Specifications and Tolerances Committee
Interim Report

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Weights and Measures

Reference
Key Number

300 INTRODUCTION

The Specifications and Tolerances (S&T) Committee (hereinafter referred to as "Committee") submits its Interim Report for consideration by the National Conference on Weights and Measures (NCWM). This report contains the items discussed and actions proposed by the Committee during its Interim Meeting in Daytona Beach, Florida, January 11 - 14, 2009.

Table A identifies the agenda items in the Report by reference key number, item title, and page number. The item numbers are those assigned in the Interim Meeting agenda. A Voting item is indicated with a "**V**" after the item number. An item marked with an "**I**" after the reference key number is an Informational item. An item marked with a "**D**" after the reference key number is a Developing item. The Developing designation indicates an item has merit; however, the item was returned to the submitter for further development before any action can be taken at the national level. An item marked with a "**W**" was Withdrawn by the Committee and generally will be referred to the regional weights and measures associations because it either needs additional development, analysis, and input or does not have sufficient Committee support to bring it before the NCWM.

This Report contains many recommendations to revise or amend National Institute of Standards and Technology (NIST) Handbook 44 (HB 44), 2009 Edition, "Specifications, Tolerances, and Other Technical Requirements for Weighing and Measuring Devices." Proposed revisions to the handbook(s) 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.***

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

Table A
Index to Reference Key Items

Table B
Appendices

Table C
Glossary of Acronyms

AWS	Automatic Weighing Systems	NEWMA	Northeastern Weights and Measures Association
AWWA	American Water Works Association	NIST	National Institute of Standards and Technology
BCS	Belt-Conveyor Scales	NTEP	National Type Evaluation Program
CC	Certificate of Conformance	NTETC	National Type Evaluation Technical Committee
CWMA	Central Weights and Measures Association	NW&SA	National Weighing and Sampling Association
EPO	Examination Procedure Outline	OEM	Original Equipment Manufacturer
GS	NTETC Grain Analyzer Sector	Pub 14	NCWM Publication 14
GMM	Grain Moisture Meters	RMFD	Retail Motor-Fuel Dispenser
GPMA	Gasoline Pump Manufacturers Association	SI	International System of Units
HB 44	NIST Handbook 44	SMA	Scale Manufacturers Association
HB 130	NIST Handbook 130	SWMA	Southern Weights and Measures Association
LMD	Liquid-Measuring Device	WG	Work Group
LPG	Liquefied Petroleum Gas	WMD	NIST Weights and Measures Division
MDMD	Multiple Dimension Measuring Devices	WS	NTETC Weighing Sector
MFM	Mass Flow Meter	WWMA	Western Weights and Measures Association
MMA	Meter Manufacturers Association	USNWG	NIST/OIML U.S. National Working Group
MS	NTETC Measuring Sector	VTM	Vehicle-tank Meters
NCWM	National Conference on Weights and Measures, Inc.		

"Handbook 44" (HB 44) means the 2009 Edition of NIST Handbook 44 "Specifications, Tolerances, and Other Technical Requirements for Weighing and Measuring Devices"

"Handbook 130" (HB 130) means the 2009 Edition of NIST Handbook 130 "Uniform Laws and Regulations in the Areas of Legal Metrology and Fuel Quality"

Note: NIST does not imply that these acronyms are used solely to identify these organizations or technical topics.

Details of All Items
(In Order by Reference Key Number)

310 GENERAL CODE

310-1 I G-S.8. Provision for Sealing Electronic Adjustable Components, G-S.8.1. Access to Calibration and Configuration Adjustments, and G-S.8.2. Automatic or Semi-automatic Calibration Mechanism

Source: 2008 Carryover Item 310-1. This item originated from the SWMA Committee and first appeared on the Committee's 2008 agenda.

Recommendation: Amend General Code paragraph G-S.8. to clarify what is considered an effective method of sealing, and requirements for indicating and recording appropriate information when a device is in a metrological adjustment mode.

Background/Discussion: At its 2007 Annual Meeting, the SWMA received a proposal to add requirements to G-S.8. to assure that a device could not be sealed in the configuration mode and continue to operate normally. Such a condition could facilitate fraud. The proposal as submitted required that a device continuously indicate when access to the set-up mode was not disabled.

At the 2008 Interim Meeting, the Committee reviewed the comments received during the open hearing and discussed the alternate proposals provided by WMD and SMA. The Committee agreed that if a device designed for commercial applications is capable of being "sealed" with external or remote access to the calibration or configuration mode, it is clearly in violation of the current G-S.8. Provision for Sealing Electronic Adjustable Components and G-S.2. Facilitation of Fraud and, therefore, no change to the existing language is needed. However, because of the ongoing disagreement on the interpretation of G-S.8. among the NTEP laboratories, the Committee agreed to make changes to the proposal based on the concerns raised during the open hearing. The changes to the original proposal made a distinction between configuring a device to either enable or disable external or remote access to the calibration and configuration modes and taking the device out of a normal mode of operation and putting it into a special mode of operation where adjustments are made to calibration and configuration parameters. In other words, if the internal position of a switch or jumper enables external access to the calibration and configuration modes, the device will operate normally until an operator takes action such as entering a pass code, depressing and holding down a specific key, or uses other means to enter a special operating mode to make adjustments to calibration and configuration parameters. The Committee also believes that an indication for the adjustment mode of operation is only necessary for devices with approved category 1, 2, or 3 audit trails and that it not be operable in normal weighing or measuring operation.

The revised proposal states that:

- In the case of a device with a physical security seal, the application of the seal means that the external or remote access that enables the calibration and configuration modes is automatically disabled.

- In the case where a device has an approved audit trail, the device would be required to clearly and continuously indicate on the display (and printed if equipped with a printer) that it is in a calibration mode and not the normal operating mode.

At the 2008 Annual Meeting, the Committee heard comments from WMD which noted that the alternate language submitted by SMA would require that ***all*** devices provide the operator with indications in the calibration mode. This would encompass mechanical and electronic devices, and devices that use category 1 physical seals. Additionally, WMD believes that a device does not need indications in a calibration or configuration mode if it is incapable of providing indications that can be interpreted, printed, or transmitted to a memory device as a correct measurement value. WMD suggested that the Committee amend the recommendation to address some of the concerns noted by the CWMA, NTEP participating laboratories, and WMD since the 2008 Interim Meeting.

The Committee agreed with the comments from the CWMA, and WMD and amended paragraph G-S.8.1. to:

- delete the references to the sealing categories of device,

- clarify printing requirements, and

- include an option that the device not operate or provide metrological indications that can be interpreted, or transmitted into memory or to recording elements while in this mode.

Just prior to the voting session, it was noted that the revised language in G-S.8.1.(a) was inadvertently changed to where it could be literally read that the physical seal itself disabled access to the adjustment mechanisms instead of preventing access to the mechanism. Consequently, the Committee changed the status of the item from Voting to Informational. The Committee believed that the intent of the recommendation is to ensure that the access to the calibration and configuration modes is disabled.

The Committee redrafted the language in paragraph G-S.8.1. and submitted the following revised language for G-S.8.1. to the regional weights and measures associations for further review and consideration.

G-S.8.1. Access To Calibration and Configuration Adjustments - Electronic Devices. – An electronic device shall be so designed that access to calibration and configuration modes, including external and remote access, are only permitted when:

(a) the application of the physical security seal shall ensure that the access to the calibration and configuration modes is disabled, or

(b) the calibration and configuration adjustments are protected by an approved ~~category 1, 2, or 3~~ audit trail, and the device shall clearly and continuously indicate and print, if equipped with a printer, that the calibration and configuration adjustment modes are enabled.

During the calibration and configuration adjustment mode, electronic devices shall either;

- ***not provide metrological indications that can be interpreted, or transmitted into memory, or printed while it is in the calibration and/or configuration adjustment mode as a correct measurement value, or***

- ***clearly and continuously indicate that it is in the calibration and/or configuration adjustment mode and record such message if capable of printing in this mode.***

(Nonretroactive as of January 1, 201X)

At its 2008 Annual Technical Conference, the WWMA supported the above alternate language for paragraph G-S.8.1. and recommended that this move forward as an Informational item to allow further review, comments and recommendations by the NTETC weighing and measuring sectors, the other regional associations, and other interested parties.

At its 2008 fall meeting, the NTETC Weighing Sector did not have sufficient time to review and provide comments on this item.

During its 2008 Interim Meeting, the CWMA and NEWMA supported the Committee's recommendation as shown in the 2008 Annual Report of the NCWM and 2009 Interim agenda.

At its 2008 Annual Meeting, the SWMA heard no specific recommendations for change to the proposal during its open hearings. The SWMA Committee heard that the SMA plans to further review the item and may have additional recommendations to propose for consideration. The Committee supports the changes proposed by the NCWM S&T Committee at the July 2008 Annual Meeting, noting that there were some comments regarding portions of the language that may need to be addressed. If an agreement cannot be reached on proposed changes to these paragraphs, the SWMA recommended that additional work is needed before the item is ready for a vote and that the NCWM S&T Committee may wish to consider at least incorporating interpretations and guidelines for the existing language in its reports. Consequently, the Committee recommended maintaining this as an Informational item on its agenda.

At its 2008 fall meeting, the SMA supported the intent of the item and recommends the following language:

G-S.8.1. Access to Calibration and Configuration Adjustments. – A device shall be so designed that:

(a) The application of the physical security seal shall ensure that the calibration and configuration modes are disabled, or

(b) The calibration and configuration adjustments are protected by an approved category 1, 2, or 3 method of sealing, and the device shall clearly and continuously indicate and print, if equipped with a printer, that the calibration and configuration adjustment modes are enabled.

During the calibration and configuration adjustment mode, electronic devices shall either;

- ***The device shall not provide metrological indications that can be interpreted, or transmitted into memory, or printed while it is in the calibration and/or configuration adjustment mode as a correct measurement value, or***

- ***The device shall clearly and continuously indicate that it is in the calibration and/or configuration adjustment mode and record such message if capable of printing in this mode.***

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

During the open hearings at the 2009 Interim Meeting, WMD stated that it had received comments questioning how the application of a physical seal (as recommended by the manufacturer and listed on the CC) ensures that the calibration and configuration modes are disabled. What does that presence of the physical seal (pressure sensitive or lock and wire) do to the device that disables the calibration and configuration modes?

