of weight, and utilize adequate sample sizes (with appropriate scales) to determine the seed count per unit of weight. The Scales Code recognizes only Class I and Class II scales as counting scales.

13. *A scale designed for a special application rather than general use shall be conspicuously marked with suitable words, visible to the operator and to the customer, restricting its use to that application, e.g., postal scale, prepack scale, weight classifier, etc.\** When a scale is installed with an operational counting feature, the scale shall be marked on both the operator and customer sides with the statement “The counting feature is not legal for trade,” except when a Class I or Class II prescription scale complies with all Handbook 44 requirements applicable to counting features.

Even if you call them counting scales, the scales that automatically weigh multiple drafts to obtain the quantity for the transaction are automatic bulk weighing systems and have to meet the requirements of the Automatic Bulk Weighing Systems Code.

## **Definition Allows Different Units of Measure: Item 360-1**

The proposed definition allows the sale of the product in units of measure different from the units of measure used to weigh the raw material. Suppose that I have one of these systems, can I sell the treated seed by the Gasoline Equivalent Gallon? Tomorrow, can I sell it by the Diesel Equivalent Gallon? What prevents me from doing that? If this definition is adopted, then do I have to use legal units of measurement?

California produces huge amounts of grapes that are used to produce wine. The picked grapes are weighed on platform scales or truck scales. If the NCWM adopts the proposed definition for batching scales, does that mean that the scales used to weigh grapes for wine-making can indicate in bottles of wine? What would prohibit it under this definition? Under the proposed definition, can the scales be considered batching scales, since they are used in one step of the overall wine production process?

## **Non-automatic Batching Systems: Item 320-1**

The proposed definition in item 360-1 is for a batching scale. The proposed change in item 320-1 adds the text “including non-automatic batching systems.” What is a non-automatic batching system? What is the difference



between a non-automatic and an automatic batching system? What is the difference between a batching scale and a batching system? Why is this proposed additional text needed, when there are no changes proposed for the Scales Code? What is the objective of this proposed change?

### **Return to Zero Tolerance or Scale Empty Tolerance: Item 320-1**

The scales have a programmable zero empty tolerance feature that is larger than the return-to-zero requirement in Handbook 44. NTEP CC 14-009 for the automatic bulk weighing system controller does not list this feature on the Certificate. Additionally, the CC states that “There are no metrological functions that require a seal.” Either this feature was not brought to the attention of NTEP at the time of the type evaluation or the manufacturer has changed the design of the controller and added a metrological characteristic to the controller. Either way, this feature should not be allowed on a commercial measuring device.

### **Addition to the Liquid Measuring Devices Code: Items 330-1 and 360-1**

Based on the proposed definition in 360-1 and the proposed addition to the LMD Code item 330-1, if a RMFD has one meter for regular and one for premium gasoline and the midgrade is a blend of the two, does that make the RMFD a batching meter?

If a loading rack meter blends the additives into the gasoline at the time that the tank truck is loaded, does the loading rack meter become a batching meter? What is the difference between a loading rack meter and a loading rack batching meter?

Are there different requirements that must be added to the code to apply to batching meters? If not, then why add a statement in the application section of the code for a batching meter when there aren’t any special requirements for batching meters?

### **Addition to the Automatic Weighing Systems Code: Items 224-1 and 360-1**

As for Item 324-1, which is the addition to the Automatic Weighing Systems Code, the Code applies to completely different types of scales than the KSi automatic bulk weighing systems. If this change is made and an automatic checkweigher is used in a packaging line for packaging macaroni-and-cheese packages, does the checkweigher become a macaroni-and-cheese batching scale? If an automatic checkweigher is used in a cheese packaging line, does it become a cheese-batching scale? What is the basis for proposing the addition to the A.1. paragraph? To which types of scales is this proposed addition intended to apply?

## **Conclusions**

In summary:

- A gain-in-weight batching scale weighs multiple raw materials in the hopper.
- A scale used in a production process is not a batching scale, unless it weighs two or more different materials as a batch.
- Seed treatment is a production process; not a batching process.
- Weighing a single grain for a transaction does not make the scale a batching scale.
- The KSi systems weigh a single grain (seed) for each order, which the industry appears to call a “batch.” Calling the product of the seed treatment process a “batch,” for the purposes of a transaction, does not make the scale a batching scale.
- A scale that automatically weighs multiple drafts of a single grain is an automatic bulk weighing system.

The four items, 320-1, 324-1, 330-1, and 360-1, are ill conceived, poorly developed and without merit. These items should be withdrawn from the S&T Committee agenda.

If a definition of batching scale is needed, then the following definition is offered for consideration.

**Batching scale.** – A batching scale is a scale that weighs two or more commodities or materials into a weigh hopper as part of a single weighment. To clarify, a hopper scale or weighing system that weighs a single commodity or material as a single weighment is not a batching scale. Also, a hopper scale or weighing system that automatically weighs a single commodity or material in multiple drafts (either fixed or variable-sized drafts) for a single transaction is not a batching scale, since these scales or systems are automatic bulk weighing systems and must meet the requirements of the Automatic Bulk Weighing Systems Code.

## Appendix: Examples of Batching Systems

Web Site References:

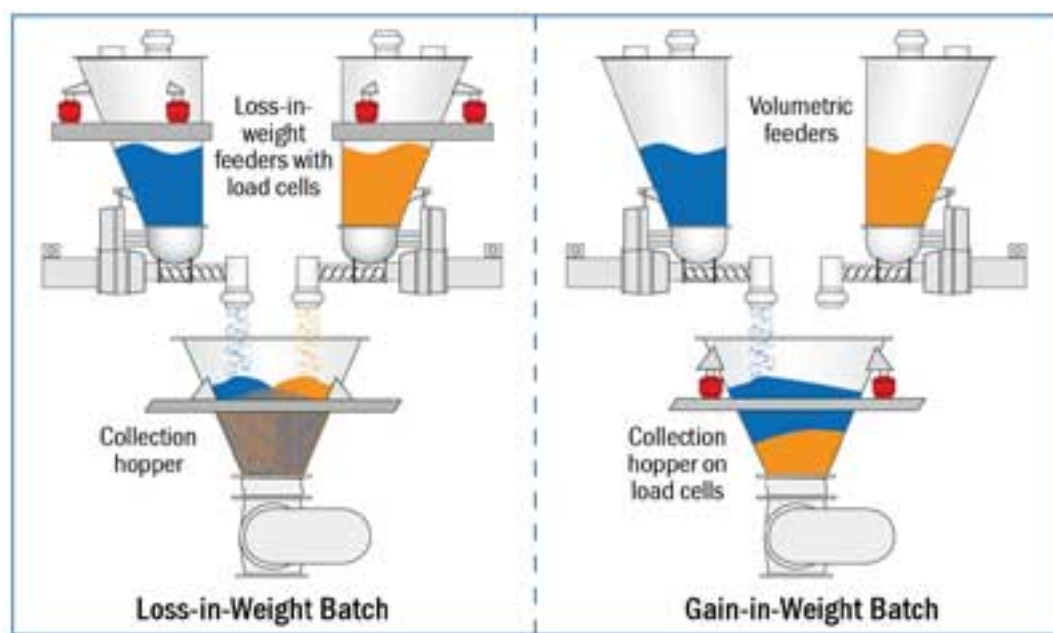
<http://www.ktron.com/process-equipment/feeders/technology/batch-feeding.cfm>

<http://www.ktron.com/process-equipment/feeders/technology/gain-in-weight-batching.cfm>

<http://www.ktron.com/process-equipment/feeders/technology/loss-in-weight-batching.cfm>

### Batch Feeding and Weighing Systems

There are two principle batching methods for weighing and feeding bulk materials



The manufacture of any blended product typically involves the intermediate process steps of transfer and weighing or batching of individual ingredients based upon their weight percentage in a blend. Depending on this percentage, materials are categorized as majors, minors and micros.

A Gain-in-Weight (GIW) batching station includes volumetric metering devices, such as screw feeders or valves, that deliver the product to a hopper on load cells. The Loss-in-Weight (LIW) batching system employs gravimetric feeding devices, such as loss-in-weight screw or vibratory feeders, which are mounted on individual load cells or scales. In cases where small amounts of micro ingredients are required, both methods may be employed: LIW feeders for the micros and minors, and GIW batchers for the major ingredients.

### Gain-in-Weight Batching Principle

Volumetric feeders are often used in Gain-in-Weight (GIW) applications for controlled batch dispensing and weighing of dry bulk materials. Batching may take place directly into IBCs (Intermediate Bulk Containers), hoppers or drums. Batched ingredients may also be dispensed directly into batch blenders. Where hazardous ingredients are

among the batched ingredients, processors need a batching device where ingredients can be easily contained to eliminate any exposure of the product to the operator or to the environment.

In GIW batching the volumetric metering devices sequentially feed multiple ingredients into a collection hopper mounted on load cells. Each feeder delivers approximately 90% of the ingredient weight at high speed, slowing down towards the end of the cycle to deliver the last 10% at a reduced rate (often called "dribble mode") to ensure higher accuracy.

The GIW controller monitors the weight of each ingredient and signals each volumetric feeder to start, increase or reduce speed, or stop accordingly. Once all the ingredients have been delivered, the batch is complete and the mixture is discharged into the process below.

### **Loss-In-Weight Batching Principle**

LIW batching is used when individual ingredients must be weighed more accurately or when the batch cycle times need to be very short. Gravimetric feeders operating in batch mode simultaneously feed multiple ingredients into a collection hopper. Adjustment of the delivery speed (on/off, fast/slow) lies with the LIW feeder controls. Since each feeder has its own dedicated weighing system, the LIW batching system, delivers highly accurate batches for each ingredient.

Once all the ingredients have been delivered, the batch is complete and the mixture is delivered to the process below. Since all ingredients are being metered at the same time, there is no layering of ingredients, and the overall batch time as well as further processing times downstream are greatly reduced.

This method of batching is preferred where micro ingredients are involved, since highly accurate weighing is often required by the recipe and by the desire to control the cost of expensive ingredients.

### **Gain-in-Weight (GIW) versus Loss-in-Weight (LIW)**

Batch size, number of materials, material characteristics and accuracy requirements will all influence which type of batching — via loss-in-weight or gain-in-weight feeding — is best. Typical accuracies that can be expected with the GIW method of batch weighing are +/- 0.5% of the full scale capacity. LIW batching delivers +/- 0.1 - 0.5% of batch weight setpoint (see table).

### Comparison Chart: Loss-in-Weight vs Gain-in-Weight Batching

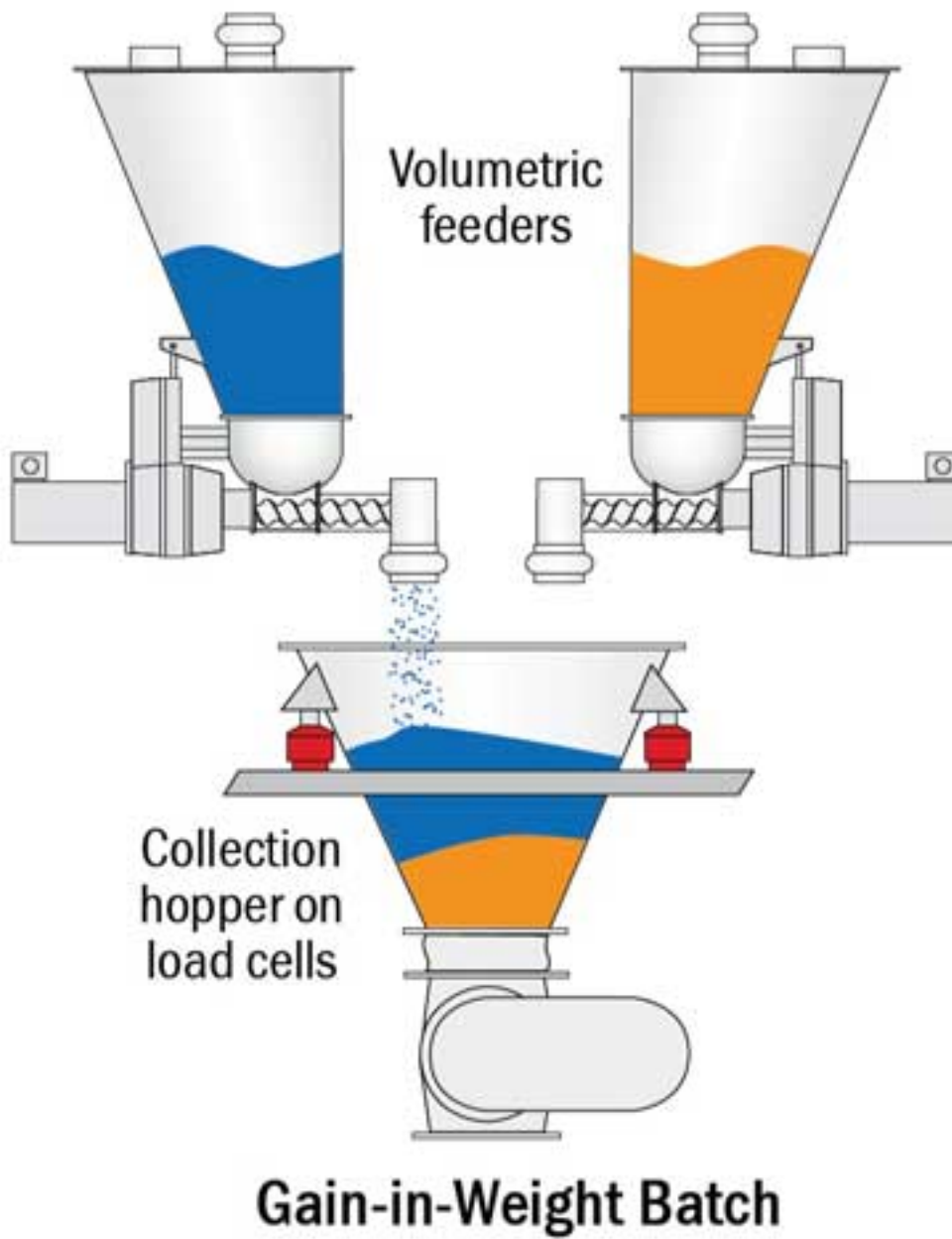
Requirements	Loss-in-Weight Batching	Gain-in-Weight Batching
Accuracy	0.1 - 0.5 % of batch weight setpoint	0.5% or greater of the overall capacity of the scale or load cells
Single ingredient batching	Best	Good - Depending on the size of the batch versus the overall scale capacity; highly dependent on container size versus ingredient weight %
Multi ingredient batching	Best - Quickest way to batch out multi ingredients simultaneously	Good - Only one component at a time
Cost	Moderate - Each feeder on load cells/scale	Lower - Volumetric feeders with one set of load cells/scale for receiving vessel
Containment designs for hazardous materials	Available	Available