In considering these comments, WMD suggested that the Committee consider the following changes:

- Modify G-S.8. to clarify the differences in requirements between physical seals and electronic seals (audit trails),
- Add new specifications for externally and remotely configurable devices,
- Amend G-UR.4.5. to require the user to verify that the device is correctly configured to disable external configuration,
- Add definitions from the white paper on the "Metrological Requirements for Audit Trails" adopted by NCWM in July 1993, and
- Add a new definition for externally configurable devices.

Stephen Patoray, Consultants on Certification, LLC, related discussions from the NTETC Weighing Sector where it was reported that service agents were leaving scales configured with external calibration capability and then applying a security seal which did not follow the manufacturer's instructions. He also expressed concerns that the proposed language would require a manufacturer to design a device where the application of the physical seal (e.g., lock and wire, pressure sensitive, etc.) would disable external access to the configuration mode. Currently, all that a physical seal does is provide an indication that the seal has been broken and thus leave a device subject to adjustment. He believes that the language in the proposal would force the manufacturer to redesign access covers to devices so that the cover disables the external adjustment capability. Consequently, the application of the security seal secures the cover in place and then if broken, provides an indication that the device may have been adjusted.

The Committee also received a comment from Will Wotthlie, Maryland, stating that he was concerned with the language that requires that the physical seal "shall ensure" that external access to the configuration mode is disabled. He provided examples of a mechanical ATC element where a specially designed sealing pin had to be installed before the physical seal could be applied and where electronic motor-fuel devices have a specially designed cover plate where the closing of the cover plate disables the electronic configuration. The manufacturer has the option

under this proposal to either specially design the physical seal method or sealing or design the device with an electronic method of sealing.

Several manufacturers stated that this proposal was not ready and that designs for the method of providing security to the metrological adjustments should be left to the manufacturers. Darrell Flocken, Mettler-Toledo, added that the intent of the proposal is that the manufacturer can either design a device so that a security seal cannot be applied without placing the device into the proper mode ***or,*** design the device so that it has an approved audit trail.

The Committee agreed with the comments that the proposal ***is not ready*** to become a Voting item and suggested that further development to the proposal addresses the following concerns:

1. Avoid language that allows the indication of usable metrological values while in the adjustment mode for devices that do not have an event logger.

2. Recognize that more than one method of sealing is acceptable on a single device, such as using a lock and wire seal for the mechanical adjustments and an audit trail for electronic adjustments.

3. Recognize that other codes in HB 44 do not have language for device categories and corresponding methods of sealing.

4. Require an obvious indication when a device is being adjusted if it is provided with a physical security seal.

5. Clarify that the application of a physical security seal to a specially designed and sealable plate or cover that disables external access to the configuration and adjustment mode is not the only method to seal adjustable components.

Consequently, the Committee recommends that this item remain Informational. See the 2008 NCWM Annual Report for additional background information.

After the Interim Meeting, the NIST technical advisor developed the following language that can be further developed by the regional weights and measures associations, NTETC sectors, and other interested parties with the intent that a revised proposal can be forwarded to the Committee for consideration at the 2010 NCWM Interim Meeting.

G-S.8. Provision for Sealing Electronic Adjustable Components. *– A device shall be designed with provision(s) for****: ~~applying a security seal that must be broken, or for using other approved means of providing security (e.g., data change audit trail available at the time of inspection), before any change that detrimentally affects the metrological integrity of the device can be made to any electronic mechanism.~~***

(a) applying a physical security seal that must be broken, or

(b) using other approved means of providing security (e.g., data change audit trail available at the time of inspection)

before any change that detrimentally affects the metrological integrity of the device can be made to any electronic mechanism.
[Nonretroactive as of January 1, 1990]

(Amended 201X)

A device may be fitted with an automatic or a semi-automatic calibration mechanism. This mechanism shall be incorporated inside the device. After sealing, neither the mechanism nor the calibration process shall facilitate fraud.

(Added 1985) (Amended 1989 and 1993)

***G-S.8.1. Multiple Weighing or Measuring Elements that Share a Common Provision for Sealing.* - (Unchanged)**

G-S.8.2. Multiple Sealing Methods. – Weighing and measuring devices may be approved for use with multiple methods for sealing adjustable components such as physical seals for calibration adjustment (e.g., load cells, meters, etc.) and event counters or event logger for the configuration parameters (e.g., capacity, interval size, octane blend settings, etc.).
[Nonretroactive as of January 1, 1990]
(Added 201X)

G S.8.3. Adjustment Mode Indications. – During the calibration and configuration adjustment mode, the device shall:

(a) ***Not provide metrological indications that can be interpreted, or transmitted into memory, or printed while it is in the calibration and/or configuration adjustment mode as a correct measurement value, or***

(b) ***Clearly and continuously indicate that it is in the calibration and/or configuration adjustment mode, and record such message if capable of printing in this mode.***

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

310-2 I Appendix D – Definition of Electronic Devices, Software-Based and Built-For-Purpose Device

Source: 2008 Carryover Item. This item originated from the NTETC Software Sector and first appeared on the Committee's 2007 agenda as Developing Item Part 1, Item 2.

Recommendation: Delete the current definition of built-for-purpose device as follows:

~~**built-for-purpose device. Any main device or element which was manufactured with the intent that it be used as, or part of, a weighing or measuring device or system. [1.10]**~~
~~**(Added 2003)**~~

Add a new definition and a cross-reference to Appendix D in HB 44 for "Electronic devices, software-based" as follows to replace the current definition of "built-for-purpose device:"

Electronic devices, software-based. – Weighing and measuring devices or systems that use metrological software to facilitate compliance with Handbook 44. This includes:

(a) Embedded software devices (Type P), aka built-for-purpose. – A device or element with software used in a fixed hardware and software environment that cannot be modified or uploaded via any interface without breaking a security seal or other approved means for providing security, and will be called a "P," or

(b) Programmable or loadable metrological software devices (Type U), aka not-built-for-purpose. – A personal computer or other device and/or element with PC components with programmable or loadable metrological software, and will be called "U." A "U" is assumed if the conditions for embedded software devices are not met.

Software-based devices – See Electronic devices, software-based.

Background/Discussion: In 2005 the Board of Directors established an NTETC Software Sector. One of the tasks of the Sector is to develop a clear understanding of the use of software in today's weighing and measuring instruments.

At the Sector's October 2007 meeting, it was initially suggested that the term "not-built-for-purpose" be removed from the wording in NIST HB 44 paragraph G-S.1.1. since there is no definition for a not-built-for-purpose device in HB 44. After a lengthy discussion related to the terms "built-for-purpose" and "not-built-for-purpose," the Sector agreed these terms were not clear and should be replaced with the terminology proposed above. The proposed definitions are based on the revision of OIML R 76 Non-automatic weighing instruments Subsections 5.5.1. (Type P) and 5.5.2. (Type U).

At the 2008 Interim Meeting, the SMA supported the intent of the item, but stated that it is premature to place these definitions in HB 44. The SMA recommended that the status of the item be changed to Developing on the S&T Committee agenda. The Committee agreed to move Item 310-2 of the 2008 S&T Committee Interim agenda and assign Developing status as 360-2 Part 1, Item 2.

At the 2008 Annual Meeting, the Committee heard comments from the former NTETC Software Sector Chairman indicating that the Sector had completed its review of this item and could not develop it any further. The Chairman requested that the Committee consider moving the item from the Developing section of the agenda and at least make it an Informational item to facilitate discussion and comment on the proposed language. Consequently, the Committee agreed to change the status of the item from Developing to Informational in its agenda.

At its 2008 Annual Technical Conference, the WWMA agreed to propose this item remain Informational, based on comments heard supporting the item, until other interested parties had the opportunity to provide comments.

At its 2008 Interim Meeting, the CWMA heard comments during their open hearings in favor of the item and no comments were made in opposition. The CWMA recommends this item go forward as a Voting item.

At its 2008 Interim Meeting, NEWMA discussed how this item would affect field examination and verification of software. NEWMA recommends this item move forward as Informational.

At its 2008 Annual Meeting, the SWMA heard comments indicating that the Software Sector is seeking additional input on the proposed definitions and views the proposed changes as a first step in developing wider changes to the General Code and Definitions to better accommodate software-based devices. The SWMA agrees that additional review and study is needed before the proposal can be forwarded as a Voting item and, therefore, is maintaining this item as an Informational item on its agenda. The SWMA encourages people to review this proposal and the proposal in Item 310-3 and provide input to the NCWM S&T Committee and the Software Sector. The SWMA is interested in comments from other organizations, including SMA. In the meantime, the Committee also offers the following comments for consideration:

- The term "software-based electronic devices" is not currently included in NIST Handbook 44. The Committee acknowledges that this proposal is a step toward a broader proposal; however, it believes it is inappropriate to include a definition for a term that isn't currently used in the handbook.

- There needs to be a definition and/or cross-reference for the terms "Type P" and "Type U." A better approach might be to add a reference for "not-built-for-purpose;" include cross-references for terms "Type P" and "Type U" to the terms "built-for-purpose" and "not-built-for purpose;" and develop proposed changes to the General Code to incorporate the new terms "Type P" and "Type U." This would ensure references to terminology that is being used in Handbook 44.

At the 2009 NCWM Interim Meeting, the Committee received comments from the SMA stating that it now opposes this item since there is no technological justification for making a distinction in software-based device types. Darrell Flocken added that the SMA can only provide limited responses; SMA continues to support the efforts of the Software Sector and the SMA response is based on the concern that the proposed definitions in this recommendation and the marking requirements proposed in agenda Item 310-3 will make a weighing device more complex than what is currently produced. The MMA indicated that it supports the item as written in the recommendation.

Will Wotthlie, Maryland, does not agree with the SMA position that there are no technological differences between the types of software-based devices. He added that Type P devices and separable elements have limited flexibility in changing software and indications and frequently include the sensing elements necessary for the measurement (e.g., load cells, meters, etc.), whereas Type U devices and separable elements are typically devices that do not contain measuring elements; can be replaced with compatible equipment and display devices purchased from any number of sources; and only process metrological information received from measuring and other sensing elements.

Stephen Patoray, Consultants in Certification, LLC, agrees with the SMA that there are few differences between Type P and U software-based devices. However, there are significant differences between Type P and U devices in that a Type P device is defined as an instrument that requires a security means since the instrument has fixed hardware (including sensing components), where the metrological software is ***embedded*** into the instrument. Type U devices do not include fixed components and metrological software cannot be sealed using physical security seals or the minimum form of an audit trail (i.e., two event counters).

Software Sector Co-chair Jim Pettinato (FMC Technologies) added that international recommendations recognize the differences between embedded software and programmable/loadable software. Additionally, the Software Sector recommends that this item remain Informational to allow conference members to further study the proposed definitions.