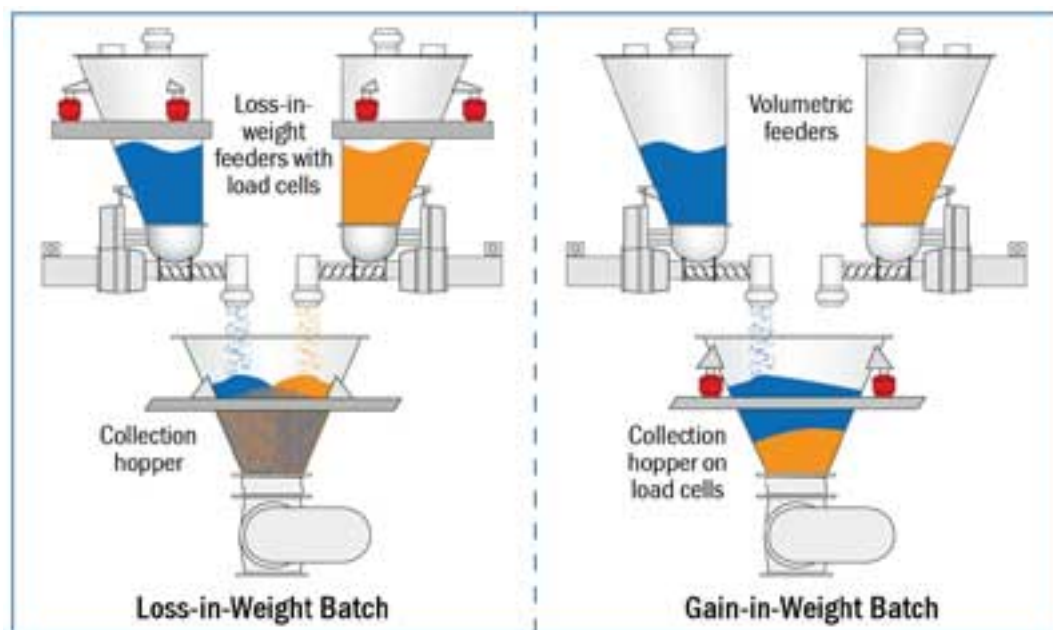
The Gain-in-Weight batching method is necessarily sequential for each ingredient, and therefore requires a longer overall batching time than with LIW batching. This sequential feeding also results in a layering of ingredients, so that mixing may be required before dispensing the batch into the process.

In cases where multiple products (major, minor and/or micro ingredients) are batched into larger IBC containers, a combination of volumetric and loss-in-weight (LIW) feeders may be used. The volumetric feeders are used to batch out the major ingredients first, directly into the IBC on a platform scale. The LIW feeders are each mounted on individual weighing systems (load cells or scales), and are then used to simultaneously batch out the smaller percentage minor/micro ingredients.

The scale on which the vessel is located is then used to verify the overall total batch weight of all the components. This combination of LIW and GIW technologies eliminates the requirement to batch each ingredient separately, thus decreasing the overall process batch times.

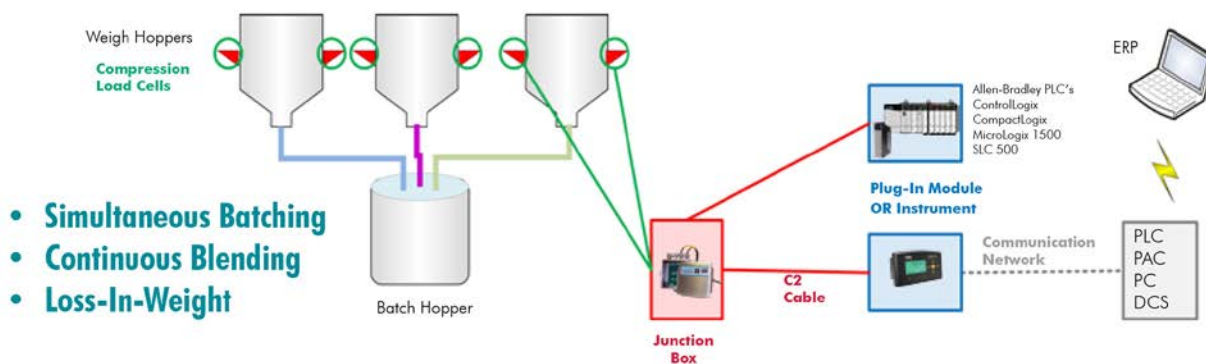
Most floor scales do not have sufficient speed and resolution to detect small amounts of batched products relative to the larger overall weights of the IBC or process vessel. If accuracy requirements on minors are in the range of 0.1 – 0.5%, LIW feeders are typically used with the feeders mounted on high speed digital load cells with 1 part in 4 million resolution. A LIW batch controller monitors material weight loss from the feeder hopper and controls the start/stop function of the feeder to control the achievement of batch weight setpoint.





Web Site Reference:

<http://www.hardysolutions.com/solutions/solutions-by-application/batching-and-blending-make/batching-by-weight>



Web Site Reference:

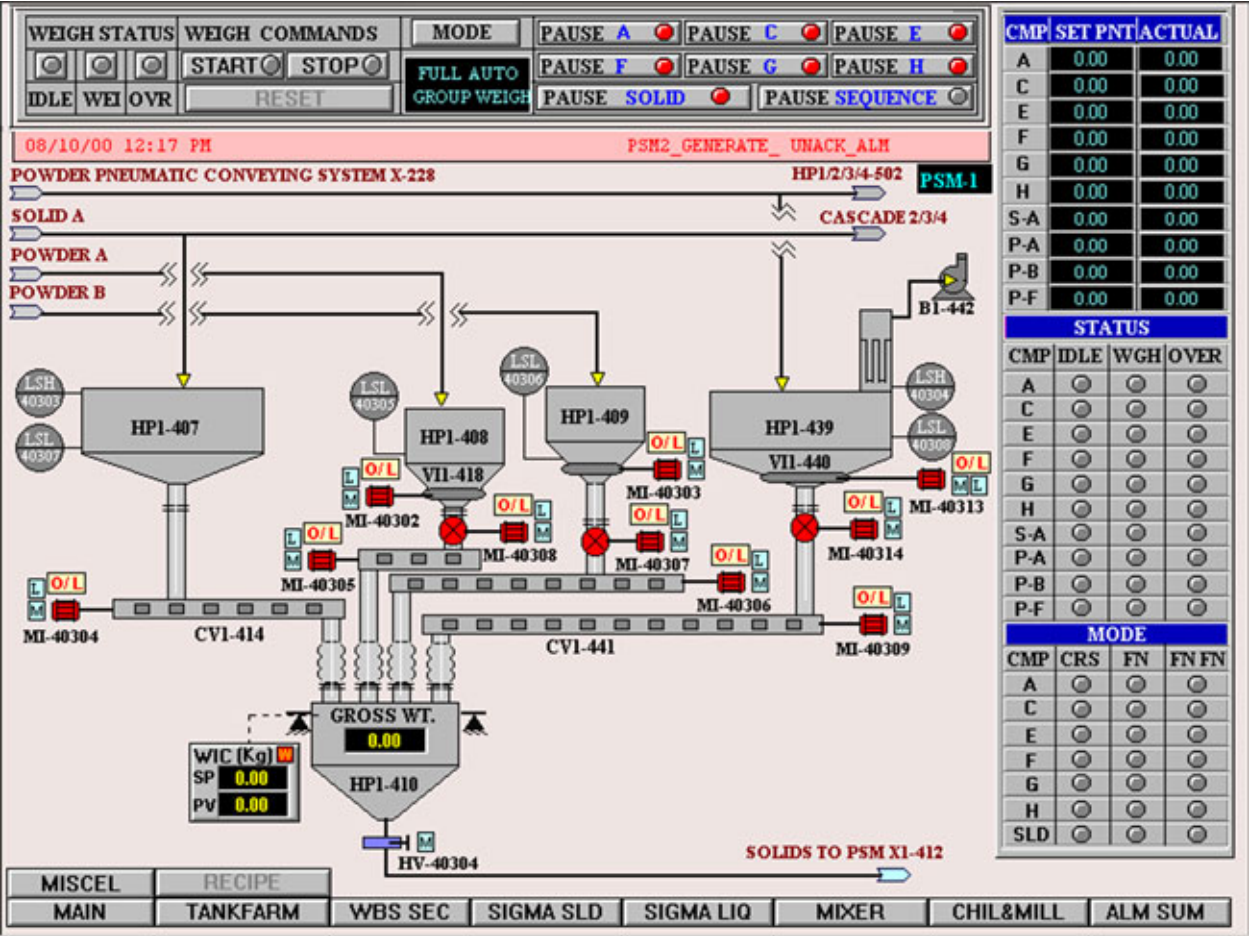
[http://www.prochem.co.in/batching\\_systems.html](http://www.prochem.co.in/batching_systems.html)

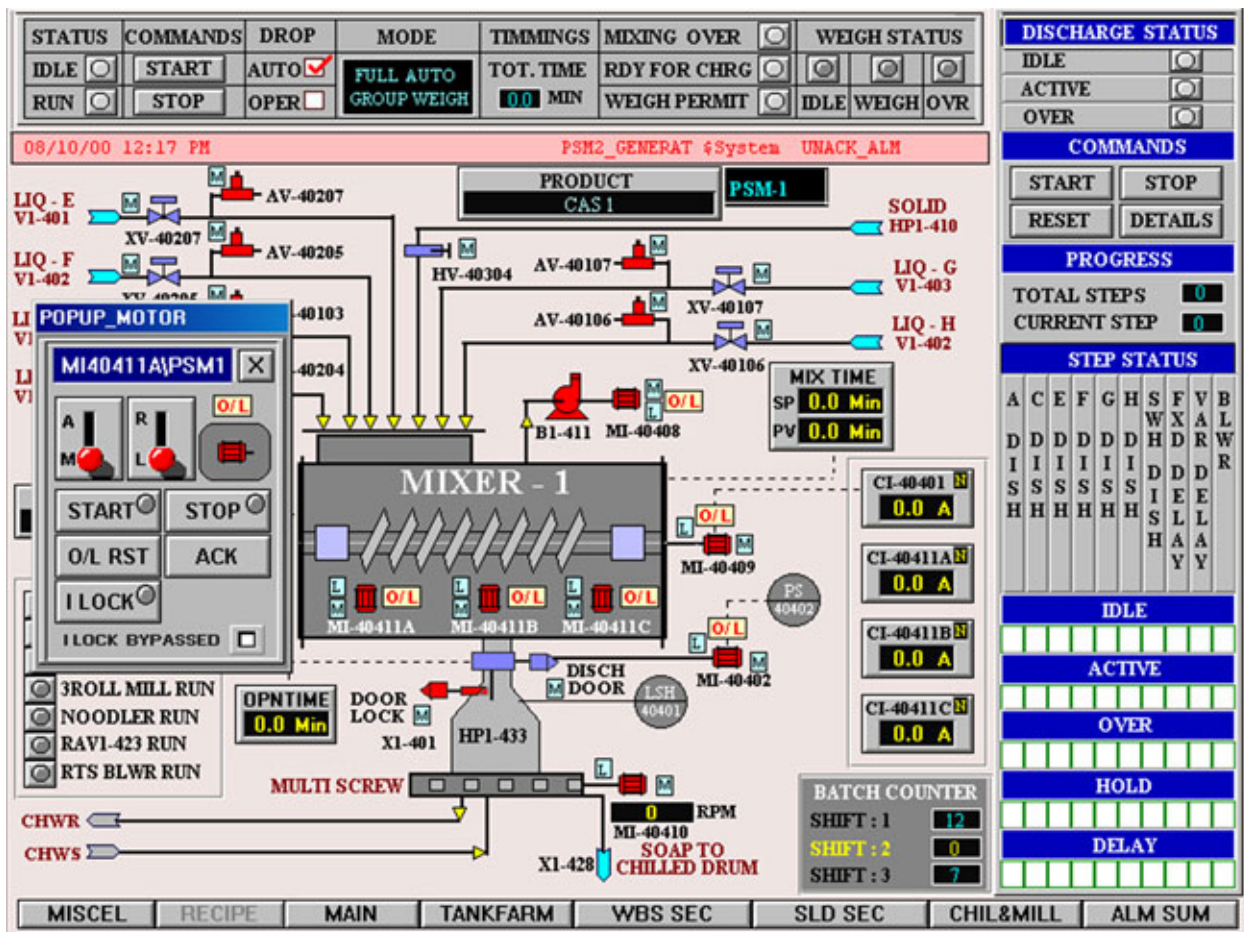
Many powder handling systems require bulk weighing of large amounts of materials and the preparation of product batches for ingredient formulations. Typical applications are for food mixes, soups and flavourings, pre-mixed baking recipes, infant formulas, drinks, sauces, health and nutritional supplements, breakfast cereals, confectionery, pharmaceuticals and many others.

### Typical Features

- High accuracy load-cells and weight control electronics
- Gain-in-weight, loss-in-weight and continuous weighing systems
- Fast/bulk fill and slow/trickle filling with self tuning pre-act systems
- Major, minor and micro ingredient dosing systems
- Maximised flexibility for variable recipes
- Automatic top-up systems
- Safe, sanitary and dust free systems
- Multiple ingredient systems
- State of the art control systems and recipe management using SCADA/HMI software for process visualization, inventory control, and reporting functions for management information systems.







## Appendix C

### Item 320-4 Draft Tentative Code Applicable to Weigh-In-Motion Systems Used for Vehicle Enforcement Screening

## Section 2.25. Weigh-In-Motion Systems used for Vehicle Enforcement Screening – Draft Code

### A. Application

**A.1. General.** – This code applies to systems used to weigh vehicles, while in motion, for the purpose of screening and sorting the vehicles based on the vehicle weight to determine if a static weighment is necessary.

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

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

### S. Specifications

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

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

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

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

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

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

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

#### S.1.4. Value of Other Units of Measure.

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

**S.1.4.2. Axle-Spacing (Length).** – The center-to-center distance between any two successive axles shall be measured in:

- (a) feet and inches;
- (b) feet and decimal submultiples of a foot; or

- (c) meters and decimal submultiples of a meter.

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

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

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

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

#### **S.1.7. Recorded Representations.**

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

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

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

## **S.2. System Design Requirements.**

**S.2.1. Violation Parameters.** – The instrument shall be capable of accepting user entered violation parameters for the following items:

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

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

## **S.3. Design of Weighing Elements.**

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

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

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

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

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

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

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

### **N. Notes**

#### **N.1. Test Procedures.**

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

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

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

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

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

Note: The axles within an axle group are not considered single axles.