The Committee agreed with the comments received during the open hearing and the request from the Co-chairman of the Software Sector and agreed that this item should remain an Informational item for further review.

Additional background information on this item can be reviewed in the 2008 Final Report of the Committee.

310-3 I G-S.1. Identification. – (Software)

Source: 2008 Carryover Item. This item originated from the NTETC Software Sector and first appeared on the Committee's 2007 agenda as Developing Item Part 1, Item 1.

Recommendation: Amend G-S.1. and G-S.1.1. as follows:

G-S.1. Identification. – <u>For the purposes of identification, all equipment, except weights and separate parts necessary to the measurement process but not having any metrological effect and manufactured on or after January 1, 201X, shall be clearly marked as specified in Table G-S.1. Identification and explained in the accompanying notes in Table G-S.1. Notes:</u>

All equipment, except weights and separate parts necessary to the measurement process but not having any metrological effect **<u>and manufactured prior to January 1, 201X</u>**, 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 ***Type U*** *(**not-built-for-purpose) software-based** devices;*
[Nonretroactive as of January 1, 1968]
(Amended 2003 **and 201X**)

(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 ***Type U (not-built-for-purpose) software-based*** *devices;*
[Nonretroactive as of January 1, 2004]
(Added 2003) **(Amended 201X)**

(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)

(e) an NTEP Certificate of Conformance (CC) number or a corresponding CC Addendum Number for devices that have a CC. 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 Type U (Not-Built-For-Purpose), Software-Based Devices. – *For* ***Type U~~-not-built-for-purpose, software-based~~*** *devices* ***manufactured prior to January 1, 201X,*** *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 Certificate of Conformance (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 201X**)

Table G-S.1. Identification
for Devices Manufactured on or after January 1, 201X
(For applicable notes, see Table G-S.1. Notes on Identification)

Required Marking	Full Mechanical Devices and Separable Mechanical Elements	Type P Electronic Devices and Separable Elements	Type U Electronic Devices and Separable Elements
Name, initials, or trademark of the manufacturer or CC holder	Hard-Marked	Hard-Marked or Continuously Displayed	Hard-Marked, Continuously Displayed, or Via Menu (display) or Print Option (8)
Model identification information that positively identifies the pattern or design of the device (1)	Hard-Marked	Hard-Marked or Continuously Displayed	Hard-Marked, Continuously Displayed, or Via Menu (display) or Print Option (8)
Non-repetitive serial number (2)	Hard-Marked	Hard-Marked or Continuously Displayed	Not Acceptable
Software version or revision (3)	Not Applicable	Hard Marked (5), Continuously Displayed, or by Command (operator action) (6)	Continuously Displayed or Via Menu (display) or Print Option (8)
Certificate of Conformance number or corresponding CC Addendum (4)	Hard-Marked	Hard-Marked or Continuously Displayed	Hard-Marked (7) or Continuously Displayed
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.			

(Added 201X)

Table G-S.1. Notes on Identification
For Devices Manufactured on or after January 1, 201X

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.**

2) **Except for equipment with no moving or electronic parts, the serial number shall be prefaced by words, an abbreviation, or a symbol, that clearly identifies the number as the required serial number.**
   - **Abbreviations for the word "Serial" shall, as a minimum, begin with the letter "S," and abbreviations for the word "Number" shall, as a minimum, begin with the letter "N" (e.g., S/N, SN, Ser. No., and S. No.).**

3) **Metrologically significant software shall be clearly identified with the software version. The identification may consist of more than one part but one part shall be dedicated to the metrologically significant portion.**
   - **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.**
   - **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.).**

4) **An NTEP Certificate of Conformance (CC) number or a corresponding CC Addendum Number for devices that have a CC. 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.).**

5) **If the manufacturer declares that the primary sensing element "software" is integral, has no end user interface and no print capability, the version/revision shall be hard-marked on the device. Example: Primary sensing element may be Positive Displacement (P.D.) meter with integral correction, digital load cell (only for reference, not limiting).**

6) **Information on how to obtain the Version/Revision shall be included on the NTEP CC.**

7) **Hard-marking of the CC Number is permitted if no means of displaying this information is available.**

8) **Information on how to obtain the name, initials, or trademark of the manufacturer or CC holder, model designation, and software version/revision information shall be included on the NTEP CC.**

(Added 201X)

Background/Discussion: In 2005 the Board of Directors established an NTETC Software Sector. One of the tasks of the Sector is to develop a clear understanding of the use of software in today's weighing and measuring instruments.

During their October 2007 meeting, the Sector discussed the value and merits of required markings for software. This included the possible differences in some types of devices and 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 make, model, S.N. to comply with G-S.1. Identification.

At the 2008 NCWM Annual Meeting, the Committee heard comments from the former NTETC Software Sector Chairman indicating that the Sector had completed its review of this item and could not develop it any further during its May 2008 Sector meeting. He requested that the Committee consider moving the item from the Developing section of the agenda and make it an Informational item on the Committee's agenda to facilitate discussion and comment on the proposed language. Consequently, the Committee agreed to forward the item to the regional weights and measures associations for consideration and will include this item on its 2009 interim agenda.

After the 2008 Annual Meeting, WMD reviewed the following Software Sector Proposal to amend G-S.1. and/or G-S.1.1. in the Committee's 2008 Interim Report:

Method	NTEP CC No.	Make/Model/Serial No.	Software Version/Revision
TYPE P electronic devices shall meet at least one of the methods in each column:			
Hard-Marked	X	X	Not Acceptable[1]
Continuously Displayed	X	X	X
By command or operator action	Not Acceptable	Not Acceptable	X[2]

[1] If the manufacturer declares that the primary sensing element "software" is integral, has no end user interface and no print capability, the version/revision shall be hard marked on the device. Example: Primary sensing element may be Positive Displacement (P.D.) meter with integral correction, digital load cell (only for reference, not limiting).

[2] Information on how to obtain the Version/Revision shall be included on the NTEP CC.

Metrologically significant software shall be clearly identified with the software version. The identification may consist of more than one part but one part shall be only dedicated for the metrologically significant portion.

Method	NTEP CC No.	Make/Model	Software Version/Revision
TYPE U electronic devices shall meet at least one of the methods in each column:			
Hard-Marked	X[3]	X	Not Acceptable
Continuously Displayed	X	X	X
Via Menu (display) or Print Option	Not Acceptable	X[4]	X[4]

[3] Only if no means of displaying this information is available.

[4] Information on how to obtain Make/Model, Version/Revision shall be included on the NTEP CC.

Metrologically significant software shall be clearly identified with the software version. The identification may consist of more than one part but one part shall be only dedicated for the metrologically significant portion.

WMD agreed that the proposed language has merit. However, the Software Sector did not include a recommendation on how to incorporate the proposal into existing G-S.1. and G-S.1.1. language. WMD studied the current and proposed language and was not sure how to address the various existing requirements and multiple non-retroactive dates. Consequently, WMD suggested changes to the General Code language on Identification be considered in the further review of this item by the Committee. In brief, the WMD proposed language divides the identification and marking location requirements for all devices and separable elements manufactured prior to and

after a date adopted by the Conference. WMD developed two versions of proposed Table G-S.1. (with the only difference being that the rows and columns are reversed) for consideration by the Conference and forwarded these to the regional weights and measures associations.

At their September 2008 meetings, the WWMA and CWMA reviewed the WMD suggested changes for G-S.1. and Tables G-S.1.a. and G-S.1.b. and supported the proposal to amend G-S.1. and to include the marking requirements in a table format similar to other specific device codes. The WWMA also expressed a preference for the alternate Table G-S.1.a. and recommends that this item remain Informational for further review and discussion.

At their October 2008 Interim Meeting, NEWMA also recommended this item move forward as Informational.

At its 2008 Annual Meeting, the SWMA heard comments during its open hearings from Gordon Johnson, Gilbarco, proposing that the words "not acceptable" in the third column for the entry "By command or operator action" be replaced with an "X" and a reference to footnote 2. Will Wotthlie, Maryland, stated that he would support the change to an "X," but that a new footnote should be created; Will noted that, if the information is not going to be physically marked on a plate, the inspector would need a means to find the information without having to go to a CC to find out how to call it up. The SWMA acknowledged that this variation is already permitted for computer-based systems, but acknowledged that additional review is needed before proposing such a change. The SWMA believes that additional input is needed on this issue before it is ready to move forward as a Voting item. The SWMA S&T Committee is interested in comments from other organizations, including SMA on this issue. Consequently, the SWMA made this an Informational item on its agenda.

At the 2009 Interim Meeting, SMA commented that it has consistently opposed having different requirements between embedded and downloadable/programmable software-based devices and added that it continues to support the intent of the proposal and will continue to participate in the Software Sector discussions to develop alternate proposals for the marking of software-based devices. Several weights and measures officials expressed concerns that the proposed language does not specify how the identification information is to be retrieved if it is not continuously displayed noting this could result in several ways to access the information (e.g., passwords, display checks, dropdown menus, etc.). They added that the identification location information on the NTEP CC will become outdated anytime a manufacturer changes the way the information can be retrieved. They suggested that a limited number of methods to access the identification information be developed and specified as the only acceptable methods to retrieve identification information. This would make it easier for the inspector to verify the required identification information.

WMD noted that in 1992, the NCWM adopted S&T Committee agenda Item 320-6, S.6.3. Marking Requirements; Capacity by Division and recommended that Tables S.6.3.a. and S.6.3.b. (note 3) be interpreted to permit the required capacity and scale division markings to be presented as part of the scale display (e.g., displayed on a video terminal or in a liquid crystal display), rather than be physically marked on the device. WMD agrees with the interpretation and suggests that this interpretation could be expanded to other marking requirements (e.g., flow rates capacity, interval, etc.,) and codes on a case-by-case basis, and that specific language (based on the above interpretation) be added to the applicable sections in HB 44.

Software Sector Co-chair Jim Pettinato (FMC Technologies) noted that there were some typographical errors in the proposed tables which have been corrected in the above recommendations. He also stated that the Software Sector recommends that this item remain Informational to allow conference members to further study the proposal in order to develop a consensus on the format for Table G-S.1. Identification.

The Committee agreed with the format of the first version of Table G-S.1. Identification since the format matches the style of similar tables in HB 44. Consequently, the Committee agreed that this item should remain an Informational item for further review. Additional background information on this item can be reviewed in the Committee's 2008 Final Report.