#### **N.1.2. Test Loads.**

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

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

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

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

**N.1.4. Test Speeds.** – All dynamic tests shall be conducted within 20% below or at the posted speed limit.

#### **N.1.5. Test Procedures.**

**N.1.5.1. Dynamic Load Test.** – The dynamic test shall be conducted using the test vehicles defined in N.1.1. The test shall consist of a minimum of 20 runs for each test vehicle at the speed as stated in N.1.4.

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

**N.1.5.2. Vehicle Position Test.** – During the conduct of the dynamic testing ensure that the vehicle stays within the defined roadway along the width of the sensor. The test shall be conducted with 10 runs with the vehicle centered along the width of the sensor, 5 runs with the vehicle on the right side along the width of the sensor, and 5 runs with the vehicle on the left side along the width of the sensor. Only gross vehicle weight is used for this test and the tolerance for each weighment shall be based on the tolerance value specified in T.2.3.

**N.1.5.3. Axle Spacing Test.** – The axle spacing test is a review of the displayed and/or recorded axle spacing distance of the test vehicles. The tolerance value for each distance shall be based on the tolerance value specified in T.2.4.

## **T. Tolerances**

### **T.1. Principles.**

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

### **T.2. Tolerance Values for Accuracy Class A.**

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

**T.2.2. Tolerance Values for Dynamic Load Test.** – The tolerance values applicable during dynamic load testing are as specified in Table T.2.2.

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

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

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

**T.3. Influence Factors.** – The following factor is applicable to tests conducted under controlled conditions only.

**T.3.1. Temperature.** – Systems shall satisfy the tolerance requirements under all operating temperature unless a limited operating temperature range is specified by the manufacturer.

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

## UR. USER REQUIREMENTS

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

### UR.1.1. General

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

<b>Table 1.</b>	
<b>Typical Class or Type of Device for Weighing Applications</b>	
<b>Class</b>	<b>Weighing Application</b>
A	Screening and sorting of vehicles based on axle, axle group and gross vehicle weight.
<b>Note:</b> A WIM system with a higher accuracy class than that specified as “typical” may be used.	

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

**UR.2.1. System Modification.** – The dimensions (e.g., length, width, thickness, etc.) of the load receiving element of a system shall not be changed beyond the manufacturer’s specifications, nor shall the capacity of a scale be increased beyond its design capacity by replacing or modifying the original primary indicating or

recording element with one of a higher capacity, except when the modification has been approved by a competent engineering authority, preferably that of the engineering department of the manufacturer of the system, and by the weights and measures authority having jurisdiction over the system.

**UR.2.2. Foundation, Supports, and Clearance.** – The foundation and supports shall be such as to provide strength, rigidity, and permanence of all components.

On load-receiving elements which use moving parts for determining the load value, clearance shall be provided around all live parts to the extent that no contacts may result when the load-receiving element is empty, nor throughout the weighing range of the system.

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

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



**The following are proposed definitions to be added to NIST Handbook 44, Appendix D to support the Weigh-In-Motion Systems used for Vehicle Enforcement Screening – Draft Code.**

**weigh-in-motion (WIM).** A process of estimating a moving vehicle's gross weight and the portion of that weight that is carried by each wheel, axle, or axle group, or combination thereof, by measurement and analysis of dynamic vehicle tire forces.

**axle.** The axis oriented transversely to the nominal direction of vehicle motion, and extending the full width of the vehicle, about which the wheel(s) at both ends rotate.

**axle-group load.** The sum of all tire loads of the wheels on a group of adjacent axles; a portion of the gross-vehicle weight.

**axle load.** The sum of all tire loads of the wheels on an axle; a portion of the gross-vehicle weight.

**axle spacing.** The distance between the centers of any two axles. When specifying axle spacing, you also need to identify the axles used.

**single-axle load.** The load transmitted to the road surface by the tires lying on the same longitudinal axis (that axis transverse to the movement of the vehicle and about which the wheels rotate).

**tandem-axle load.** The load transmitted to the road surface by the tires of two single-axles lying on the same longitudinal axis (that axis transverse to the movement of the vehicle and about which the wheels rotate).

**triple-axle load.** The load transmitted to the road surface by the tires of three single-axles lying on the same longitudinal axis (that axis transverse to the movement of the vehicle and about which the wheels rotate).

**Weigh-in-Motion Screening Scale .** A WIM system used to identify potentially overweight vehicles.

**Wheel weight.** The weight value of any single or set of wheels on one side of a vehicle on a single axle.

**WIM System.** A set of sensors and supporting instruments that measure the presence of a moving vehicle and the related dynamic tire forces at specified locations with respect to time; estimate tire loads; calculate speed, axle spacing, vehicle class according to axle arrangement, and other parameters concerning the vehicle; and process, display, store, and transmit this information. This standard applies only to highway vehicles.



## Appendix D

### Item 330-4 N.4.2.5. Determination of Error on Whole Sale Devices with Multiple Flow Rates and Calibration Factors

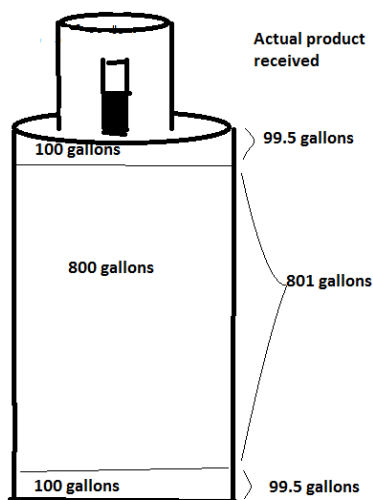
# How Slow Flow Accuracy Affects LMD's

Because the legal tolerance on slow flow tests is so great ( $\pm 0.5\%$ ) compared to industry standards (typically  $\pm 0.05\%$ ), and because slow flow tests themselves are so time consuming, registered service agents may be tempted to skip slow flow tests entirely during seasonal re-calibrations. Even if one ignores the fact that the Liquid Measuring Device Code in NIST Handbook 44 requires that a special test be done at the slow flow rate, there remains a very good reason that slow flow rates should always be tested. If the error at the slow flow rate is unknown, then it is impossible to calibrate the high flow rates to deliver with the extreme accuracy sought by industry on quantities which are greater or less than the test prover used at the time of calibration.

Imagine a typical whole sale meter which is calibrated using a 1,000 gallon prover at a terminal where the customers' trucks have pocket sizes between 1,000 and 4,000 gallons. The meter has an electronic register programmed with a slow flow rate for start-up and shut-down, a high-flow rate for typical deliveries, and a mid-speed fallback rate for when the pumps can't keep up with demand. Startup and shutdown deliveries are 100 gallons each regardless of total quantity delivered.

Now imagine that the service agent calibrating the meter didn't check the slow flow rate and didn't know that the meter was short five gallons on a one thousand gallon test. Instead, he calibrated the fallback and normal flow rates without testing the slow flow and introduced a linear error which increases the farther the transaction quantity deviates from the prover size. On a 1,000 gallon delivery the meter would appear to be accurate, but on a 3,400 gallon delivery a three gallon error has been introduced. That is a 0.09% error which is almost twice the typical industry goal.

#### Calibrating high flow means compensating for slow flow error.



When calibrating at the normal and fallback speeds, the meter registers 200 gallons of product for the startup and shutdown, but actually delivers only 199 gallons. (99.5 gallons delivered for every 100 gallons registered at slow speed.) If the service technician calibrates the meter to zero at normal and fallback rates, the meter will actually deliver 801 gallons for every 800 gallons it registers at those rates.

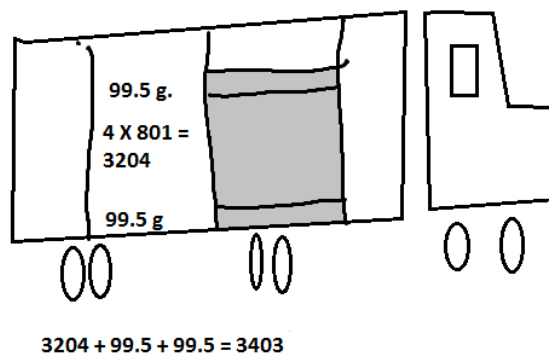
Every subsequent delivery of 1000 gallons should receive exactly the right amount. Every delivery exceeding 1000 gallons will be 'long' and every delivery less than 1000 gallons will be short.

**EXAMPLE SLOW FLOW IS 5G/1000G SHORT AND HIGH FLOW WAS ADJUSTED AS A RESULT.**

Driver ordered 3400 gallons for pocket 2.

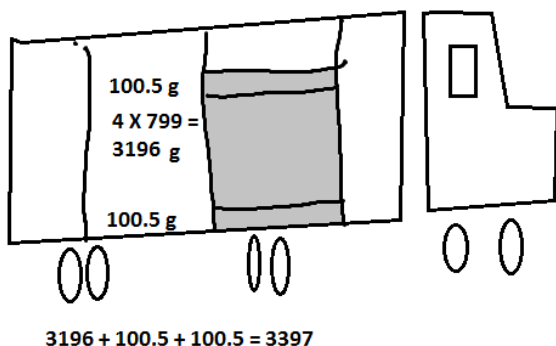
To determine the error on a typical delivery, the service agent needs to calculate the error introduced by the startup and shutdown gallons, and then the error introduced at the higher flow rates.

For a 3,400 gallon delivery in this example, the meter would register 100 gallons on startup but only deliver 99.5 gallons. It would then jump to normal rate and deliver 801 gallons for every 800 gallons it registers until it goes into shutdown mode when it slows down and again delivers only 99.5 gallons of the 100 gallons it registers. Delivery error is +3 gallons (0.09%)



**EXAMPLE WHEN SLOW FLOW RATE IS 5G/1000G LONG AND HIGH FLOW WAS ADJUSTED AS A RESULT.**

Driver ordered 3400 gallons for pocket 2.



The math would be reversed if the meter had been five gallons long on a 1,000 gallon slow flow test at the startup and shutdown speed. The meter would deliver 100.5 gallons for every 100 gallons it registered at startup and shutdown, but only 799 gallons for every 800 gallons registered at the normal delivery rate. The total delivery is 3 gallons (0.09%) short. Under-registration, which is favorable to consumers in most situations, can be detrimental to them when it occurs at the slow flow speed.

Does it matter considering that the error introduced is so much smaller than the tolerance allowed in the liquid measuring code? It does to industry, or they wouldn't set such tight accuracy standards for themselves. And it does to Weights & Measures officials who must consider the predominant direction of error in addition to tolerance. Everyone's time is wasted chasing extreme accuracy at the normal delivery rate if the accuracy of the startup and shutdown rate has been ignored.

Appendix E

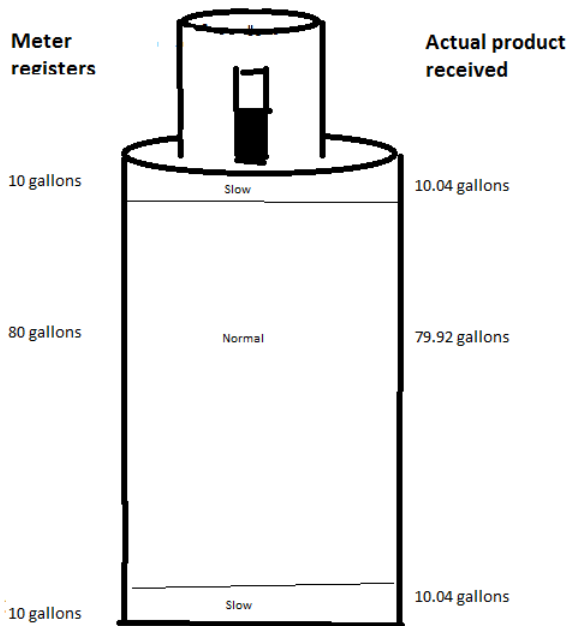
Item 331-2: N.4.2.1. Determination of Error on Vehicle-Tank Meters with Multiple Flow Rates and Calibration Factors

# How Slow Flow Errors Affect VTM's

Imagine a typical VTM which is calibrated using a 100 gallon prover for a bulk delivery company whose customers' tanks are typically between 100 and 1,000 gallons. The meter has an electronic register programmed with a slow flow rate for start-up and shut-down, and a high-flow rate for typical deliveries. Startup and shutdown deliveries are 10 gallons each regardless of total quantity delivered.

Now imagine that the service agent calibrating the meter didn't check the slow flow rate and didn't know that the meter was long 0.4 gallons on a 100 gallon test. Instead, he calibrated the normal flow rate without testing the slow flow and introduced a linear error which increases the farther the transaction quantity deviates from the prover size. On a 100 gallon delivery the meter would appear to be accurate, but on a 500 gallon delivery a -0.4 gallon error has been introduced. That is within tolerance, but if all of his meters have similar errors in the same direction, typical deliveries will be in the operator's favor at the expense of his customers.

Calibrating high flow means  
compensating for slow flow error.



When calibrating at the normal speed, the meter registers 20 gallons of product for the startup and shutdown, but actually delivers 20.08 gallons. (10.04 gallons delivered for every 10.00 gallons registered at slow speed.) If the service technician calibrates the meter to zero at normal speed, the meter will actually deliver 79.92 gallons for every 80.00 gallons it registers at that flow rate.

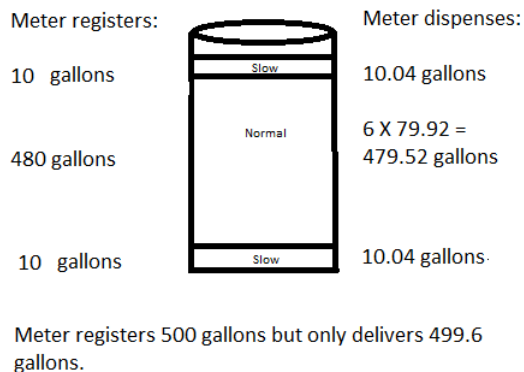
Every subsequent delivery of 100 gallons should receive exactly the right amount. Every delivery exceeding 100 gallons will be 'short' and every delivery less than 100 gallons will be 'long.'

To determine the error on a typical delivery, the service agent needs to calculate the error introduced by the startup and shutdown gallons, and then the error introduced at the higher flow rates.

For a 500 gallon delivery in this example, the meter would register 10 gallons on startup but actually deliver 10.04 gallons. It would then jump to normal rate and deliver 79.92 gallons for every 80 gallons it registers until it goes into shutdown mode when it slows down and again delivers 10.04 gallons as it registers only an additional 10 gallons.

**SLOW FLOW RATE IS +0.4 g/100 G, AND CALIBRATION OF NORMAL RATE WAS ADJUSTED TO COMPENSATE**

Customer ordered 500 gallons of product.



The error would be well within maintenance tolerance so the Weights and Measures official need only be concerned if the slow flow errors on all the meters for a particular product are in the same direction. At that point, the official should determine the direction of the error on a typical delivery to determine if the equipment is being properly maintained. Device users can ensure they have no problems with this requirement by making sure that slow flow errors are not predominantly in one direction.

## Appendix F

### **Agenda Item 337-1: Submitters Background and Justification for Handbook 44 Definition of “Diesel Gallon Equivalent (DGE)” of Compressed Natural Gas (CNG) and Liquefied Natural Gas (LNG) as a Vehicular Fuel**

#### **Clean Vehicle Education Foundation**

##### *Development of the “Gasoline Gallon Equivalent” by NCWM\**

In 1993, under the auspices of the National Conference on Weights and Measures (NCWM), a Compressed Natural Gas (CNG) Working Group came together to determine the way in which CNG would be sold to the public at retail as a motor fuel. .

The working group focused on three issues:

1. How to provide the Natural Gas Vehicle (NGV) industry a method of sale that would be familiar and acceptable to consumers
2. How to provide weights and measures officials a verifiable and quantifiable means to determine the accuracy of natural gas dispensers; and
3. How to meet these requirements with a uniform, national standard.

NCWM considered three proposals for the method of sale of CNG:

1. Joules, the unit of energy measurement in SI units
2. Mass
3. The Gasoline Gallon Equivalent (GGE)

The Natural Gas Vehicle Coalition (now NGV America) recommended that the Gasoline Gallon Equivalent be adopted as the method of sale for CNG, and that it be based on the energy equivalent of a gallon of gasoline. The use of the GGE was recommended primarily for the convenience of the retail customer comparing the cost and fuel economy of a natural gas vehicle to a comparable gasoline vehicle. During the discussion, a proposal was made to eliminate the reference to energy content of CNG and replace it with a fixed conversion factor based on mass, with the fixed mass of CNG being equal to a gallon of gasoline. Measurement of mass in the retail dispenser and verification by W&M officials is easier and less costly than measurement of energy content.

Since the energy content of a unit measure of CNG (standard cubic foot - scf) and gasoline (gallon) vary widely depending on the sample of fuel measured, the reference gallon of gasoline was determined to be Indolene, the gasoline used by EPA to certify emissions and fuel economy, with an energy content (lower heating value) of 114,118 BTU/gal. Work conducted by the Institute of Gas Technology and the Gas Research Institute (now combined into the Gas Technology Institute) surveyed 6811 samples of natural gas nationwide and concluded that

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\* *Report of the 78<sup>th</sup> National Conference on Weights and Measures, 1993*, NIST Special Publication 854, pp 322-326.

*Report of the 79<sup>th</sup> National Conference on Weights and Measures, 1994*, NIST Special Publication 870, pp 213-217.

*Program and Committee Reports for the National Conference on Weights and Measures, 79<sup>th</sup> Annual Meeting, July 17-21, 1994*, NCWM Publication 16, pp 89-92.

the “average” natural gas in the US had an energy content (lower heating value) of 923.7 BTU/scf, and a density of 0.0458172 lbs/cubic foot. This translates 20,160.551 BTU/lb. Dividing gasoline’s 114.118 BTU/gal by natural gas’s 20,160.551 BTU/lb gives 5.660 lbs of natural gas = 1 GGE. Similar calculations determined that a gasoline liter equivalent of natural gas equals 0.678 kg of natural gas.

At its 79<sup>th</sup> annual meeting in July of 1994, NCWM adopted resolutions that: “All

natural gas kept, offered or exposed for sale or sold at retail as a vehicle fuel shall be in terms of the gasoline liter equivalent (GLE) or gasoline gallon equivalent (GGE), and

All retail natural gas dispensers shall be labeled with the conversion factor in terms of kilograms or pounds. The label shall be permanently and conspicuously displayed on the face of the dispenser and shall have either the statement “1 Gasoline Liter Equivalent (GLE) is equal to 0.678 kg of Natural Gas” or “1 Gasoline Gallon Equivalent (GGE) is equal to 5.660 lbs of Natural Gas” according to the method of sale used.”

These statements can be found in NIST Handbook 130<sup>\*</sup>, along with the definition of “natural gas” which seems to apply only to Compressed Natural Gas, not to Liquefied Natural Gas. Handbook 130, §§3.11 and 3.12 (Engine Fuels, Petroleum Products, and Automotive Lubricants Regulations) confirm that these requirements are for CNG, rather than LNG. Similar requirements and definitions are found in Handbook 44.

During the discussions it was recognized that, although diesel and gasoline are both sold in gallon units, a gallon of diesel fuel has substantially more energy content than a gallon of gasoline. While it is convenient to use the Gasoline Gallon Equivalent unit when comparing the cost and fuel economy of gasoline-powered light-duty vehicles to equivalent natural gas vehicles, a Diesel Gallon Equivalent unit would be more useful

for operators of medium and heavy-duty (usually diesel powered) vehicles. However, in 1994, the NCWM working group “agreed to defer development of a “Diesel Gallon Equivalent” until the issues related to the ‘Gasoline Gallon Equivalent’ were decided by the NCWM and agreed to meet again if additional work is necessary.”<sup>\*\*</sup> The issue of the formal definition a Diesel Gallon Equivalent (DGE) unit has not come before NCWM from that time until today, although the DGE is often used in the industry, defined as 6.31 lbs of compressed natural gas.

#### Need for a Definition of a “Diesel Gallon Equivalent” Unit

Today there are an increasing number of commercial vehicles using natural gas as a fuel, to lower emissions and Greenhouse Gases, decrease America’s use of petroleum, and lower fuel costs (U.S. DOE Clean Cities Alternative Fuel Price Report for April 2012

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\* “Method of Sale Regulation,” §2.27

\*\* *Report of the 79<sup>th</sup> National Conference on Weights and Measures, 1994*, NIST Special Publication 870, p 214



shows in Table 2 ‘Overall Average Fuel Price on Energy-Equivalent Basis’ that diesel is priced at \$4.12/gal and CNG at \$2.32/gal

[http://www.afdc.energy.gov/afdc/pdfs/afpr\\_apr\\_12.pdf](http://www.afdc.energy.gov/afdc/pdfs/afpr_apr_12.pdf)).

Since the NCWM’s working group deferred development of a DGE unit in 1994, there has been little call by the natural gas vehicle industry for the formalization of that unit in the sale of Compressed Natural Gas. However the use of **Liquefied** Natural Gas (LNG) as a motor fuel has been growing (more than 350 LNG stations are being built on the nations interstate Highways) and there is significant interest in using the DGE as a unit for the sale of that fuel.

LNG as a motor fuel is used almost exclusively by commercial vehicles, most of which view diesel as the conventional alternative. Using the same logic as was used for the development of the GGE unit, the convenience of the retail customer comparing the cost and fuel economy of a natural gas vehicle to a comparable conventional vehicle, it makes sense for NCWM to now “officially” define the DGE.

Other than §3.12. Liquefied Natural Gas, in the Engine Fuels and Automotive Lubricants Regulation section of Handbook 130, we find no specific provisions in either Handbook 44 or Handbook 130 for the retail sale of LNG as a motor fuel. However LNG is sold in California and other states on a mass basis (by the pound), which allows for easy confirmation by weights and measures authorities. An “official” definition of the DGE as a specific mass of LNG and CNG would allow states to easily move from retail sale by pound to retail sale by DGE, simplifying the sale process for the retail customer used to dealing with “gallons of diesel” as a fuel measure.

Therefore, at this time we are asking for a definition of the Diesel Gallon Equivalent (and Diesel Liter Equivalent) units by NCWM.

*Justification of the Definition of a DGE as 6.38 Pounds of Compressed Natural Gas* Handbook 130

contains the following definitions of natural Gas as a vehicle fuel<sup>\*</sup> : **Gasoline liter equivalent**

**(GLE).** – Gasoline liter equivalent (GLE) means  
0.678 kg of natural gas.

**Gasoline gallon equivalent (GGE).** – Gasoline gallon equivalent (GGE) means  
2.567 kg (5.660 lb) of natural gas.

As the NCWM working group recognized during its deliberations in 1993 on the Gasoline Gallon Equivalent unit, both gasoline and natural gas can vary in their BTU content from sample to sample. The working group determined the gasoline gallon (energy) equivalent based on a gallon of Indolene (114,118 BTU/gal – lower heating value) and a survey of 6811 natural gas samples nationwide with an average of 923.7 BTU/scf (lower heating value) and a density of 0.0458172 lbs/cubic foot. This

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<sup>\*</sup> NIST handbook 130, 2006, Method of State Regulation, §§2.27.1.2 and 2.227.1.3; also Engine Fuels, Petroleum Products, and Automotive Lubricants Regulation, §§1.25 and 1.26.

equates to 20,160.551 BTU/lb. Dividing gasoline's 114,118 BTU/gal by natural gas's 20,160.551 BTU/lb gives 5.660 lbs of natural gas = 1 GGE. Similar calculations determined that a gasoline liter equivalent of natural gas equals 0.678 kg of natural gas.

Starting with 5.660 lbs of natural gas = 1 GGE and 0.678 kg of natural gas = 1 GLE, we can calculate the mass of natural gas necessary to make a DGE and a DLE by comparing the amount of energy in a gallon of diesel fuel to the amount of energy in a gallon of gasoline fuel and apply that ratio to scale up the masses of natural gas calculated for the GGE and GLE units.

Unfortunately it is no easier today than it was in 1993 to set one energy value as representative of a unit for all gasoline, (or diesel) fuel. EPA's certification fuel has likely changed in energy content since 1993, as both gasoline and diesel fuels have been modified for improved emissions.

We recommend using the most recent Department of Energy *Transportation Energy Data Book*<sup>\*</sup>, as an authoritative reference for both gasoline and diesel fuel energy values. Taking further surveys or basing our calculations on today's EPA certification fuel only delays our action, substantially increases costs, and, in the end, provides a limited potential increase in accuracy based on one point in time. Table B.4 of the *Transportation Energy Data Book*, on the heat content of fuels lists the net energy of diesel as 128,700 BTU/Gal. The 31<sup>st</sup> Edition may be downloaded at the following site.  
<http://cta.ornl.gov/data/download31.shtml>

Therefore a Diesel Gallon Equivalent of compressed natural gas is: (128,700

BTU/Gal / 20,160.551 BTU/lb) = 6.38 lb/DGE (2.894 kg/DGE) and a Diesel Liter

Equivalent of compressed natural gas is:

2.894 kg/DGE X 0.2642 Gal/Liter = 0.765 kg/DLE

#### Justification of the Definition of a DGE as 6.06 Pounds of Liquefied Natural Gas

Cooling pipeline natural gas to -259 °F makes liquefied Natural Gas (LNG). The pipeline natural gas has the same national average composition as was determined for CNG with a LHV of 20,160.551 BTU/lb. In order to reduce the natural gas temperature for liquefaction carbon dioxide must be removed since it would solidify in the system and nitrogen, which remains a gas at LNG temperatures, is reduced to less than 0.5% by volume in the final product. These changes to the composition of the pipeline gas increase the LHV of LNG to 21,240 BTU/lb.

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\* Stacy C. Davis and Susan W. Diegel, Oak Ridge National Laboratory, *Transportation Energy Data Book*, Edition 31, 2012, ORNL-6987, or <http://cta.ornl.gov/data/index.shtml>

National Average Natural Gas Composition Used for GGE Standard - Applied to LNG DGE - GGE Calculation							
CNG				LNG			
Components	LHV - BTU/LB	LBS/CF	%V <sup>1</sup>	%V <sup>2</sup>	LBS/CF	%MASS	LHV
C1	21537	0.0425	92.87	95.12	0.040425567	90.29305699	19446.41568
C2	20394	0.0803	3.34	3.42	0.002746969	6.13552872	1251.279727
C3	19807	0.1196	0.63	0.65	0.000771727	1.723700114	341.4132816
i-C4	19529	0.1582	0.07	0.07	0.000113422	0.253334595	49.47371306
n-C4	19815	0.1582	0.12	0.12	0.000194437	0.434287877	86.05414286
i-C5	19478	0.1907	0.04	0.04	7.81272E-05	0.174502103	33.98951966
n-C5	20485	0.1907	0.03	0.03	5.85954E-05	0.130876577	26.81006688
C6	19403	0.0228	0.05	0.05	1.16761E-05	0.026079234	5.06015379
N2	0	0.0744	2.07	0.50	0.000370992	0.828633789	0
CO2	0	0.117	0.78	0.00	0	0	0
			100.00	100.00	0.044771512	100	21240
Diesel <sup>3</sup> LHV=							128,700
LNG - DGE=							6.06

<sup>1</sup> CNG national average composition of natural gas from the NCWM Laws and Regulations - CNG Working Group letter 10/18/1993 Appendix A. Conversion Factor Background

<sup>2</sup> LNG composition based on CNG composition with CO2 removed and nitrogen reduced to 0.5%

<sup>3</sup> DOE Transportation Energy Data Book Table B.4

Note: each 0.1% reduction/addition of nitrogen in LNG lowers/raises DGE by 0.01 lb

Therefore a Diesel Gallon Equivalent of LNG is:

$$128,700 \text{ BTU/lb} / 21,240 \text{ BTU/lb} = 6.06 \text{ lb/DGE} (2.749 \text{ kg/DGE})$$

and a Diesel Liter Equivalent of LNG is:

$$2.749 \text{ kg/DGE} \times 0.2642 \text{ Gal/Liter} = 0.7263 \text{ kg/DLE}$$

The attached presentation file provides an overview of the CNG and LNG processes from pipeline to dispensing along with the calculation of the LNG LHV based on the change in LNG chemical composition through the liquefaction process.

Prepared by:

Clean Vehicle Education Foundation

<http://www.cleanvehicle.org>

# Clean Vehicle Education Foundation



## Proposal for CNG & LNG – DGE NCWM March 20, 2013

Douglas Horne – President

12/10/13

[www.cleanvehicle.org](http://www.cleanvehicle.org)

1

## Why DGE is Now Needed by the NGV Market

- In the 1994 NCWM set GGE at 5.66 lbs but deferred the development of DGE because:

The consumer market was LD gasoline conversions



and diesel class NGVs were fleets such as transit that use private stations.