310-4 V G-N.3. Verification of Testing Standards

Source: 2008 Carryover S&T Item 310-4. This item arose as a result of a proposal submitted by the CWMA. See also the note in the Background/Discussion regarding the origin of this item.

Recommendation: Add the following paragraph G-N.3. to the General Code:

G-N.3. Verification (Testing) Standards. – Field standards will meet the specifications of the National Institute of Standards and Technology Handbook 105-Series standards (or other suitable and designated standards). This section shall not preclude the use of additional field standards and/or equipment, as approved by the Director, for uniform evaluation of device performance. In all cases where the standard is used without correction, its combined error and uncertainty must be less than one-third of the applicable device tolerance.

(Added 2009)

Delete corresponding paragraphs in the Scales Code, Automatic Bulk Weighing Systems Code, and the Automatic Weighing Systems Code as follows:

Scales Code:

~~**N.2. Verification (Testing) Standards. Field standard weights used in verifying weighing devices shall comply with requirements of NIST Handbook 105 Series standards (or other suitable and designated standards) or the tolerances expressed in Fundamental Considerations, paragraph 3.2. (i.e., one third of the smallest tolerance applied).**~~

~~**(Amended 1986)**~~

Automatic Bulk Weighing Systems Code:

~~**N.2. Verification (Testing) Standards. Standard weights and masses used in verifying weighing devices shall comply with requirements of NIST Handbook 105 1 (Class F) or the tolerances expressed in Appendix A, Fundamental Considerations, paragraph 3.2. (i.e., one third of the smallest tolerance applied).**~~

Automatic Weighing Systems Code:

~~**N.1.3. Verification (Testing) Standards. Field standard weights shall comply with requirements of NIST Handbook 105 1 (Class F) or the tolerances expressed in Fundamental Considerations, paragraph 3.2. (i.e., one third of the smallest tolerance applied).**~~

Background/Discussion: This item was originally addressed under Item 330-2 in the Committee's 2008 Interim agenda. As a result of deliberations (see "Background/Discussion" below) at the 2008 Interim Meeting, the Committee decided to delete Item 330-2 and to address the issue in this new Item 310-4, which proposes adding a paragraph to the General Code to designate general requirements for all field standards. At the 2008 NCWM Annual Meeting, the Committee decided (as a result of comments received following the Interim Meeting) to reinstate Item 330-2 (which proposes an addition to the Liquid-Measuring Devices Code to specify pour and drain times for measuring device test standards) as an Informational item; the Committee's rationale for this decision is outlined in Item 330-2. Note that the Committee retained Item 310-4 and presented that item as a Voting item at the Annual Meeting; however, the item did not receive sufficient votes to pass or fail and, therefore, was returned to the Committee. See the Committee's 2008 Final Report for additional background information.

The CWMA noted that HB 44 does not address pour or drain times for 5-gallon test measures used to test retail motor-fuel devices. However, the pour and drain time requirements are in HB 112 Examination Procedure Outline Numbers 21 and 22 for Retail Motor-fuel Dispensers in Test Notes paragraph 2. They are also referenced in NIST HB 105-3 Specifications and Tolerances for Graduated Neck-Type Volumetric Field Standards Section 7. Test Methods and References.

Metrology labs are not routinely requiring that hand-held test measures be labeled with this information when the information is missing. Additionally, many hand-held test measures used by service agents and agencies do not specify drain times. As a result, service agents, are using incorrect pour and drain times.

At the 2008 Interim Meeting, the Committee agreed that rather than putting a requirement in HB 44 stipulating pour and drain times for provers and test measures, it is preferable to reference the requirements in NIST Handbook 105-3.

The Committee received comments from WMD indicating that, since pour and drain times are published in the EPOs and taught in WMD training, a reference to the 105 series in the General Code is more appropriate; particularly since NIST Handbook 105-3 Section 4.5.10.1. requires the marking of drain and delivery times on handheld test measures. With regard to concerns raised by some about update intervals for a particular 105 series handbook, WMD pointed out that the 105 series are already referenced in the Fundamental Considerations and have been for some time, and periods during which a handbook is being updated have apparently not posed any significant problems in the past. WMD also raised a concern over whether a trend for inclusion of references such as this in many individual codes might ultimately discourage the inspector and service company from referencing the Fundamental Considerations where other important information about necessary equipment and practices are found.

At the 2008 NCWM Annual Meeting, the Committee agreed that the proposed change to the General Code should remain as a Voting item since the language will provide guidance for device codes that do not specify the suitability and use of standards in the specific codes.

The Committee heard comments during the open hearing that specific hand-held test measure use requirements are still needed in the LMD Code for weights and measures officials and service agents. Therefore, the Committee recommends that language originally submitted by the CWMA be reinstated in the Committee's report as an Informational item on the agenda. The Committee also heard comments that the language in parentheses referring to "suitable and designated standards" is not clear with regard to what criteria are used to determine suitability and what entity "designates" the standards.

At its 2008 Annual Technical Conference, the WWMA heard a comment from one weights and measures jurisdiction during the open hearing that the addition of paragraph G-N.3. will not ensure that service agents will follow proper test procedures. The SMA supports this item, and recommends removal from the Scales Code, AWS Code and ABWS Code to the General Code. The WWMA recommends this be a Voting item, and also supports the specific requirements proposed in Item 330-2.

At its 2008 Interim Meeting, the CWMA stated it believes other suitable and designated standards as stated in the original item came from Fundamental Considerations, Section 3. Testing Apparatus as referenced below. Therefore the CWMA recommends that the item move forward for a Vote and that the words *"or other suitable and designated standards"* be removed from the proposal.

At its 2008 Annual Meeting, the SWMA heard no comments on this item during its open hearings. The Committee considered the proposed changes from the CWMA which would strike the words "other suitable standards;" however, the SWMA believes this language is necessary since there are not 105 Handbooks for every type of test standard. The SWMA also noted that there is similar language in other handbook requirements and that it is generally understood that this refers to the approval authority of the weights and measures jurisdiction. The SWMA supports the item as written in the 2008 NCWM Annual Report.

At its 2008 Interim Meeting, NEWMA reviewed and discussed the proposal which included comments that this requirement already exists in the Fundamental Considerations of HB 44 and as such may not be necessary. NEWMA does not support this item.

At the 2009 NCWM Interim Meeting, the Committee heard comments form Ross Andersen, New York, stating that the proposed addition of the words "or other suitable standards" raises the question of how the suitability of the standards are determined. Steve Malone, Nebraska, supported the addition of the language "the most current" when referring to the 105 Series documents; he stated that older versions of theses standards may no longer be sufficient and, therefore, conflict with the Fundamental Consideration Section 3 Testing Apparatus. The SMA supported the original language proposed by the Committee stating that it had concerns about the impact of the words "the most current" in the proposal in the 2008 Annual Report.

Ross Andersen submitted the following alternate proposal to the Committee that he believes addresses the CWMA's and SWMA's concerns:

> G-N.3. Verification (Testing) Standards. – Where practical, field standards conforming to the specifications and tolerances in the NIST 105 Series, recommendations of the OIML or other designated standards shall be used for official tests. The requirements of Fundamental Considerations paragraph 3.2 (i.e., one-third of the smallest tolerance applied) shall apply to all standards used in official tests.

The Committee reviewed the requirements in Fundamental Considerations Section 3. The Committee reworded the proposal as shown in the Committee's recommendation above so that the words are consistent with the language in footnote 2 of that section, and addresses the suitability concerns expressed by the comments received during the open hearing. The Committee agreed to present the revised proposal for a Vote at the 2009 Annual Meeting.

310-5 W G-T.1. Acceptance Tolerances

Source: Central Weights and Measures Association

Recommendation: Amend General Code paragraph G-T.1. Acceptance Tolerances as follows:

G-T.1. Acceptance Tolerances. – Acceptance tolerances shall apply to:

(a) equipment to be put into commercial use for the first time;

(b) equipment that has been placed in commercial service within the preceding 30 days and is being officially tested for the first time;

(c) equipment that has been returned to commercial service following official rejection for failure to conform to performance requirements and is being officially tested for the first time within 30 days after corrective service;

(d) equipment that is being officially tested for the first time within 30 days after **metrological adjustment or** major reconditioning or overhaul; and

(Amended 201X)

(e) equipment undergoing type evaluation.

(Amended 1989)

Background/Discussion: At its 2008 Interim Meeting, the CWMA received comments that there are differences in how jurisdictions interpret G-T.1. Acceptance Tolerances. Several jurisdictions feel that when a seal on commercial equipment is broken by other than a regulatory official, this action constitutes taking the device out of service. Furthermore, if metrological adjustments are made and the equipment was resealed, this would constitute placing the equipment back into service. It is believed that the 30-day window for applying acceptance tolerance would apply to this scenario.

The CWMA also noted that equipment that "is adjusted" would require the application of acceptance tolerance according to HB 44 Appendix A – Fundamental Considerations in the second paragraph of Section 2.1. Tolerances for Commercial Equipment – Acceptance and Maintenance Tolerances.

During the open hearing at the 2009 NCWM Interim Meeting, the Committee received several comments opposing this item. Some comments indicated that the proposed language may deter routine maintenance to bring a device that was already in maintenance tolerance into acceptance tolerance. For example, device owners may have service contracts for verifying the accuracy of their equipment between official inspections and as part of the routine service, break the security seal to adjust the equipment as close to zero as possible. As a result of the adjustment and subsequent "placed in service report," an official inspection may be conducted resulting in the potential that the

equipment may be rejected even if it repeats with maintenance tolerances. The device would not have been rejected if the owner did not attempt to maintain their equipment. Other comments indicated that devices may no longer be capable of being adjusted to acceptance tolerances but still maintain maintenance tolerances. SMA stated that a "metrological adjustment" does not have the same significance as a "major reconditioning or overhaul" in G-T.1., and that the implication of failing a test using acceptance tolerances may create an unnecessary economic burden on the device owner. The MMA commented that normal deterioration in repeatability may cause rejection even though the device is capable of performing within applicable maintenance and repeatability tolerances. The CWMA noted that Appendix A – Fundamental Considerations Section 2.1. Acceptance and Maintenance Tolerances states that acceptance tolerances are applied to new, newly reconditioned, or adjusted equipment.

The Committee reviewed past conference reports that indicated that a similar proposal was considered by the NCWM in the Committee's 1990 agenda Item 310-5. The proposal would have required acceptance tolerances to apply whenever the security seal has been changed. The proposal was ultimately Withdrawn since the possible ramifications of this proposal had not been sufficiently developed to evaluate the proposal.