America's natural gas highway



In the last twenty years the market growth has been in HD vehicles and now a national network of public CNG and LNG - LCNG fueling is emerging

LNG Class 8



CNG Class 8



CNG HD



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2

## CNG and LNG Delivery Systems



## CNG DGE Based on 1994 NCWM GGE Standard

- The 1994 acceptance NCWM of Gasoline Gallon Equivalent (GGE) for natural gas to be equal to 5.660 lbs was based on a national weighted average composition of natural gas
  - density of 0.0458172 lbs/scf
  - LHV = 20,160.551 BTU/lb
- Using the the same natural gas composition and the LHV of diesel noted in Table B.4 of the DOE Transportation Energy Data Book
  - 128,700/20,160.551 gives the Diesel Gallon Equivalent (DGE) of 6.38 lbs
- For those NGVs that use CNG as a replacement for diesel, a DGE of CNG would be 6.38 lbs



## DGE for Vehicle Using LNG and

- As shown in the LNG delivery system slide the national average pipeline gas has a LHV of 20,160 BTU/lb and during liquefaction the inert gas constituents are reduced thus increasing the LHV to 21,240 BTU/lb
  - For those NGVs that use LNG as a replacement for diesel, a DGE of LNG would be 128,700 LHV diesel divided by 21,240 LHV of LNG equaling 6.06 lbs

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5

## DGE & GGE Based on LNG Composition

National Average Natural Gas Composition Used for GGE Standard - Applied to LNG DGE - GGE Calculation							
CNG				LNG			
Components	LHV - BTU/LB	LBS/CF	%V <sup>1</sup>	%V <sup>2</sup>	LBS/CF	%MASS	LHV
C1	21537	0.0425	92.87	95.12	0.040425567	90.29305699	19446.41568
C2	20394	0.0803	3.34	3.42	0.002746969	6.13552872	1251.279727
C3	19807	0.1196	0.63	0.65	0.000771727	1.723700114	341.4132816
i-C4	19529	0.1582	0.07	0.07	0.000113422	0.253334595	49.47371306
n-C4	19815	0.1582	0.12	0.12	0.000194437	0.434287877	86.05414286
i-C5	19478	0.1907	0.04	0.04	7.81272E-05	0.174502103	33.98951966
n-C5	20485	0.1907	0.03	0.03	5.85954E-05	0.130876577	26.81006688
C6	19403	0.0228	0.05	0.05	1.16761E-05	0.026079234	5.06015379
N2	0	0.0744	2.07	0.50	0.000370992	0.828633789	0
CO2	0	0.117	0.78	0.00	0	0	0
			100.00	100.00	0.044771512	100	21240
Diesel <sup>3</sup> LHV=							128,700
LNG - DGE=							6.06

<sup>1</sup>CNG national average composition of natural gas from the NCWM Laws and Regulations - CNG Working Group letter 10/18/1993 Appendix A. Conversion Factor Background

<sup>2</sup>LNG composition based on CNG composition with CO2 removed and nitrogen reduced to 0.5%

<sup>3</sup>DOE Transportation Energy Data Book Table B.4

Note: each 0.1% reduction/addition of nitrogen in LNG lowers/raises DGE by 0.01 lb

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6

## Proposal

- CNG dispensers may dispense natural gas in two units:  
GGE = 5.66 lbs  
DGE = 6.38 lbs
- LNG dispensers will dispense LNG in one unit:  
DGE = 6.06 lbs

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7

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12/10/13

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8





## Appendix G

### Item 337-2: Mass Flow Meters Code Paragraph S.3.6. Automatic Density

The following background information is excerpted from the NIST SP 920 the 1997 Report of the 82<sup>nd</sup> NCWM in the Final Report of the Specifications and Tolerances Committee in Agenda Item 337-2:

**337-2      VC      S.3.6.(b) Automatic Density Correction; Volume-Measuring Devices**

(This item was adopted as part of the consent calendar.)

**Source:** Southern Weights and Measures Association

**Recommendation:** Modify S.3.6.(b) Automatic Density Correction on Volume-Measuring Devices as follows:

**S.3.6. Automatic Density Correction**

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

*[Nonretroactive as of January 1, 1995. To become retroactive as of January 1, 1999.]*

*(Amended 1994 and 1997)*

**Discussion:** The Southern Weights and Measures Association submitted this proposal after reviewing a proposal from Hoffer Flow Controls to delete S.3.6. Automatic Density Correction on Volume-Measuring Devices from Handbook 44. Hoffer Flow Control's position was that neither a direct mass flow meter or an inferred mass flow meter is capable of determining composition of a gas without the use of a gas chromatograph or similar type of analytical equipment which can make qualitative and quantitative determinations of the components that makeup a gas.

The Southern believes that there are some misinterpretations of this paragraph relating to the use of the term "composition." The Southern noted that paragraph S.3.6. recognizes that product density can vary with changes in product composition and with changes in product temperature. Any changes in product density can affect the accuracy of the meter, thus these devices must be equipped with a means to automatically correct for changes in product density. Manual entries of product density are not sufficient to compensate for changes in density which may vary with changes in the supply of product. Based on its review of past NCWM S&T reports the Southern believes the use of the term "composition" was not intended to require a device to automatically monitor changes in the qualitative properties of the gas; the requirement for monitoring changes in product density relates only to the subsequent impact on the measurement determination. Therefore, the Southern does not believe it is appropriate to delete the word "composition" and recommends as an alternative that the focus of the changes to S.3.6. should be to clarify the concerns which have been raised. The Southern notes that it heard additional comments that pressure may also affect product density and recommended that the S&T Committee study whether or not the term "pressure" should be added to S.3.6.

During the open hearing session at the Interim Meeting, comments were heard that indicate other influence factors (in addition to temperature and composition) may affect product density. Based on this information, the Committee recommends that the term "pressure" be added to paragraph S.3.6. to require that these systems have an automatic means to determine and correct for changes in product density due to changes in "pressure." The Committee recommends that this requirement be revisited as new technologies are developed that indicate other influence factors affect product measurement in these systems.

The Committee heard comments from one manufacturer of an indirect mass flow meter that this item should be made informational until it completes research on these measuring systems. The Committee acknowledged that the study is in progress and noted that it may revisit this issue when the study is complete on the effects of product composition.

The following background information is excerpted from NIST SP 870 the 1994 Report of the 79<sup>th</sup> NCWM in the Final Report of the Specifications and Tolerances Committee in Agenda Item 337-4B:

**337-4B      V      S.3.6. Automatic Density Correction**

(This item was adopted.)

Based upon comments received, add the following as a new Item 337-4B to address volume-measuring devices used to measure compressed natural gas as an engine fuel.

**Recommendation:** To recognize volume-measuring devices being used to measure Compressed Natural Gas (CNG) as an engine fuel consistent with the requirements of the Hydrocarbon Gas Vapor-Measuring Devices Code and to permit time for these devices to be modified to incorporate automatic density correction, the Committee recommends that S.3.6. be amended to read:

**S.3.6. ~~Mass Flow Meters~~ 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 natural gas as a motor vehicle engine fuel shall be equipped with an automatic means to determine and correct for changes in product density, both for the temperature and composition of the product.*  
(Nonretroactive as of January 1, 1995. To become retroactive as of January 1, 1999.)

**Discussion:** In the absence of a permanent Mass Flow Meters Code, requirements for mass flow meters have been adopted into several codes for measuring devices. The requirements of the Hydrocarbon Gas Vapor-Measuring Devices Code have been applied to devices used to measure CNG. This code permits volume measuring devices to indicate in units of volume, but the method of sale for CNG is currently being considered by the NCWM to be the gasoline gallon equivalent (GGE). The GGE is based upon mass units, hence, the automatic correction for changes in composition of the natural gas is needed to promote more accurate measurement.

To provide time to incorporate automatic density correction for these devices, subparagraph (b) is added as a nonretroactive requirement. During the time volumetric devices are used to measure compressed natural gas as a motor vehicle engine fuel, corrections for changes in product density due to changes in composition will have to be entered manually. It is the owner's responsibility to maintain the device within tolerance at all times. Subparagraph (b) will become retroactive as of January 1, 1999.

## Appendix H

### Item 360-5: Electric Vehicle Fueling and Submetering

This draft code replaces the version of the code included in the Committee's 2014 Final Report. This version was developed by the USNWG and has been reviewed and forwarded to NCWM by each of the regional associations for national consideration. The submitter, the USNWG, and all four regionals propose that this version be considered for voting in July 2015.

## Draft NIST Handbook 44 Device Code Requirements for Electric Vehicle Fueling Systems

### **SECTION 3.XX. ELECTRICITY-MEASURING DEVICES – TENTATIVE CODE**

This tentative code has only a trial or experimental status and is not intended to be enforced. The requirements are designed for study prior to the development and adoption of a final code. Officials wanting to conduct an official examination of an Electric Vehicle Supply Equipment (EVSE) or system are advised to see paragraph G-A.3. Special and Unclassified Equipment.  
(Tentative Code Added 20XX)

#### **A. APPLICATION**

**A.1. General.** – This code applies to devices, accessories, and systems used for the measurement of electricity dispensed in vehicle fuel applications wherein a quantity determination or statement of measure is used wholly or partially as a basis for sale or upon which a charge for service is based.

**A.2. Exceptions.** – This code does not apply to:

- (a) The use of any measure or measuring device owned, maintained, and used by a public utility or municipality only in connection with measuring electricity subject to the authority having jurisdiction such as the Public Utilities Commission.
- (b) Electric Vehicle Supply Equipment (EVSEs) used solely for dispensing electrical energy in connection with operations in which the amount dispensed does not affect customer charges or compensation.
- (c) The wholesale delivery of electricity.

**A.3. Additional Code Requirements.** – In addition to the requirements of this code, Electricity-Measuring Devices shall meet the requirements of Section 1.10. General Code.

**A.3.1. Electric Vehicle Supply Equipment (EVSE) with Integral Time-Measuring Devices.** – An EVSE that is used for both the sale of electricity as vehicle fuel and used to measure time during which services (e.g., vehicle parking) are received. These devices shall also meet the requirements of Section 5.55. Timing Devices.

**A.4. Type Evaluation.** – The National Type Evaluation Program (NTEP) will accept for type evaluation only those EVSEs that comply with all requirements of this code and have received safety certification by a Nationally Recognized Testing Laboratory (NRTL).

## **S. SPECIFICATIONS**

### **S.1. Primary Indicating and Recording Elements.**

**S.1.1. Electric Vehicle Supply Equipment (EVSE).** – An EVSE used to charge electric vehicles shall be of the computing type and shall indicate the electrical energy, the unit price, and the total price of each transaction.

- (a) EVSEs capable of applying multiple unit prices over the course of a single transaction shall also be capable of indicating the start and stop time, the total quantity of energy delivered, the unit price, and the total price for the quantity of energy delivered during each discrete phase corresponding to one of the multiple unit prices.
- (b) EVSEs capable of applying additional fees for time-based and other services shall also be capable of indicating the total time measured; the unit price(s) for the additional time based service(s); the total computed price(s) for the time measured; and the total transaction price, including the total price for the energy and all additional fees.

**S.1.2. EVSE Indicating Elements.** – An EVSE used to charge electric vehicles shall include an indicating element that accumulates continuously and displays, for a minimum of 15 seconds at the activation by the user and at the start and end of the transaction, the correct measurement results relative to quantity and total price. Indications shall be clear, definite, accurate, and easily read under normal conditions of operation of the device. All indications and representations of electricity sold shall be clearly identified and separate from other time-based fees indicated by an EVSE that is used for both the sale of electricity as vehicle fuel and the sale of other separate time-based services (e.g., vehicle parking).

**S.1.2.1. Multiple EVSEs Associated with a Single Indicating Element** - A system with a single indicating element, for two or more EVSEs, shall be provided with means to display information from the individual EVSE(s) selected or displayed, and shall be provided with automatic means to indicate clearly and definitely which EVSE is associated with the displayed information.

### **S.1.3. EVSE Units.**

**S.1.3.1. EVSE Units of Measurement.** –EVSEs used to charge electric vehicles shall be indicated and recorded in megajoules (MJ) or kilowatt-hours (kWh) and decimal subdivisions thereof.

**S.1.3.2. EVSE Value of Smallest Unit.** – The value of the smallest unit of indicated delivery by an EVSE, and recorded delivery, if the EVSE is equipped to record, shall be 0.005 MJ or 0.001 kWh.

**S.1.3.3. Values Defined.** – Indicated values shall be adequately defined by a sufficient number of figures, words, symbols, or combinations thereof. An indication of “zero” shall be a zero digit for all displayed digits to the right of the decimal mark and at least one to the left.

### **S.2. EVSE Operating Requirements.**

#### **S.2.1. EVSE Return to Zero.**

- (a) The primary indicating and the primary recording elements of an EVSE used to charge electric vehicles, if the EVSE is equipped to record, shall be provided with a means for readily returning the indication to zero either automatically or manually.

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

**S.2.2. EVSE Indicator Zero Reset Mechanism.** – The reset mechanism for the indicating element of an EVSE used to charge electric vehicles shall not be operable during a transaction. Once the zeroing operation has begun, it shall not be possible to indicate a value other than the latest measurement, or “all zeros,” blank the indication, or provide other indications that cannot be interpreted as a measurement during the zeroing operation.

**S.2.3. EVSE Provision for Power Loss.**

**S.2.3.1. Transaction Information.** – In the event of a power loss, the information needed to complete any transaction (i.e., delivery is complete and payment is settled) in progress at the time of the power loss (such as the quantity and unit price, or sales price) shall be determinable through one of the means listed below or the transaction shall be terminated without any charge for the electrical energy transfer to the vehicle:

- at the EVSE;
- at the console, if the console is accessible to the customer;
- via on site internet access ; or
- through toll-free phone access.

For EVSEs in parking areas where vehicles are commonly left for extended periods, the information needed to complete any transaction in progress at the time of the power loss shall be determinable through one of the above means for at least 8 hours.

**S.2.3.2. Transaction Termination.** - In the event of a power loss, either: (a) the transaction shall terminate at the time of the power loss; or (b) the EVSE may continue charging without additional authorization if the EVSE is able to determine it is connected to the same vehicle before and after the supply power outage . In either case, there must be a clear indication on the receipt provided to the customer of the interruption, including the date and time of the interruption along with other information required under S.2.6. EVSE Recorded Representations.

**S.2.3.3. User Information.** – The EVSE memory, or equipment on the network supporting the EVSE, shall retain information on the quantity of fuel dispensed and the sales price totals during power loss.

**S.2.4. EVSE Indication of Unit Price and Equipment Capacity and Type of Voltage.**

**S.2.4.1. Unit Price.** – An EVSE shall be able to indicate on each face the unit price at which the EVSE is set to compute or to dispense at any point in time during a transaction.

**S.2.4.2. Equipment Capacity and Type of Voltage.** – An EVSE shall be able to conspicuously indicate on each face the maximum rate of energy transfer (i.e., maximum power) and type of current associated with each unit price offered (e.g., 7 kW AC, 25 kW DC, etc.).

**S.2.4.3. Selection of Unit Price.** – When electrical energy is offered for sale at more than one unit price through an EVSE, the selection of the unit price shall be made prior to delivery through a deliberate action of the purchaser to select the unit price for the fuel delivery. Except when the conditions for variable price structure have been approved by the customer prior to the sale, a system shall not permit a change to the unit price during delivery of electrical energy.