The Committee agreed to withdraw this item because of the lack of support from industry and weights and measures officials and because it believes that equipment which performs within maintenance tolerances poses "no serious injury" to either the buyer or seller of commodities (See 2009 NIST Handbook 44 Appendix A – Fundamental Considerations Section 2.2. Theory of Tolerances).

320 SCALES

320-1A V S.2.1.6. Combined Zero-Tare ("0/T") Key, Appendix D – Definitions for Tare Mechanism, and Tare Balancing Mechanism

Source: Carryover Item 320-6. (This item originated from the NTETC WS and first appeared on the Committee's 2007 agenda.) This item will be considered jointly along with the similar Item 324-2A. It should also be noted that the proposed tare definitions can be found in Item 320-1A.

Recommendation: The recommendations in Items 320-1A through 320-1D are intended to clarify the requirements for metrological tare (e.g., tare objects weighed or balanced off at the time of the transaction), tare accuracy, operating range, visibility, and preset tares (e.g., manually entered or stored tares for multiple transactions) as outlined in the recommendation below by modifying the definition for "tare mechanism" and adding new definitions for "gross weight value," "net weight," "net weight value," "tare," and "tare weight value" to Appendix D, and amending paragraphs S.2.3. and S.2.3.1. and adding new paragraphs S.2.3.2. through S.2.3.8. and S.2.4. through S.2.4.3. to provide new requirements for tare accuracy, operating range, and visibility.

Amend paragraph S.2.1.6. as follows:

S.2.1.6. Combined Zero-setting and Tare-balancing Mechanisms ("0/T") Key. – Scales not intended to be used in direct sales **to the public ~~applications~~** may be equipped with a combined zero-**setting** and tare-**balancing** function key, provided that the device is clearly marked as to how the key functions. ~~**The device must also be clearly marked on or adjacent to the weight display with the statement "Not for Direct Sales."**~~**The following apply to the zero-setting mechanism and the tare-balancing mechanism at any load:**

(a) After zero/tare setting, the accuracy of the zero/tare setting shall be not more than ± 0.25 d. [Nonretroactive as of January 1, 2010]

(b) A "center-of-zero" condition shall either automatically be maintained to ± 0.25 d or less or have an auxiliary or supplemental "center-of-zero" indicator that defines a zero-balance condition to ± 0.25 d or less.
[Nonretroactive as of January 1, 2010]

(c) A *zero*-tracking mechanism, if equipped, shall operate only when:

(1) the indication is at zero, or at a negative net value equivalent to gross zero, and
(2) the weight indication is stable.

(d) The scale must also be clearly marked on or adjacent to the weight display with the statement "Not for Direct Sales."

(Added 1998)

(Amended 2009)

Amend the following definition for "tare mechanism:"

tare mechanism. A **tare-weighing or tare-balancing** mechanism (including a tare bar) designed for determining **the value of,** or balancing out the weight of packaging material, containers, vehicles, or other materials that are not intended to be included in net weight determinations **and for setting the net indication to zero when the tare object is on the load-receiving element (See also "preset tare," "tare-weighing mechanism" and "tare-balancing mechanism").**

Notes:
1. **Reducing the weighing range for net loads is known as subtractive tare (e.g., Net Weight + Tare Weight ≤ Gross Weight Capacity).**
2. **Increasing the weighing range for gross loads without altering the weighing range for net loads on mechanical scales is known as additive tare (e.g., a tare bar on a mechanical scale with a beam indicator where Net Weight + Tare Weight ≥ Gross Weight Capacity).**

The tare mechanism may function as:

1. **a non-automatic mechanism (load balanced or weighed by an operator),**
2. **a semi-automatic mechanism (load balanced or weighed automatically following a single manual command), or**
3. **an automatic mechanism where the load is balanced or weighed automatically without the intervention of an operator. An automatic tare mechanism is only suitable for indirect sales to the customer (e.g., prepackaging scales).**

[2.20**, 2.24**]

(Amended 2009)

Add a new definition for tare-balancing mechanism in Appendix D.

tare-balancing mechanism. A tare mechanism with an indication that tare has been taken either semiautomatically or automatically and without an indication of the tare value (weight) when the instrument is loaded. A negative net weight is assumed to be the tare value when the weighing instrument is unloaded. [2.20, 2.24]

(Added 2009)

Background/Discussion: The WS proposal is one of several proposed modifications to HB 44 requirements intended to clarify the acceptable tare features already recognized for use in commercial applications. Scales Code requirements do not include sufficiently detailed language to identify all types of tare, define how tare features must operate, or specify the net and tare values a scale must indicate and record. Current HB 44 requirements that address tare include paragraphs S.2.1.6. Combined Zero-Tare ("0/T") Key; S.2.3. Tare; S.2.3.1. Monorail Scales Equipped with Digital Indications; and T.N.2.1. General (Tolerances).

The WS developed criteria used to type evaluate tare features based on General Code paragraph G-S.2. Facilitation of Fraud and other requirements that apply to indicating and recording elements and recorded representations. NTEP laboratories find it has become increasingly difficult to base compliance decisions solely on paragraph G-S.2. because the general nature of the language results in multiple interpretations. Type evaluation criteria are published

in NCWM Publication 14; however, this document is not in wide distribution in the weights and measures community. Additionally, only a limited number of weights and measures officials, device manufacturers, and device owners and operators are regular participants in WS meetings where tare evaluation criteria are developed and discussed. It is difficult for parties responsible for the design, use, and test of the tare feature to interpret and apply technical requirements published in Publication 14. This results in differing interpretations of HB 44 requirements.

In 2006 the NTETC WS formed a Tare WG to review existing tare requirements and make recommendations as to how tare should operate on a single range scale, a multiple range scale, and a multi-interval scale. The WG was asked to develop, where necessary, recommendations for changes to Publication 14, HB 44, and HB 130 and to provide guidance to the WS on type evaluation requirements.

The WG developed proposals to amend HB 44 requirements to:

a. ensure a tare feature operates in a manner that increases the accuracy of net weight determinations,
b. state clearly what information and values are permitted and required for indicated and recorded representations of net weight and tare weight, and
c. identify the types (e.g., semiautomatic and stored) of tare weight values determined at the time objects are weighed or tare weight values are determined prior to the time objects are weighed.

At its 2007 Annual Meeting, the WS reviewed the final recommendation of the Tare WG and recommended that the NIST technical advisor submit a number of these recommendations to the weights and measures regional association and the NCWM S&T Committees.

Comments from all the 2007 regional weights and measures associations indicated general support for the recommendations and clarification of the tare definitions and that this item be broken up into several parts in order to provide additional clarification.

During the 2008 NCWM Interim Meeting Committee discussions on this item, the following clarifications for "consecutive tare operations" and "transactions using different tare mechanisms" were provided by Mettler-Toledo.

"Consecutive tare operations" in proposed paragraph S.2.3.5. are described as a single transaction with one gross, one net, and multiple tare values. Examples include but are not limited to:

(1) The sales of wrapped candy sold in bulk where a metrological tare (weighed) for a bag and a preset (percentage) tare for the candy wrappers are used to determine the net weight of the candy.

(2) The loading of a vehicle with bins of products (where the preset tare weight for the bins was predetermined). If indicated and/or printed, the representation of tare would include the value of the metrological tare (T) and the summed values of the preset tare (PT).

"Net weight values and tare values determined by different tare mechanisms" in proposed paragraph 2.3.6.(e) include single transactions with multiple gross, tare, and net determinations. For example, an unloaded vehicle would first be weighed to determine tare, loaded with a commodity, and reweighed to determine the gross weight and the net weight for that commodity. The vehicle would then be loaded with a different commodity and reweighed to determine a new gross weight. The second gross weight would be used to calculate the net weight of the second commodity by taking the difference between the second "tare" weight (gross weight of the first commodity) and the second gross weight (total weight of unloaded vehicle and both commodities).

At its 2008 Annual Technical Conference, the WWMA considered a request from the SMA asking the WWMA to keep this an Informational item until it has an opportunity to discuss it and make comments after its fall meeting. The NIST technical advisor gave a presentation at the WWMA that provided clarification. The Committee recommends this presentation be made available at the other regional meetings. The Committee recommends this item remain Informational.

At its 2008 Interim Meeting, the CWMA heard comments during discussion that:

- The tare information language should be put in Handbook 44 format for viewing.
- New language is needed for type evaluation and the tare information from Publication 14 might be referenced in Handbook 44.
- More training with detailed examples should be placed in Handbook 44 format.

At its 2008 Annual Meeting, the SWMA heard no opposition to this item during its open hearings; however, the Committee believes that, because of the complexity of the issue and the number of new terms involved, the item should remain an Informational item. The Committee heard that Steve Cook, NIST WMD, developed and presented an excellent presentation on this issue at the Western Weights and Measures Association meeting in September 2008. Tina Butcher, NIST WMD, reported that Steve plans to post this presentation on the NIST WMD website in the near future. Steve also prepared two related articles intended to assist the community in its review of these issues. The Committee supported a recommendation to ask that Steve give this presentation at the NCWM Interim and Annual Meetings to help provide additional background to the community on these proposals.

During its 2008 Interim Meeting, NEWMA recommended this item remain Informational.

At the 2009 NCWM Interim Meeting, the SMA suggested that the proposal be Withdrawn since the item began with a Weighing Sector item dealing with the proper rounding of a tare value, on multiple range devices, when changing ranges. This discussion led to the development of the "mathematically correct" item (See Item 320-2 in the 2008 S&T agenda which was subsequently adopted) and the creation of the Tare Work Group. They believe that this proposal goes beyond the original scope of the WG since its focus was to determine if any similar situation exists in HB 44 that would not be addressed with the "mathematically correct" agenda item. The work group expanded its efforts to include harmonization to OIML R 76 requirements related to tare. It is SMA's feeling that these changes do not address any problem and can only lead to confusion in the current regulatory and product development fields.

NIST technical advisor Steven Cook gave a presentation on this item describing the background and answered questions regarding the specific language in the proposal in response to the suggestions from the CWMA. The Committee decided to break the item into multiple parts to make it easier for people to address and analyze as follows:

320-1A is the proposal to amend (and renumber depending if other items are adopted) paragraph S.2.1.6. regarding scales with a combination "zero/tare" key.

320-1B is the proposal to amend paragraph S.2.3. by:

- reorganizing the separate subjects in the existing paragraph,
- specifying that tare cannot operate above the tare capacity of the device,
- adding tare division and capacity requirements for multi-interval and multiple range scales, and
- adding new language for tare accuracy.