Note: When electrical energy is offered at more than one unit price, selection of the unit price may be through the deliberate action of the purchaser: 1) using controls on the EVSE; 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.2.4.4. Agreement Between Indications.** – All quantity, unit price, and total price indications within a measuring system shall agree for each transaction.

**S.2.5. EVSE Money-Value Computations.** – An EVSE shall compute the total sales price at any single-purchase unit price for which the electrical energy being measured is offered for sale at any delivery possible within either the measurement range of the EVSE or the range of the computing elements, whichever is less.

**S.2.5.1. Money-Value Divisions Digital.** – An EVSE with digital indications 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 0.5 MJ or 0.1 kWh.

**S.2.5.2. Auxiliary Elements.** – If a system is equipped with auxiliary indications, all indicated money value and quantity divisions of the auxiliary element shall be identical with those of the primary element.

**S.2.6. EVSE Recorded Representations.** – a receipt providing the following information shall be available through a built-in or separate recording element at the completion of all transactions:

- (a) the total quantity of the energy delivered with unit of measure;
- (b) the total computed price of the energy sale;
- (c) the unit price of the energy; (for systems capable of applying multiple unit prices for energy during a single transaction, the following additional information is required):
  - (1) the start and stop time of each phase during which one of the multiple unit prices was applied;
  - (2) the unit price applied during each phase;
  - (3) the total quantity of energy delivered during each phase;
  - (4) the total purchase price for the quantity of energy delivered during each phase;
- (d) the maximum rate of energy transfer (i.e., maximum power) and type of current (e.g., 7 kW AC, 25 kW DC, etc.);
- (e) any additional separate charges included in the transaction (e.g., charges for parking time) including:
  - (1) the time and date when the service ends and the time and date when the service begins; or the total time interval purchased, and the time and date that the service either begins or ends;
  - (2) the unit price applied for the time-based service;
  - (3) The total purchase price for the quantity of time measured during the complete transaction;
- (f) the final total price of the complete transaction including all items;
- (g) the unique EVSE identification number;
- (h) the business name; and
- (i) the business location.

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.).

**S.2.7. Indication of Delivery.** – The EVSE shall automatically show on its face the initial zero condition and the quantity delivered (up to the capacity of the indicating elements).

**S.3. Design of Measuring Elements and Measuring Systems.**

**S.3.1. Metrological Components.** – An EVSE measuring system shall be designed and constructed so that metrological components are adequately protected from environmental conditions likely to be detrimental to accuracy. The system shall be designed to prevent undetected access to adjustment mechanisms and terminal blocks by providing for application of a physical security seal or an audit trail.

**S.3.2. Terminals.** – The terminals of the EVSE system shall be arranged so that the possibility of short circuits while removing or replacing the cover, making connections, or adjusting the system, is minimized.

**S.3.3. Provision for Sealing.** – Adequate provision shall be made for an approved means of security (e.g., data change audit trail) or physically applying security seals in such a manner that no adjustment may be made of:

- (a) each individual measurement element;
- (b) any adjustable element for controlling voltage or current when such control tends to affect the accuracy of deliveries;
- (c) any adjustment mechanism that corrects or compensates for energy loss between the system and vehicle connection; and
- (d) any metrological parameter that detrimentally affects the metrological integrity of the EVSE or system.

When applicable, the adjusting mechanism shall be readily accessible for purposes of affixing a security seal. Audit trails shall use the format set forth in Table S.3.4. Categories of Device and Methods of Sealing.

<b><u>Table S.3.4.</u></b> <b><u>Categories of Device and Methods of Sealing</u></b>	
<b><u>Categories of Device</u></b>	<b><u>Method of Sealing</u></b>
<b><u>Category 1:</u></b> No remote configuration capability.	<u>Seal by physical seal or two event counters: one for calibration parameters and one for configuration parameters.</u>
<b><u>Category 2:</u></b> Remote configuration capability, but access is controlled by physical hardware.  <u>The device shall clearly indicate that it is in the remote configuration mode and record such message if capable of printing in this mode or shall not operate while in this mode.</u>	<u>The hardware enabling access for remote communication must be on-site. The hardware must be sealed using a physical seal or an event counter for calibration parameters and an event counter for configuration parameters. The event counters may be located either at the individual measuring EVSE or at the system controller; however, an adequate number of counters must be provided to monitor the calibration and configuration parameters of the individual EVSEs at a location. If the counters are located in the system controller rather than at the individual EVSE, means must be provided to generate a hard copy of the information through an on-site device.</u>

<p><b>Category 3:</b> Remote configuration capability access may be unlimited or controlled through a software switch (e.g., password).</p> <p>The device shall clearly indicate that it is in the remote configuration mode and record such message if capable of printing in this mode or shall not operate while in this mode.</p>	<p>An event logger is required in the device; it must include an event counter (000 to 999), the parameter ID, the date and time of the change, and the new value of the parameter. A printed copy of the information must be available through the EVSE or through another on-site device. The event logger shall have a capacity to retain records equal to 10 times the number of sealable parameters in the EVSE, but not more than 1000 records are required. <b>(Note:</b> Does not require 1000 changes to be stored for each parameter.)</p>
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#### **S.3.4. Data Storage and Retrieval.**

- (a) EVSE data accumulated and indicated shall be unalterable and accessible.
- (b) Values indicated or stored in memory shall not be affected by electrical, mechanical or temperature variations, radio-frequency interference, power failure, or any other environmental influences to the extent that accuracy is impaired.
- (c) Memory and/or display shall be recallable for a minimum of three years. A replaceable battery shall not be used for this purpose.

**S.3.5. Temperature Range for System Components.** – EVSEs shall be accurate and correct over the temperature range of -40 °C to +85 °C (-40 °F to 185 °F). If the system or any measuring system components are not capable of meeting these requirements, the temperature range over which the system is capable shall be stated on the NTEP CC, marked on the EVSE, and installations shall be limited to the narrower temperature limits.

#### **S.4. Connections.**

**S.4.1. Diversion of Measured Electricity.** – No means shall be provided by which any measured electricity can be diverted from the measuring device.

**S.4.1.1. Unauthorized Disconnection.** - Means shall be provided to automatically terminate the transaction in the event that there is an unauthorized break in the connection with the vehicle.

**S.4.2. Directional Control.** – If a reversal of energy flow could result in errors that exceed the tolerance for the minimum measured quantity, effective means, automatic in operation to prevent or account for the reversal of flow shall be properly installed in the system. (See N.3. Minimum Test Draft (Size))

**S.5. Markings.** – The following identification and marking requirements are in addition to the requirements of Section 1.10 General Code, paragraph G-S.1. Identification.

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

- (a) within 60 cm (24 in) to 150 cm (60 in) from ground level;
- (b) on a portion of the EVSE that cannot be readily removed or interchanged (e.g., not on a service access panel).

**S.5.2. EVSE Identification and Marking Requirements.** – In addition to all the marking requirements of Section 1.10 General Code, paragraph G-S.1. Identification, each EVSE shall have the following information conspicuously, legibly, and indelibly marked:



- (a) Voltage rating;
- (b) Maximum current deliverable;
- (c) Type of current (AC or DC or, if capable of both, both shall be listed);
- (d) Minimum measured quantity (MMQ); and
- (e) Temperature limits, if narrower than and within -20°C to +50°C (-4°F to 122°F).

**S.5.3. Abbreviations and Symbols.** – The following abbreviations or symbols may appear on an EVSE system.

- (a) VAC = Volts Alternating Current;
- (b) VDC = Volts Direct Current;
- (c) MDA = maximum deliverable amperes;
- (d) J = Joule.

**S.6. Printer.** – When assembly system is equipped with means for printing the measured quantity, the printed information must agree with the indications on the EVSE for the transaction and the printed values shall be clearly defined.

**S.6.1. Printed Receipt.** – Any delivered, printed quantity shall include an EVSE identification number that uniquely identifies the EVSE from all other EVSEs within the seller's facility, the time and date, and the name of the seller. This information may be printed by the EVSE system or pre-printed on the ticket.

**S.7. Totalizers for EVSE Systems.** – EVSE systems shall be designed with a nonresettable totalizer for the quantity delivered through each separate measuring device. Totalizer information shall be adequately protected and unalterable. Totalizer information shall be provided by the system and readily available on site or via on site internet access.

**S.8. Minimum Measured Quantity.** – The minimum measured quantity shall satisfy the conditions of use of the measuring system as follows:

- (a) Measuring systems shall have a minimum measured quantity not exceeding 2.5 MJ or 0.5 kWh.

## **N. NOTES**

**N.1. No Load Test.** – A no load test may be conducted on an EVSE measuring system by applying rated voltage to the system under test and no load applied.

**N.2. Starting Load Test.** – A system starting load test maybe conducted by applying rated voltage and 0.5-ampere load.

**N.3. Minimum Test Draft (Size).** – Full and light load tests shall require test of the EVSE System for a delivery of the minimum measured quantity as declared by the manufacturer.

**N.4. EVSE System Test Loads.** - EVSE measuring system testing shall be accomplished by connecting the test load and test standard at the point where the fixed cord is connected to the vehicle. Losses in the cord between the meter under test and the test standard should be automatically corrected for in the EVSE quantity indication for direct comparison to the test standard and also while the EVSE is in normal operation. For EVSEs that require a customer supplied cord, system testing shall be accomplished by connecting the test load and test standard at the point where the customer's cord is connected to the EVSE.

#### **N.5. Test of an EVSE System.**

**N.5.1 Performance Verification in the Field** – Testing in the field is intended to validate the transactional accuracy of the EVSE system. The following testing is deemed sufficient for field a validation.

**N.5.2 Accuracy Testing** – The testing methodology compares the total energy delivered in a transaction and the total cost charged as displayed/reported by the EVSE with that measured by the measurement standard.

(a) For AC systems:

(1) Accuracy test of the EVSE system at a load of not less than 85 percent of the maximum deliverable current (MDA) as determined from the pilot signal for a total energy delivered of at least twice the minimum measured quantity (MMQ). If the MDA would result in maximum deliverable power of greater than 7.2kW, then the test may be performed at 7.2kW.

(2) Accuracy test of the EVSE system at a load of not greater than 10 percent of the maximum deliverable current (MDA) as determined from the pilot signal for a total energy delivered of at least the minimum measured quantity (MMQ).

(b) For DC systems (see note):

(1) Accuracy test of the EVSE system at a load of not less than 85 percent of the maximum deliverable current (MDA) as determined from the pilot signal for a total energy delivered of at least twice the minimum measured quantity (MMQ).

(2) Accuracy test of the EVSE system at a load of not more than 10 percent of the maximum deliverable current (MDA) as determined from the pilot signal for a total energy delivered of at least the minimum measured quantity (MMQ).

Note: For DC systems it is anticipated that an electric vehicle may be used as the test load. Under that circumstance testing at the load presented by the vehicle shall be sufficient.

**N.6. Repeatability Tests.** – Tests for repeatability should include a minimum of three consecutive tests at the same load, similar time period, etc. and be conducted under conditions where variations in factors are reduced to minimize the effect on the results obtained.

#### **T. TOLERANCES**

##### **T.1. Tolerances, General.**

(a) The tolerances apply equally to errors of underregistration and errors of overregistration.

(b) The tolerances apply to all deliveries measured at any load within the rated measuring range of the EVSE.

(c) Where instrument transformers or other components are used, the provisions of this section shall apply to all system components.

**T.2. Load Test Tolerances.**

**T.2.1. EVSE Load Test Tolerances.** – The tolerances for EVSE load tests are Acceptance Tolerance: 1.0 % and Maintenance Tolerance: 2.0 %.

**T.3. Repeatability.** – When multiple load tests are conducted at the same load condition, the range of the load test results shall not exceed 25% of the absolute value of the maintenance tolerance and the results of each test shall be within the applicable tolerance.

**T.4. Tolerance Application in Type Evaluation Examinations for EVSEs.** – For type evaluation examinations, the acceptance tolerance values shall apply under the following conditions:

- (a) at any temperature, voltage, load, and power factor within the operating range of the EVSE, and
- (b) regardless of the influence factors in effect at the time of the conduct of the examination, and
- (c) for all quantities greater than the minimum measured quantity.

**T 5. No Load Test.** – An EVSE measuring system shall not register when no load is applied.

**T.6. Starting Load.** – An EVSE measuring system shall register starting load test at a 0.5 ampere load.

**UR. USER REQUIREMENTS**

**UR.1. Selection Requirements.**

**UR.1.1. Computing-Type Device; Retail EVSE.** – An EVSE used to charge electric vehicles shall be of the computing type and shall indicate the electrical energy, the unit price, and the total price of each delivery.

**UR.1.2. Connection Cord-Length.** – An adequate means for cord management shall be in use when the cord exceeds 25 ft in length.

**UR.2. Installation Requirements.**

**UR.2.1. Maximum Deliverable Current.** – The marked maximum deliverable current shall not exceed the total capacity in amperes of the EVSE or the thermal overload protectors of the installation site.

**UR.2.2. Manufacturer's Instructions.** – An EVSE shall be installed in accordance with the manufacturer's instructions, and the installation shall be sufficiently secure and rigid to maintain this condition.

**UR.2.3. Load Range.** – An EVSE shall be installed so that the current and voltage will not exceed the rated maximum values over which the EVSE is designed to operate continuously within the specified accuracy. Means to limit current and/or voltage shall be incorporated in the installation if necessary.

**UR.2.4. Regulation Conflicts and Permit Compliance.** – If any provision of Section UR.2. Installation Requirements is less stringent than that required of a similar installation by the serving utility, the installation shall be in accordance with those requirements of the serving utility.

The installer of any EVSE shall obtain all necessary permits.

**UR. 2.5. Responsibility, Unattended EVSE.** – An unattended EVSE shall have clearly and conspicuously displayed thereon, or immediately adjacent thereto, adequate information detailing the name, address, and phone number of the local responsible party for the device.

### **UR.3. Use of EVSE.**

**UR.3.1. Unit Price for Retail EVSE Devices.** – The unit price at which the EVSE is set to compute shall be conspicuously displayed or posted on the face of a retail EVSE used in direct sale.

**UR.3.2. Return of Indicating and Recording Elements to Zero.** – The primary indicating elements (visual) and the primary recording elements shall be returned to zero immediately before each transaction.

**UR.3.3. Printed Ticket.** – A receipt providing the following information shall be available through a built-in or separate recording element at the completion of all transactions:

- (a) the total quantity of the energy delivered with unit of measure;
- (b) the total computed price of the energy sale;
- (c) the unit price of the energy; (for systems capable of applying multiple unit prices for energy during a single transaction, the following additional information is required):
  - (1) the start and stop time of each phase during which one of the multiple unit prices was applied;
  - (2) the unit price applied during each phase;
  - (3) the total quantity of energy delivered during each phase;
  - (4) the total purchase price for the quantity of energy delivered during each phase;
- (d) the maximum rate of energy transfer (i.e., maximum power) and type of current (e.g., 7 kW AC, 25 kW DC, etc.);
- (e) any additional separate charges included in the transaction (e.g., charges for parking time) including:
  - (1) the time and date when the service ends and the time and date when the service begins; or the total time interval purchased, and the time and date that the service either begins or ends;
  - (2) the unit price applied for the time-based service;
  - (3) The total purchase price for the quantity of time measured during the complete transaction;
- (f) the final total price of the complete transaction including all items;
- (g) the unique EVSE identification number;
- (h) the business name; and
- (i) the business location.

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.).

**UR.3.4. EVSE in Operation.** – **The EVSE shall be permanently, plainly, and visibly identified so that it is clear which EVSE and connector is in operation.**

**UR.3.5. Steps After Charging.** – After delivery to a customer from a retail EVSE:

- (a) the EVSE shall be shut-off at the end of a charge, through an automatic interlock that prevents subsequent charging until the indicating elements and recording elements, if the EVSE is equipped and activated to record, have been returned to their zero positions; and

- (b) the vehicle connector shall not be returned to its starting position unless the zero set-back interlock is engaged or becomes engaged by the act of disconnecting from the vehicle or the act of returning the connector to the starting position.

## HANDBOOK 44, APPENDIX D. DEFINITIONS

The specific code to which the definition applies is shown in [brackets] at the end of the definition. Definitions for the General Code [1.10] apply to all codes in Handbook 44.

### A

**active (real) power.** – The component of electric power that performs work, typically measured in kilowatts (kW) or megawatts (MW). Also known as "real power." The terms "active" or "real" power are used to modify the base term "power" to differentiate it from reactive and apparent power. The active power ( $P_{ac}$ ) or real power measured by a system, is the product of voltage (E) times current (I) times the cosine of the angle by which the current lags the voltage ( $\cos \phi$ ) or power factor (pf).  $P_{ac} = (E) (I) (\cos \phi)$  where  $\phi$  is the phase angle of the lag.[3.XX]  
(Added 20XX)

**alternating current (AC).** – An electric current that reverses direction in a circuit at regular intervals.[3.XX]  
(Added 20XX)

**ampere.** – The practical unit of electric current. It is the quantity of current caused to flow by a potential difference of one volt through a resistance of one ohm. One ampere is equal to the flow of one coulomb of charge per second. One coulomb is the unit of electric charge equal in magnitude to the charge of  $6.24 \times 10^{18}$  electrons.[3.XX]  
(Added 20XX)

**apparent power.** – The product of the RMS current (I) and the RMS voltage (E) in a circuit.[3.XX]  
(Added 20XX)

**audit trail.** – An electronic count and/or information record of the changes to the values of the calibration or configuration parameters of a device.[1.10, 2.20, 2.21, 2.24, 3.30, 3.37, 3.39, 3.XX, 5.56(a)]  
(Added 1993) (Amended 20XX)

### B

**balanced load.** – Balanced load is used to indicate equal currents in all phases and relatively equal voltages between phases and between each phase and neutral (if one exists); with approximately equal watts in each phase of the load.[3.XX]  
(Added 20XX)

**basic lightning impulse insulation level (BIL).** – A specific insulation level expressed in kilovolts of the crest value of a standard lightning impulse. (Example: BIL = 10 Kv)[3.XX]  
(Added 20XX)

**burden (B).** – The impedance of the circuit connected to the instrument transformer's secondary winding. (Example: B = 21 Ohms Max.)[3.XX]  
(Added 20XX)

### C

**calibration parameter.** – Any adjustable parameter that can affect measurement or performance accuracy and, due to its nature, needs to be updated on an ongoing basis to maintain device accuracy, e.g., span adjustments, linearization factors, and coarse zero adjustments.[2.20, 2.21, 2.24, 3.30, 3.37, 3.39, 3.XX, 5.56(a)]  
(Added 1993) (Amended 20XX)

**central location.** – A laboratory or shop used for the testing of systems to measure in-service accuracy.[3.XX]  
(Added 20XX)

**configuration parameter.** – Any adjustable or selectable parameter for a device feature that can affect the accuracy of a transaction or can significantly increase the potential for fraudulent use of the device and, due to its nature, needs to be updated only during device installation or upon replacement of a component, e.g., division value (increment), sensor range, and units of measurement.[2.20, 2.21, 2.24, 3.30, 3.37, 3.XX, 5.56(a)]  
(Added 1993) (Amended 20XX)

**connection line impedance.** – The impedance of the circuit used to convey energy sold from a fueling device to the storage of an electric vehicle.[3.XX]  
(Added 20XX)

**creep.** – A continuous apparent measurement of energy indicated by a system with operating voltage applied and no power consumed (load terminals open circuited) .[3.XX]  
(Added 20XX)

**current.** – The rate of the flow of electrical charge past any one point in a circuit. The unit of measurement is amperes or coulombs per second.[3.XX]  
(Added 20XX)

## D

**direct current (DC).** – an electric current that flows in one direction.  
(Added 20XX)

## E

**electric vehicle, plug-in.** – A vehicle that employs electrical energy as a primary or secondary mode of propulsion. Plug-in electric vehicles may be all-electric vehicles (EV's) or plug-in hybrid electric vehicles (PHEV's). All-electric vehicles are powered by an electric motor and battery at all times. All-electric vehicles may also be called battery-electric vehicles (BEV's). Plug-in hybrid electric vehicles employ both an electric motor and an internal combustion engine that consumes either conventional or alternative fuel or a fuel cell. In a parallel type hybrid-electric vehicle, either the electric motor or the engine may propel the vehicle. In a series type hybrid-electric vehicle, the engine or fuel cell generates electricity that is then used by the electric motor to propel the vehicle. EV's, BEV's, and PHEV's are capable of receiving and storing electricity via connection to an external electrical supply. Not all hybrid-electric vehicles are of the plug-in type. Hybrid-electric vehicles that do not have the capability to receive electrical energy from an external supply (HEV's) generate electrical energy onboard with the internal combustion engine, regenerative braking, or both.[3.XX]  
(Added 20XX)

**electric vehicle supply equipment (EVSE).** – A device or system designed and used specifically to transfer electrical energy to an electric vehicle, either as charge transferred via physical or wireless connection, by loading a fully charged battery, or by other means.[3.XX]  
(Added 20XX)

**electricity as vehicle fuel.** – Electrical energy transferred to and/or stored onboard an electric vehicle primarily for the purpose of propulsion.[3.XX]  
(Added 20XX)

**electricity meter.** – A device that measures and registers the integral of an electrical quantity with respect to time.[3.XX]

**element (stator).** – A combination of a voltage-sensing unit and a current-sensing unit, which provides an output proportional to the quantities measured.[3.XX]  
(Added 20XX)

**energy.** – The integral of active power with respect to time.[3.XX]  
(Added 20XX)

**energy flow.** – The flow of energy between line and load terminals (conductors) of an electricity system. Flow from the line to the load terminals is considered energy delivered. Energy flowing in the opposite direction (i.e., from the load to line terminals) is considered as energy received.[3.XX]  
(Added 20XX)

**equipment, commercial.** – Weights, measures, and weighing and measuring devices, instruments, elements, and systems or portion thereof, used or employed in establishing the measurement or in computing any basic charge or payment for services rendered on the basis of weight or measure. As used in this definition, measurement includes the determination of size, quantity, value, extent, area, composition (limited to meat and poultry), constituent value (for grain), or measurement of quantities, things, produce, or articles for distribution or consumption, purchased, offered, or submitted for sale, hire, or award.[1.10, 2.20, 2.21, 2.22, 2.24, 3.30, 3.31, 3.32, 3.33, 3.34, 3.35, 3.38, 3.XX, 4.40, 5.51, 5.56.(a), 5.56.(b), 5.57, 5.58, 5.59]  
(Added 2008) (Amended 20XX)

**event counter.** – A nonresettable counter that increments once each time the mode that permits changes to sealable parameters is entered and one or more changes are made to sealable calibration or configuration parameters of a device.[2.20, 2.21, 3.30, 3.37, 3.39, 3.XX, 5.54, 5.56(a), 5.56(b), 5.57]  
(Added 1993) (Amended 20XX)

**event logger.** – A form of audit trail containing a series of records where each record contains the number from the event counter corresponding to the change to a sealable parameter, the identification of the parameter that was changed, the time and date when the parameter was changed, and the new value of the parameter.[2.20, 2.21, 3.30, 3.37, 3.39, 3.XX, 5.54, 5.56(a), 5.56(b), 5.57]  
(Added 1993) (Amended 20XX)

**EVSE field reference standard.** – A portable apparatus that is traceable to NIST and is used as a standard to test EVSEs in commercial applications. This instrument is also known as a portable standard or working standard.[3.XX]  
(Added 20XX)

## F

**face.** – That portion of a computing-type pump or dispenser which displays the actual computation of price per unit, delivered quantity, and total sale price. In the case of some electronic displays, this may not be an integral part of the pump or dispenser.[3.30, 3.XX]  
(Added 1987) (Amended 20XX)

**form designation (FM).** –An alphanumeric designation denoting the circuit arrangement for which the meter is applicable and its specific terminal arrangement. The same designation is applicable to equivalent meters for all manufacturers. (Example: FM 2S)[3.XX]  
(Added 20XX)

## H

**hertz (Hz).** – Frequency or cycles per second. One cycle of an alternating current or voltage is one complete set of positive and negative values of the current or voltage.[3.XX]  
(Added 20XX)

## I

**instrument transformer ratio.** – The stated ratio of the primary circuit current or voltage compared to the secondary circuit current or voltage. (Example: CTR = 200 : 0.1)[3.XX]  
(Added 20XX)

## J

**megajoule (MJ).** – An SI unit of energy equal to 1,000,000 joules.[3.XX]  
(Added 20XX)

## K

**kilowatt (kW).** – A unit of power equal to 1,000 watts.[3.XX]  
(Added 20XX)

**kilowatt-hour (kWh).** – A unit of energy equal to 1,000 watthours.[3.XX]  
(Added 20XX)

## L

**line service.** – The service terminals or conductors connecting the EVSE to the power source.[3.XX]  
(Added 20XX)

**load service.** – The service terminals or conductors connecting the EVSE to the electrical load (e.g., vehicle, tenant, etc.)[3.XX]  
(Added 20XX)

**load, full.** – A test condition with rated voltage, current at 100% of test amps level, and power factor of 1.0.[3.XX]  
(Added 20XX)

**load, light.** – A test condition with rated voltage, current at 10% of test amps level, and power factor of 1.0.[3.XX]  
(Added 20XX)

## M

**master meter, electric.** – An electric watthour meter owned, maintained, and used for commercial billing purposes by the serving utility. All the electric energy served to a submetered service system is recorded by the master meter.[3.XX]  
(Added 20XX)

**meter, electricity.** – An electric watthour meter.[3.XX]  
(Added 20XX)

**metrological components.** – Elements or features of a measurement device or system that perform the measurement process or that may affect the final quantity determination or resulting price determinations. This includes accessories that can affect the validity of transactions based upon the measurement process. The



measurement process includes determination of quantities; the transmission, processing, storage, or other corrections or adjustments of measurement data or values; and the indication or recording of measurement values or other derived values such as price or worth or charges.[3.XX]  
(Amended 20XX)

## N

**nationally recognized testing laboratory (NRTL).** – A laboratory that conducts testing and certification that is recognized by OSHA.[3.XX]  
(Added 20XX)

**nonresettable totalizer.** – An element interfaced with the measuring or weighing element that indicates the cumulative registration of the measured quantity with no means to return to zero.[3.30, 3.37, 3.39, 3.XX]  
(Amended 20XX)

## O

**ohm.** – The practical unit of electric resistance that allows one ampere of current to flow when the impressed potential is one volt.[3.XX]  
(Added 20XX)

## P

**percent registration.** – Percent registration is calculated as follows:

$$\text{Percent Registration} = \frac{\text{Wh measured by EVSE}}{\text{Wh measured by STANDARD}} \times 100$$

[3.XX]  
(Added 20XX)

**percent error.** – Percent Error = Percent Registration – 100. A system is said to be “slow” that has percent registration below 100% and negative percent error.[3.XX]  
(Added 20XX)

**point-of-sale system.** – An assembly of elements including a weighing or measuring element, an indicating element, and a recording element (and may also be equipped with a “scanner”) used to complete a direct sales transaction.[2.20, 3.30, 3.32, 3.37, 3.39, 3.XX]  
(Added 1986) (Amended 1997 and 20XX)

**power factor.** – The ratio of the active power to the apparent power in an AC circuit. The power factor is a number between 0 and 1 that is equal to 1 when the voltage and current are in phase (load is entirely resistive).[3.XX]  
(Added 20XX)

**primary indicating or recording elements.** – The term “primary” is applied to those principal indicating (visual) elements and recording elements that are designed to, or may, be used by the operator in the normal commercial use of a device. The term “primary” is applied to any element or elements that may be the determining factor in arriving at the sale representation when the device is used commercially. (Examples of primary elements are the visual indicators for meters or scales not equipped with ticket printers or other recording elements and both the visual indicators and the ticket printers or other recording elements for meters or scales so equipped.) The term “primary” is not applied to such auxiliary elements as, for example, the totalizing register or predetermined-stop mechanism on a meter or the means for producing a running record of successive weighing operations, these elements being supplementary to those that are the determining factors in sales representations of individual deliveries or weights. (See “indicating element” and “recording element.”)[1.10, 3.XX]  
(Amended 20XX)

**primary watthour constant (PK<sub>h</sub>).** – The meter watthour constant per revolution or pulse (K<sub>h</sub>) multiplied by the product of the current and/or voltage transformer ratio(s):

$$PK_h = K_h (\text{Current Transformer Ratio} \times \text{Voltage Transformer Ratio})$$

[3.XX]

(Added 20XX)

## R

**reactive power.** – For sinusoidal quantities in a two-wire circuit, reactive power is the product of the voltage, the current, and the sine of the phase angle between them, using the current as the reference.[3.XX]

(Added 20XX)

**recorded representation.** – The printed, electronically recorded, or other representation that retains a copy of the quantity and any other required information generated by a weighing or measuring device.[1.10, 3.XX]

(Amended 20XX)

**recording element.** – An element incorporated, connected to, or associated with ~~in~~ a weighing or measuring device by means of which its performance relative to quantity or money value is permanently recorded in a printed or electronic form.[1.10, 3.XX]

(Amended 20XX)

**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 itself necessary to the operation of the weighing or measuring device or is not a permanent part of that device.[2.20, 2.21, 2.24, 3.30, 3.37, 3.39, 3.XX, 5.56(a)]

(Added 1993) (Amended 20XX)

**retail device.** – A measuring device primarily used to measure electrical energy for the purpose of sale to the end user.[3.30, 3.32, 3.37, 3.39, 3.XX]

(Amended 1987, ~~and~~ 2004, and 20XX)

**revolution equivalent.** – The number of watthours represented by one increment (pulse period) of serial data.[3.XX]

(Added 20XX)

**root mean square (RMS).** – The mathematical convention used to describe the average quantity of a property (such as current) that is varying as a sine wave.[3.XX]

(Added 20XX)

## S

**serving utility.** – The utility distribution company that owns the master meter and sells electric energy to the owner of a submeter system.[3.XX]

(Added 20XX)

**starting load.** – The minimum load above which the device will indicate energy flow continuously.[3.XX]

(Added 20XX)

**submeter.** – A system furnished, owned, installed, and maintained by the customer who is served through a utility owned master meter.[3.XX]

(Added 20XX)

## T

**tenant.** – The person or persons served electric energy from a submetered service system.[3.XX]

(Added 20XX)

**test accuracy – in-service.** – The device accuracy determined by a test made during the period that the system is in service. It may be made on the customer's premises without removing the system from its mounting, or by removing the EVSE for testing either on the premises or in a laboratory or shop.[3.XX]

(Added 20XX)

**test amperes (TA).** – The full load current (amperage) specified by the EVSE manufacturer for testing and calibration adjustment. (Example: TA 30)[3.XX]

(Added 20XX)

**test block.** – Device that facilitates safe meter testing by disconnecting the meter from the circuit without interrupting the service to the tenant.[3.XX]

(Added 20XX)

**thermal overload protector.** – A circuit breaker or fuse that automatically limits the maximum current in a circuit.[3.XX]

(Added 20XX)

## U

**unit price.** – The price at which the electrical energy is being sold and expressed in whole units of measurement.[1.10, 3.30, 3.XX]

(Added 1992) (Amended 20XX)

## V

**vehicle connector.** - A device that by insertion into an vehicle inlet, establishes an electrical connection to the electric vehicle for the purpose of providing power and information exchange, with means for attachment of electric vehicle cable. This device is a part of the vehicle coupler.