320-1C is the proposal to add new language for visibility of tare and net indications, printing of weighing results for net and tare, motion detection for tare, and requirements for consecutive tare operations.

320-1D is the proposal to add new language for preset tares, which are also known as stored tare, predetermined tare, programmable tare, etc.

The proposal to amend the definition of tare mechanism and add new terms and definitions for the terms used in the above proposals have been incorporated in the individual items where the terms first appear.

For additional background information, refer to the Committee's 2008 Annual Report.

Background/Discussion: The first item, 320-1A addresses the proposed amendment to paragraph S.2.1.6. for scales that have a combined zero/tare key. The Committee agreed to move this item and the applicable definitions for tare-balancing mechanism and tare-weighing mechanism forward as a Voting item. Note that the Committee

recommends that subparagraphs c and d be given retroactive status since these requirements have been verified by NTEP since the 0/T feature was included into HB 44.

320-1B V S.2.3. Design of Balance, Tare, Level, Damping, Arresting Mechanisms, and Appendix D – Tare-weighing Mechanism.

Source: Carryover Item 320-6. (This item originated from the NTETC WS and first appeared on the Committee's 2007 agenda.)

Recommendations: Amend paragraphs S.2.3. and S.2.3.1. as follows (**Note:** Language indicated with double underlined font represents the "strikeout language" moved from S.2.3. to S.2.3.1.):

S.2. Design of Balance, Tare, Level, Damping, and Arresting Mechanisms.

S.2.3. Tare. – ~~***On any scale (except a monorail scale equipped with digital indications, and multi-interval scales and multiple range scales when the value of tare is determined in a lower weighing segment or weighing range), the value of the tare division shall be equal to the value of the scale division.****~~ The tare**-weighing and tare-balancing** mechanism shall operate only in a backward direction (that is, in a direction of underregistration) with respect to the zero-load balance condition of the scale. *A device designed to automatically clear any tare value shall also be designed to prevent the automatic clearing of tare until a complete transaction has been indicated.**

(Amended 1985 **and 2009**)

*[**Note**: On a computing scale, this requires the input of a unit price, the display of the unit price, and a computed positive total price at a readable equilibrium. Other devices require a complete weighing operation, including tare, net, and gross weight determination.]**
*[*Nonretroactive as of January 1, 1983]*

S.2.3.1. Scale Interval (Division) and Capacity. – ***On any scale (except a monorail scale equipped with digital indications, multi-interval scales and multiple range scales when the value of tare is determined in a lower weighing segment or weighing range), the value of the tare-weighing division shall be equal to the value of the scale division for any given load and shall not be operable above its maximum capacity.***
[Nonretroactive as of January 1, 1983]

(Added 2009)

S.2.3.1.1. Monorail Scales Equipped with Digital Indications. – On a static monorail weighing system equipped with digital indications, means shall be provided for setting any tare value of less than 5 % of the scale capacity to within 0.02 % of scale capacity. On a dynamic monorail weighing system, means shall be provided to automatically maintain this condition.

(Amended 1999)

Add new paragraphs S.2.3.1.2., S.2.3.1.3., S.2.3.2. and S.2.3.3. as follows:

S.2.3.1.2. Multi-interval Scales. – On multi-interval scales, the tare capacity is limited to the capacity of the first weighing segment and the value of the tare division shall be equal to the value of the scale division from the first weighing segment.

(Added 2009)

S.2.3.1.3. Multiple Range Scales. – On multiple range scales, the tare capacity may be operable in the greater weighing ranges if it is possible to switch to a greater weighing range with a load on the scale. The value of the tare division shall be equal to the value of the scale division from the weighing range where the tare was determined.

(Added 2009)

S.2.3.2. Accuracy. – A tare-weighing or -balancing mechanism shall permit setting the net indication to zero with an accuracy equal to or better than:

(a) ± 0.25 d for electronic weighing devices and any weighing device with an analog indication, and

(b) ± 0.5 d for mechanical weighing devices with a digital indication (e.g., weighbeams with only notched poises and no sliding poises).

On a multi-interval scale, d shall be replaced by d_1 (division value of the first weighing segment).

(Added 2009)

[Nonretroactive as of January 1, 2010]

S.2.3.3. Damping - Semi-automatic or Automatic* Tare-Balancing or Tare-Weighing Mechanisms. – These mechanisms shall be operable or accessible only by a tool outside of and separate from this mechanism or they shall be enclosed in a cabinet, or they shall be operable only when the indication is stable within:

(a) ± 3 scale divisions for scales of more than 2000 kg (5000 lb) capacity in service prior to January 1, 1981, and for all axle-load, railway track, and vehicle scales; or

(b) ± 1 scale division for all other scales.

*** Automatic tare mechanisms are not permitted for direct sales to the public.**

(Added 2009)

Add a new definition for tare-weighing mechanism in Appendix D:

tare-weighing mechanism. A tare mechanism that stores a tare value that has been taken either semi-automatically or automatically and is capable of displaying (continuously or upon command) or printing the value whether or not the instrument is loaded. [2.20, 2.24]

(Added 201X)

Background/Discussion: Background information on this item can be found in 320-1A.

After the NIST presentation on Tare during the 2009 Interim Meeting and considering that very few questions were raised during the discussion of the paragraphs in the recommendation, the Committee agreed to move this item and applicable definition for a tare-weighing mechanism forward as a Voting item. Note that the Committee recommends that language in paragraphs S.2.3.1.2., and S.2.3.1.3., be given retroactive status since these requirements have been verified by NTEP and since these types of weighing devices were included into HB 44 Appendix D.

320-1C I S.2.3.4. through S.2.3.7. Value of Tare Indication and Recorded Representations, and Appendix D. Definitions for Gross Weight Value, Net Weight Value, Net Weight, Tare, and Tare Weight Value

Source: Carryover Item 320-6. (This item originated from the NTETC WS and first appeared on the Committee's 2007 agenda.)

Recommendation: Add new paragraphs S.2.3.2. through S.2.3.6. as follows:

S.2.3.4. Visibility of Operation. – Operation of the tare mechanism shall be visibly indicated on the instrument. In the case of instruments with digital indications, this shall be done by marking the indicated net value with the word "NET" or the symbol "N." "NET" may be displayed as "NET," "Net," or "net." If a scale is equipped with an indicator that allows the gross value to be displayed

temporarily while a tare mechanism is in operation, the "NET" symbol shall disappear while the gross value is displayed.

(Added 201X)

S.2.3.5. Subtractive Tare Mechanism. – After any tare operation and while tare is in effect, an indicating or recording element shall not display nor record any values when the gross load (not counting the initial dead load that has been canceled by an initial zero-setting mechanism) is in excess of 105 % of scale capacity after tare has been taken.

(Added 201X)

S.2.3.6. Consecutive Tare Operations. – Repeated operation of a tare mechanism (including preset tare) is permitted for single transactions with one gross, one net, and multiple tare values. If more than one tare mechanism is operative at the same time, tare weight values shall be clearly designated (identified) with either "T" for tare or "PT" for preset tare, as appropriate, when indicated or printed.

(Added 201X)

S.2.3.7. Indication and Printing of Weighing Results.

(c) Gross weight values may be printed without any designation or by using a complete word or symbol. For a designation by a symbol, only uppercase "G" is permitted.

(d) If only net weight values are printed without corresponding gross or tare values, they may be printed without any designation or by using a complete word or symbol. The complete word "Net" or symbol "N" shall be used to designate a net weight as shown in S.2.3.3. Visibility of Operation. This applies also where semi-automatic zero-setting and semi-automatic tare balancing are initiated by the same key.

(e) Gross, net, or tare values determined by a multiple range instrument or by a multi-interval instrument need not be marked by a special designation referring to the (partial) weighing range.

(f) If net weight values are printed together with the corresponding gross and/or tare values, the net and tare values shall be identified at least by the corresponding symbols "N" and "T" or by complete words using all upper-case letters, all lower-case letters, or a combination of upper- and lower-case letters.

(g) If net weight values and tare values determined by different tare mechanisms are printed separately for single transactions with multiple gross, tare, and net values, they shall be suitably identified (e.g., vehicle sequentially loaded with mixed commodities).

(Added 201X)

Add the following new definitions to Appendix D:

gross weight value. Indication or recorded representation of the weight of a load on a weighing device, with no tare mechanism in operation. [2.20, 2.24]

(Added 201X)

net weight (net mass). The weight of a commodity excluding any materials, substances, or items not considered to be part of the commodity. Materials, substances, or items not considered to be part of the commodity include, but are not limited to, containers, conveyances, bags, wrappers, packaging materials, labels, individual piece coverings, decorative accompaniments, and coupons, except that, depending on the type of service rendered, packaging materials may be considered to be part of the service. For example, the service of shipping includes the weight of packing materials. [2.20, 2.24]

(Added 201X)

net weight value. Indication or recorded representation of the weight of a load placed on a weighing device after the operation of a tare mechanism. [2.20, 2.24]

(Added 201X)

tare. The weight of packaging material, containers, vehicles, or other materials that are not intended to be part of the commodity included in net weight determinations. [2.20, 2.24]

(Added 201X)

tare weight value. The weight value of a load determined by a tare mechanism. [2.20, 2.24]

(Added 201X)

Background/Discussion: Background information on this item can be found in the Background/Discussion paragraphs on agenda Item 320-1A.

During the NIST presentation on Tare during the 2009 Interim Meeting, the Committee heard several questions that indicated the need for additional clarification on:

- the value of specifying acceptable words and abbreviations for Gross, Tare, Preset Tare, and Net;
- what is meant by consecutive tare operations;
- whether itemized indications and recorded representations are required for each tare; and
- whether different indications and recorded representations are required for each tare value when tare and preset tare are used in the same transaction.

Consequently, the Committee recommends that this proposal remain an Informational item and suggests that the WS further clarify the proposed language and consider providing examples of; 1) indications and recorded representations of tare and preset tare in consecutive tare transactions, and 2) indications and recorded representations when multiple tares and preset tares are used to determine net weights.

320-1D I S.2.4. Preset Tare Mechanism and Appendix D – Definitions for Preset Tare

Source: Carryover Item 320-6. (This item originated from the NTETC WS and first appeared on the Committee's 2007 agenda.)

Recommendations: Add new paragraphs S.2.4. Fto address preset tare as follows:

S.2.4. Preset Tare Mechanism, Operation. – In addition to the provisions of paragraphs S.2.3. Tare and S.2.3.1. Scale Interval, a preset tare mechanism may be operated together with one or more tare devices provided:

(a) the preset tare mechanism complies with paragraph S.2.3.6. Consecutive Tare Operations,

(b) the preset tare operation cannot be modified or cancelled as long as any tare mechanism operated after the preset tare operation is still in use,

(c) the preset tare associated with a price look-up (PLU) shall be automatically cancelled at the same time a PLU is cancelled, and

(d) the preset tare values are designated by the symbol "PT"; however, it is permitted to replace the symbol "PT" with complete words.

A preset tare may operate automatically only if the preset tare value is clearly identified with the load to be measured (e.g., part of the product look-up information).

(Added 201X)

S.2.4.1. Indication of Operation. – It shall be possible to temporarily indicate the preset tare value (e.g., pressing a tare display button or by indicating a negative net weight with no load on the load-receiving element). In addition to the provisions of paragraph S.2.3.7. Indication and Printing of Weighing Results, the net value and at least the preset tare value is printed, with the exception of:

(a) a Class II or a Class III instrument and point-of-sale systems with a maximum capacity not greater than 100 kg (200 lb) used in direct sales to the public,

(b) price computing scales, and

(c) nonautomatic weigh/price labeling scales.

(Added 201X)

Add new preset tare definitions to Appendix D as follows:

preset tare. A numerical value, representing a weight that is entered into a weighing device (e.g., via keyboard entry, recalling from stored data, or entered through an interface) and is intended to be applied to weighings without determining individual tares.

(Added 201X)

preset tare mechanism. A part of a weighing system for subtracting a preset tare value from a gross or net weight value and indicating the result of the calculation as a net weight. The weighing range for net loads is reduced accordingly.

Types of preset tare mechanisms include:

- **keyboard tare. The operation of keys on a keyboard. For example: On a scale where d = 0.01 with a typical 10-key keyboard with values 0 through 9, pushing numbered key 5, or pressing the 0 then 5 keys results in a 0.05 tare value.**

- **digital tare. By the repeated operation of a particular key, tare values are entered in amounts equal to the value of a scale division. For example, on a 25 lb x 0.01 lb scale, each time a specifically marked key is depressed, a tare is entered equal to 0.01 lb. If that key were depressed five times, the tare value would be equal to 0.05 lb.**

- **programmable tare. Preset (predetermined) tare values that are stored in memory for multiple transactions. They may be part of the product information on PLU (product look-up), preset product, or tare keys.**

- **stored tare. Preset (predetermined) tare values that are stored in memory for multiple transactions and are used predominately in vehicle scale applications.**

- **percentage tare. A preset tare value, expressed as a percentage (i.e., 5.6 %), that represents the percentage of tare material compared to the gross or net weight of the commodity. A percentage tare is one form of proportional tare.**

- **proportional tare. A preset tare value, automatically calculated by the scale, proportional to the gross weight indicated by the scale. A proportional tare can be a percentage tare or a fixed tare**

value relative to a range of gross weights (i.e., a 10 g tare for gross weights between 0 and 2 kg, a 20 g tare for gross weights from 2 and 4 kg, etc.). A proportional tare is, therefore, not limited to being a percentage tare.

[2.20, 2.24]

(Added 201X)

Background/Discussion: Background information on this item can be found in the Background/Discussion paragraphs on agenda Item 320-1A.

During the NIST presentation on Tare during the 2009 Interim Meeting, the Committee heard several questions that indicated the need for additional clarification on the value of specifying acceptable words and abbreviations for Gross, Tare, Preset Tare, and Net.

Consequently, the Committee recommends that this proposal remain an Informational item.

320-2 V T.N.4.6. Time Dependence (Creep) for Load Cells During Type Evaluation

Source: 2008 S&T Committee

Recommendation: Amend T.N.4.7. as follows:

T.N.4.7. Creep Recovery for Load Cells During Type Evaluation. – The difference between the initial reading of the minimum load of the measuring range (D_{min}) and the reading after returning to minimum load subsequent to the maximum load (D_{max}) having been applied for 30 minutes shall not exceed:

(a) **0.83** ~~**0.5**~~times the value of the load cell verification interval **(0.83**~~**0.5**~~ v) for Class I, II, III, and IIII load cells, or

(b) 1.5 times the value of the load cell verification interval (1.5 v) for Class III L load cells.

(Added 2006) **(Amended 2009)**

Background/Discussion: The current tolerance of 0.5 times the load cell verification interval comes from OIML R 60 and was adopted in an attempt at harmonization. Because of the difference between the U.S. and European marketplace, a Class III scale with 5000 divisions is more common in the UNITED STATES whereas a 3000 division Class III scale is more common in the international marketplace. The U.S. load cell manufacturers have stated that the OIML tolerance should be multiplied by $^5/_3$ to maintain consistency in the level of performance between the U.S. and international marketplace equivalent devices. For example, a HB 44 5000 lb device with a load cell where v = 1 lb would have a maintenance tolerance of ± 5 lb with a creep recovery tolerance of 0.5 lb. An equivalent capacity OIML 3000 kg scale with an equivalent load cell where v = 1 kg would have a maintenance tolerance at a capacity of 2 kg (approximately 4.4 lb) and a creep recovery of 0.5 kg (1.1 lb). The proposal would increase the HB 44 creep recovery tolerance by $^5/_3$ to 0.83 lb.

A few weeks prior to the 2008 Annual Meeting, the Committee received a "priority" request to add a proposal as a Voting item to the Committee's agenda and was prompted by a significant increase in the failure rate for load cells submitted to NTEP since creep recovery tolerances were adopted into HB 44. The request to add the item as a Voting item was not approved according to criteria in HB 44 Introduction Section H(c) Exceptions to Policy for Submission of Items to a Committee Agenda; Submission of Priority Items. However, the Committee agreed to discuss this item during the Annual Meeting. As a result of these discussions, the Committee added this item to its list of carryover items as an Informational item and recommended that the NIST technical advisor work with the submitter of the item to develop a proposal to amend Table T.N.4.6. and add a table for designating loading and unloading times for consideration by the regional weights and measures associations to the 2009 NCWM Interim Meeting.

During their 2008 fall meetings, WWMA, CWMA, SWMA, and NEWMA heard from representatives of the SMA stating that additional load cell manufacturers will discuss this issue at the November 2008 SMA meeting and expect

to have a proposal that the NCWM S&T Committee can consider at the 2009 Interim Meeting. Until such time that an alternate proposal is developed for consideration, the regional weights and measures associations recommend maintaining this item as an Informational item on its agenda. The regional associations encourage the load cell manufacturers and SMA in their efforts to develop a proposal that can be considered for voting at the 2009 NCWM Annual Meeting.

During the 2008 NCWM Interim Meeting, the Committee received comments during the open hearing on whether this proposed language should be reviewed by the Weighing Sector (WS). The WS chairman (Darrell Flocken) replied that this was not reviewed by the Sector since it is a tolerance issue for HB 44 and not the test procedures in Publication 14. Darrell stated that the 2008 WS did provide recommendations to amend Publication 14 based on some of the issues identified during the discussions of the priority item submitted to the Committee at the 2008 Annual Meeting.

At the 2009 Interim Meeting, WMD stated that the proposed tolerance deviates from the recommendations in OIML R 60. WMD believes that, in most cases, this proposed tolerance does not present a technical barrier to trade since an equivalent OIML Class C load cell with 3000 v will likely pass HB 44 Class III S 5000 v requirement because of the extra tolerance step in Table 6 and proposed increase in the creep recovery tolerance. Stephen Patoray, Consultants on Certification, LLC, cautioned the Committee that there is a similar creep recovery tolerance for scales and separable weighing/load-receiving elements, and he suggested that the Committee consider the potential impact the increase in tolerance for load cells will have on these devices. Darrel Flocken suggested that the Committee consider developing a similar proposal for scales. However, the Committee would like to determine if there are similar creep recovery problems before recommending increasing the tolerances in paragraph T.N.4.5.1.(c) Time Dependence.

The Committee agreed to move this item forward as a Voting item and requests that the NTEP weighing labs be queried to see if there is a similar increase in device failures due to the new requirements for creep recovery on scales.

After the 2009 Interim Meeting, the NIST Force Group provided a set of compliance data for load cells submitted to NTEP since November 2007 where the creep recovery compliance results were recalculated using the proposed tolerance. The compliance rate increased to 58 % passing, which is up from 29 % passing.

320-3 I S.2.1.7. Automatic Zero-Setting Mechanism

Source: 2008 NTETC Weighing Sector and S&T Committee

Recommendation: Add a new paragraph S.2.1.7. and definition for Automatic Zero-Setting Mechanism as follows:

S.2.1.7. Automatic Zero-Setting Mechanism. – If equipped, an automatic zero-setting mechanism shall operate only when the indication has remained;

(a) stable according to S.2.5. Damping Means, and

(b) below zero for at least 5 seconds.

The maximum effect of automatic zero-setting mechanism is limited to 4 % of the nominal capacity of the scale and is a sealable parameter.

(Added 201X)

Amend paragraph S.2.1.3.3. as follows:

S.2.1.3.3. Means to Disable Automatic Zero-Tracking *and* ***Automatic Zero-Setting Mechanisms on Class III L Devices. –*** *Class III L devices equipped with* ~~***an***~~ *automatic zero-tracking* ***and automatic zero-setting*** *mechanisms shall be designed with a sealable means that would allow* ***automatic*** *zero-tracking* ***and automatic zero-setting*** *to be disabled during the inspection and test of the device.*
[Nonretroactive as of January 1, 2001]

(Amended 201X)

Amend HB 44 Appendix D by adding a new definition for automatic zero-setting mechanism, move the current definition for initial zero-setting mechanism under the broad heading of type of zero-setting mechanism, and move the definition for automatic zero-tracking mechanism to a stand-alone definition as follows:

~~**automatic**~~ **zero-tracking mechanism. Automatic means provided to maintain the zero balance indication, within certain limits, without the intervention of an operator.** ~~**See "automatic zero-tracking mechanism" under "zero-setting mechanism."**~~[2.20, 2.22, 2.24]

(Amended 2010)

zero-setting mechanism. Means provided to attain a zero balance indication with no load on the load-receiving element. **Four** ~~**Three**~~ types of these mechanisms are: [2.20]

automatic zero-setting mechanism. Automatic means provided to maintain the zero balance indication without the intervention of an operator. [2.20, 2.22, 2.24]

(Added 201X)

~~**automatic zero-tracking mechanism.** Automatic means provided to maintain the zero balance indication, within certain limits, without the intervention of an operator. [2.20, 2.22, 2.24]~~

initial zero-setting mechanism. Automatic means provided to set the indication to zero at the time the instrument is switched on and before it is ready for use. [2.20]

(Added 1990)

manual zero-setting mechanism. Nonautomatic means provided to attain a zero balance indication by the direct operation of a control. [2.20]

semiautomatic zero-setting mechanism. Automatic means provided to attain a direct zero balance indication requiring a single initiation by an operator. [2.20]

(Amended 2010)

Background/Discussion: At its 2008 Annual Meeting, the NTETC Weighing Sector discussed an issue on an increasing number of scales submitted for NTEP evaluations that include an "automatic zero-setting" feature not addressed in NIST HB 44. It has been noted that many devices are built for a global marketplace and that the operation of this "automatic zero-setting" device may be functional on the device when installed in the United States. Currently, HB 44 does not define this function. NCWM Pub 14 has no test to determine if the device submitted for evaluation has such a function, or if it is sealable. Additionally, a scale was recently submitted for evaluation and certified by NTEP where the automatic zero-setting feature worked in both the positive and negative directions and could be activated or deactivated without breaking a security seal or changing the audit trail information. The operation of the feature in the positive direction does not even comply with R 76. Competitors have also commented to NTEP that they had to disable this feature because it was not allowed by other NTEP weighing labs.