(Added 20XX)

**vehicle coupler.** - A means enabling the connection, at will, of an electric vehicle cable to the equipment. It consists of a vehicle connector and a vehicle inlet.

(Added 20XX)

**vehicle inlet.** - The part incorporated in, or fixed to the vehicle, which receives power from a vehicle connector.

(Added 20XX)

**volt.** – The practical unit of electromotive force. One volt will cause one ampere to flow when impressed across a resistance of one ohm.[3.XX]

(Added 20XX)

**voltage transformer.** – A device that provides a secondary voltage that is a precise fraction of the primary voltage.[3.XX]

(Added 20XX)

## W

**watt.** – The practical unit of electric power. In an alternating-current circuit (AC), the power in watts is volts times amperes multiplied by the circuit power factor.[3.XX]

(Added 20XX)

**watthour (Wh).** – The practical unit of electric energy, which is expended in one hour when the average power consumed during the hour is one watt.[3.XX]

(Added 20XX)

**watthour – test constant ( $K_t$ ).** – The expression of the relationship between the energy applied to the meter system and corresponding occurrence of one test output indication expressed as watthours per test output indication.[3.XX]  
(Added 20XX)

## Appendix I

### Item 360-5: Electric Vehicle Fueling and Submetering

These proposed changes to Handbook 44 Section 5.55 Timing Devices Code are from the USNWM on EVFS and have been reviewed and forwarded to NCWM by each of the regional associations for national consideration. The submitter, the USNWG, and all four regionals propose that these changes be considered for voting in July 2015.

#### SECTION 5.55. TIMING DEVICES

##### A. APPLICATION

**A.1. General.** – This code applies to devices used to measure time during which services are being dispensed (such as vehicle parking, laundry drying, and car washing). **This code also applies to Electric Vehicle Supply Equipment (EVSE) when used to assess charges for time-based services in addition to those charged for electrical energy.**

**A.2. Additional Code Requirements.** – In addition to the requirements of this code, Timing Devices shall meet the requirements of Section 1.10. General Code.

##### S. SPECIFICATIONS

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

##### S.1.1. Primary Elements.

**S.1.1.1. General.** – A timing device shall be equipped with a primary indicating element, and may also be equipped with a primary recording element. **A timing device incorporated into an Electric Vehicle Supply Equipment system for use in assessing charges for timing separate from charges for electrical energy shall be equipped with the capability to provide a recorded representation of the transaction through a built-in or separate recording element.** A readily observable in-service light or other equally effective means that automatically indicates when laundry driers, vacuum cleaners, and car washes are in operation shall be deemed an appropriate primary indicating element.  
(Amended 1979)

**S.1.1.2. Units.** – A timing device shall indicate and record, if the device is equipped to record, the time in terms of minutes for time intervals of 60 minutes or less and in hours and minutes for time intervals greater than 60 minutes.

**S.1.1.3. Value of Smallest Unit.** – The value of the smallest unit of indicated time and recorded time, if the device is equipped to record, shall not exceed the equivalent of:

- (a) one-half hour on parking meters indicating time in excess of two hours;
  - (b) six minutes on parking meters indicating time in excess of one but not greater than two hours; or
  - (c) five minutes on all other devices, except those equipped with an in-service light.
- (Amended 1975)

**S.1.1.4. Advancement of Indicating and Recording Elements.** – Primary indicating and recording elements shall be susceptible to advancement only during the mechanical operation of the device, except that clocks may be equipped to manually reset the time.

**S.1.1.5. Operation of In-Service Indicator Light.** – For devices equipped with an in-service light indicator, the in-service light indicator shall be operative only during the time the device is in operation.

**S.1.1.6. Discontinuous Indicating Parking Meters.** – An indication of the time purchased shall be provided at the time the meter is activated in units of no more than one minute for times less than one hour and not more than two minutes for times of one hour or more. Convenient means shall be provided to indicate to the purchaser the unexpired time.  
(Added 1975) (Amended 1976)

## **S.1.2. Graduations.**

**S.1.2.1. Length.** – Graduations shall be so varied in length that they may be conveniently read.

**S.1.2.2. Width.** – In any series of graduations, the width of a graduation shall in no case be greater than the width of the minimum clear interval between graduations and the width of main graduations shall be not more than 50 % greater than the width of subordinate graduations. Graduations shall in no case be less than 0.2 mm (0.008 in) in width.

**S.1.2.3. Clear Interval Between Graduations.** – The clear interval shall be not less than 0.75 mm (0.03 in). If the graduations are not parallel, the measurement shall be made:

- (a) along the line of relative movement between the graduations at the end of the indicator; or
- (b) if the indicator is continuous, at the point of widest separation of the graduations.

## **S.1.3. Indicators.**

**S.1.3.1. Symmetry.** – The index of an indicator shall be symmetrical with respect to the graduations, at least throughout that portion of its length associated with the graduations.

**S.1.3.2. Length.** – The index of an indicator shall reach to the finest graduations with which it is used, unless the indicator and the graduations are in the same plane, in which case the distance between the end of the indicator and the ends of the graduations, measured along the line of the graduations, shall be not more than 1.0 mm (0.04 in).

**S.1.3.3. Width.** – The width of the index of an indicator in relation to the series of graduations with which it is used shall be not greater than:

- (a) the width of the widest graduation; and
- (b) the width of the minimum clear interval between the graduations.

**S.1.3.4. Parallax.** – Parallax effect shall be reduced to a practicable minimum.

## **S.1.4. ~~Printed Tickets~~ Recorded Representations.**

**S.1.4.1. Timing Devices, Electric Vehicle Supply Equipment.** – A timing device incorporated into an EVSE for use in assessing charges for timing separate from charges for electrical energy shall issue a recorded representation itemizing the charges for these services as defined in Section 3.XX. Electricity-Measuring Devices.

**S.1.4.1.1. Duplicate Receipts. – Duplicate receipts are permissible, provided the word “duplicate” or “copy” is included on the receipt.**

**S.1.4.2. All other Timing Devices. –** A printed ticket issued or stamped by a timing device shall have printed clearly thereon:

(a) the time and day when the service ends and the time and day when the service begins, except that a self-service money-operated device that clearly displays the time of day need not record the time and day when the service begins; or

(b) the time interval purchased, and the time and day that the service either begins or ends.

(Amended 1983)

**S.2. Marking Requirements, Operating Instructions. –** Operating instructions shall be clearly stated on the device.

**S.3. Interference. – The design of the EVSE shall be such that there will be no interference between the time and electrical energy measurement elements of the system.**

**S.4. Provisions for Sealing. – Adequate provisions shall be made to provide security for the timing element.**

**S.5. Power Interruption. – In the event of a power loss, the information needed to complete any transaction (i.e., delivery is complete and payment is settled) in progress at the time of the power loss (such as the quantity and unit price, or sales price) shall be determinable through one of the means listed below or the transaction shall be terminated without any charge for the electrical energy transfer to the vehicle. :**

- **at the EVSE;**
- **at the console, if the console is accessible to the customer;**
- **via on site internet access ; or**
- **through toll-free phone access.**

**For EVSEs in parking areas where vehicles are commonly left for extended periods, the information needed to complete any transaction in progress at the time of the power loss shall be determinable through one of the above means for at least 8 hours.**

**S.5.1. Transaction Termination. - In the event of a power loss, either: (a) the transaction shall terminate at the time of the power loss; or (b) the EVSE may continue charging without additional authorization if the EVSE is able to determine it is connected to the same vehicle before and after the supply power outage . In either case, there must be a clear indication on the receipt provided to the customer of the interruption, including the date and time of the interruption along with other information required under S.1.4.2. Recorded Representation; All Other Timing Devices.**

**S.5.2. User Information. – The EVSE memory, or equipment on the network supporting the EVSE, shall retain information on the quantity of time and the sales price totals during power loss.**

## **N. NOTES**

**N.1. Test Method. –** A timing device shall be tested with a timepiece with an error of not greater than plus or minus 15 seconds per 24-hour period. In the test of timing devices with a nominal capacity of 1 hour or less, stopwatches with a minimum division of not greater than one-fifth second shall be used. In the test of timing devices with a nominal capacity of more than one hour, the value of the minimum division on the timepiece shall be not greater than one second. Time pieces and stopwatches shall be calibrated with standard time signals as

described in National Institute of Standards and Technology Special Publication 432, NIST Time and Frequency Dissemination Services, or any superseding publication.  
(Amended 1978)

**N.2. Broadcast Times and Frequencies.** – Time and frequency standards are broadcast by the stations listed in Table N.2. Broadcast Times and Frequencies.

<b>Table N.2.* Broadcast Times and Frequencies</b>			
<b>Station</b>	<b>Location, Latitude, Longitude</b>	<b>Frequency (MHz)</b>	<b>Times of Transmission (UTC)</b>
WWV	Fort Collins, Colorado 40E41' N 105E02' W	2.5 5.0 10.0 15.0 20.0	Continuous
WWVH	Kauai, Hawaii 21E59' N 159E46' W	2.5 5.0 10.0 15.0	Continuous
CHU	Ottawa, Canada 45E18' N 75E45' W	3.330 7.335 14.670 14.670	Continuous

\*From NIST Special Publication 559, "Time and Frequency Users' Manual," 1990.  
(Added 1988)

**N.3. Interference Tests, EVSE – On an EVSE equipped with a timing device used to calculate time-based charges in addition to any charges assessed for electrical energy, a test shall be conducted to ensure that there is no interference between time and electrical energy measuring elements.**

## **T. TOLERANCES**

**T.1. Tolerance Values.** – Maintenance and acceptance tolerances for timing devices shall be as follows:

**T.1.1. For Timing Devices Other Than Those Specified in T.1.2. For Time Clocks and Time Recorders and T.1.3. On Parking Meters.** – The maintenance and acceptance tolerances shall be:

(a) On Overregistration: 5 seconds for any time interval of 1 minute or more; and  
(Amended 1986)

(b) On Underregistration: 6 seconds per indicated minute.  
(Amended 1975)

**T.1.2. For Time Clocks and Time Recorders.** – The maintenance and acceptance tolerances on over-registration and underregistration shall be three seconds per hour, but not to exceed one minute per day.  
(Amended 1975)

**T.1.3. On Parking Meters and Other Timing Devices Used to Assess Charges for Parking.** – The maintenance and acceptance tolerances are shown in Table T.1.3. Maintenance and Acceptance Tolerances for Parking Meters and Other Timing Devices Used to Assess Charges for Parking.



<b>Table T.1.3. Maintenance and Acceptance Tolerances for Parking Meters <u>and Other Timing Devices Used to Assess Charges for Parking</u></b>		
Maintenance and Acceptance Tolerances		
Nominal Time Capacity	On Overregistration	On Underregistration
30 minutes or less	No tolerance	10 seconds per minute, but not less than 2 minutes
Over 30 minutes to and including 1 hour	No tolerance	5 minutes plus 4 seconds per minute over 30 minutes
Over 1 hour	No tolerance	7 minutes plus 2 minutes per hour over 1 hour

**T.2. Tests Involving Digital Indications or Representations.** – To the tolerances that would otherwise be applied, there shall be added an amount equal to one-half the minimum value that can be indicated or recorded.

#### UR. USER REQUIREMENTS

**UR.1. Statement of Rates.** – The following information shall be clearly, prominently, and conspicuously displayed:

- ~~¶~~The price in terms of money per unit or units of time for the service dispensed; and
- for a timing device other than an EVSE**, the number of coins the device will accept and be activated by at one time ~~shall be clearly, prominently and conspicuously displayed.~~

(Amended 1976)(Amended 201X)

**UR.2. Time Representations.** – Any time representation shall be within plus or minus 2 minutes of the correct time in effect in the area, except on an individual clock used only for “time out”; in addition, the time indication of the “time-out” clock shall be the same as or less than that of the “time-in” clock.

(Amended 1975)

For quick reference in reviewing this document, below is a definition copied from Appendix D for “overregistration and underregistration.” A way to remember this is that if a device is “overregistering,” it is showing “over” or more than the amount that is showing on the standard. Note that zero tolerance is allowed on “overregistration” for parking charges because a consequence of showing that more time has elapsed than actually has occurred could be a parking violation for the driver of the vehicle.

overregistration and underregistration. – When an instrument or device is of such a character that it indicates or records values as a result of its operation, its error is said to be in the direction of overregistration or underregistration, depending upon whether the indications are, respectively, greater or less than they should be. Examples of devices having errors of “overregistration” are: a fabric-measuring device that indicates more than the true length of material passed through it; and a liquid-measuring device that indicates more than the true amount of the liquid delivered by the device. Examples of devices having errors of “underregistration” are: a meter that indicates less than the true amount of product that it delivers; and a weighing scale that indicates or records less than the true weight of the applied load.[1.10]