In the past, several of the NTEP labs, when asked about this "feature," have indicated that since it does not meet the definition of "automatic zero-tracking" mechanism, it is not allowed. Additionally, the Sector agreed that HB 44 does not clearly state that this function is not allowed. This led to incorrect interpretations of Section 2.20. Scales

paragraphs S.1.1.(c) (Zero Indication – ". . . return to a continuous zero indication") and S.1.1.1.(b) (Digital Indicating Elements – *"a device shall either automatically maintain a "center-of-zero" condition. . ."*) and could also be interpreted to allow the automatic zero-setting device as described in R 76. This interpretation was not the intent of the HB 44 requirements referenced above.

The Sector concluded the following:

1. There is a problem that needs to be solved, based on the current information or lack of information in HB 44.

2. There are no technical reasons why the feature automatic zero-setting as described in OIML R 76 should not be included in NIST Handbook 44.

3. The feature may not be suitable for all applications if it is allowed to function with both positive and negative weight indications.

4. Language will need to be developed for NCWM Publication 14 to either test for the correct function of "automatic zero-setting" or test to determine that the device does not have "automatic zero-setting" and it is a sealable parameter.

The Sector established a small WG to develop language to be submitted to the NCWM S&T Committee and to make a recommendation addressing the suitability of scales with the capability to automatically set a positive weight indication to zero. This group, which included Scott Davidson (Mettler-Toledo), Scott Henry (NCR), Steve Cook (NIST technical advisor), and Stephen Patoray (Consultants on Certification, LLC), volunteered to develop a proposal for the S&T Committee. (Todd Lucas, Ohio NTEP laboratory, and Jim Truex, NTEP Administrator, also contributed to the discussions and subsequent proposal.) Additionally, the Sector agreed to review the language developed by the WG to confirm its support of the proposed language.

In the process of developing the proposal, the WG recommends the following:

1. Make the proposal to add automatic zero-setting "retroactive" since the group is aware that the feature has been included on several scales for nearly 20 years and may not have been activated. The group considered alternate retroactive dates, but felt that the proposed requirements for the feature should be applicable to all scales incorporating this feature. Additionally, NCWM Publication 14 NTEP technical policies state that only the standard features and options that have been evaluated will be included on the CC. As a result, an NTEP applicant will have to submit an application to NTEP in order to have the automatic zero-setting feature listed on an existing CC.

2. The automatic zero-setting mechanism shall be limited to operating only when the scale indication is below zero. The group discussed allowing the feature to operate in both directions. Although there may be valid reasons for allowing it in the positive direction, the group felt that legitimate objects on a scale could be inadvertently (or intentionally) zeroed without an obvious indication to the customer or operator when the scale was indicating zero at the start of a transaction.

3. The automatic zero-setting mechanism should be considered as a "sealable parameter" since there are applications where it is required to be disabled, or scale parameters such as the time before initiating automatic zero-setting, motion detection, and capacity limitations can be adjusted beyond the requirements in the proposal.

4. Publication 14 evaluation and field examination procedures should be amended to verify that the automatic zero-setting mechanism cannot set the scale to a zero indication in less than five seconds; it can only operate if it complies with motion detection requirements, and its effect on the nominal scale capacity is no larger than 4 %.

5. The automatic zero-setting mechanism should be capable of being disabled for testing purposes for the same reasons that zero-tracking is capable of being disabled for Scales Code Class III L devices.

6. The group noted the current definition for initial zero-setting mechanism as a type of zero mechanism and should be included with the definition on zero-setting mechanism as shown in the recommendation.

7. The Committee is asked to consider recommending changing "automatic zero-tracking" to "zero-tracking" throughout the weighing codes in order to reduce the confusion with the term and definition for "automatic zero-setting." Additionally, the word "automatic" is redundant for zero-tracking since it is used in its definition.

The WG did not have sufficient time to both develop the proposal and ballot the Sector prior to the cutoff date for submitting items to the Committee. The responses to the ballot indicated that eight Sector members responded to the ballot of which six voted in favor of the proposed language. It should be noted that two of the affirmative votes stated that their vote was provisional on the basis that the reference to the 4 % of scale capacity limitation be removed from the proposal. Two members opposed that item stating that the language should not be rushed through the S&T Committee and that the feature should operate with either negative or positive weight indications.

At the 2009 NCWM Interim Meeting, the Committee heard comments from the SMA stating that it was in favor of the proposal provided the reference to the 4 % of scale capacity limitation is removed from the proposal. Paul Lewis, Rice Lake Weighing, recommended that the proposal be discussed by the regional weights and measures associations before it is ready to be voted on. Ted Kingsbury, Measurement Canada, stated that the language in the proposal is identical to Canadian requirements and that it is consistent with the recommendations in R 76. Any changes to the proposal involving the 4 % capacity limitation and the ability to operate in the positive direction would require that MC perform additional testing for devices submitted under the U.S./Canada Mutual Recognition Agreement. Darrell Flocken, Mettler-Toledo, also pointed out the inclusion of the term and definition for "automatic zero-tracking mechanism" should stand-alone and not be included as a type of zero-setting mechanism in order to be consistent with OIML R 76. Steve Cook, NIST technical advisor, added that he had received an earlier comment that the word "automatic" should be deleted from the term since the word is used in the definition and that it is not used in the corresponding term in R 76 and suggested that the Committee consider developing a proposal to delete the word "automatic" in the term "automatic zero-tracking" throughout HB 44.

The Committee reviewed the Sector ballot results and comments it received during the open hearing. The Committee agreed that there was no clear consensus among the Sector members and recommends that this proposal remain an Informational item. The Committee agreed with Darrell Flocken to move the definition of "automatic zero-tracking." The Committee also asked that the NTEP labs and the WS further discuss this item, develop a consensus position, and forward its recommendations to the Committee and that they also consider the suggestion from Steve Cook to amend the term "automatic-zero tracking."

321 BELT-CONVEYOR SCALE SYSTEMS

321-1 V UR.3.2.(c) Maintenance; Zero-Load Tests

Source: 2008 Western Weights and Measures Association (WWMA) (This item previously appeared on the 2008 Committee's Developing agenda as Item 360-2 Part 3 Item 1.)

Recommendation: Modify UR.3.2.(c) as follows:

UR.3.2. Maintenance. – Belt-conveyor scales and idlers shall be maintained and serviced in accordance with manufacturer's instructions and the following requirements:

(c) **Zero-load and load (simulated or material) tests** ~~**S**~~**simulated load tests, or material tests, and zero-load tests**shall be conducted at periodic intervals between official tests **and after a repair or mechanical adjustment to the conveyor system** in order to provide reasonable assurance that the device is performing correctly. **The minimum interval for periodic zero-load tests and simulated load tests shall be established by the official with statutory authority or according to manufacturer recommendations.**

The action to be taken as a result of the zero-load tests is as follows:

- **if the change in zero is less than ± 0.25 %, adjust the belt-conveyor scale system to zero and proceed to a simulated load test or return the conveyor to operation;**

- **if the change in zero is ~~± 0.1 % to~~ ± 0.25 % to ± 0.5 %, inspect the conveyor and weighing area for compliance with UR.2. Installation Requirements and repeat the zero-load test; and**

- **if the change in zero is greater than ± 0.5 %, inspect the conveyor and weighing area for compliance with UR.2. Installation Requirements, repeat the zero-load test, and reduce the interval between zero-load tests.**

The action to be taken as a result of the **simulated load or** material tests ~~**or simulated load tests**~~ is as follows:

(Amended 2002 **and 2009**)

- if the error is less than 0.25 %, no adjustment is to be made;

- if the error is at least 0.25 % but not more than 0.6 %, **inspect the conveyor and weighing area for compliance with UR.2. Installation Requirements and repeat the test**~~**adjustment may be made if the official with statutory authority is notified**~~;
  (Amended 1991 **and 2009**)

- **if the result of tests, after compliance with UR.2. Installation Requirements is verified, remain greater than ± 0.25 %, a span correction shall be made and the official with statutory authority notified;**

- if the error is greater than 0.6 % but does not exceed 0.75 %, **inspect the conveyor and weighing area for compliance with UR.2. Installation Requirements, and repeat the test;**
  (Amended 1991 **and 2009**)

- **if the result of tests, after UR.2. Installation Requirements compliance is verified, remains greater than ± 0.25 %, a span correction shall be made, the official with statutory authority shall be notified, and an official test shall be conducted;**

- if the error is greater than 0.75 %, an official test is required.
  (Amended 1987 **and 2009**)

Discussion: HB 44 gives limited guidance on what to do with zero-load test results. Belt loss is not the only factor that may require the scale operator to make physical adjustments to the belt-conveyor system to correct for deficiencies. For example, a dirty scale structure or a worn belt scraper will increase the zero-reference number and the test results may exceed tolerances.

The scale user/owner has to protect his interest between weighing transactions. At present, some belt-conveyor systems may have errors greater than 0.5 % in zero reference over a 24-hour period. The belt is part of tare (net load) on any empty running system and the system must be maintained to within tolerance at all times.

During its 2006 meeting, the WWMA recommended the alternate industry proposal shown above. The WWMA also recommended the alternate proposal be considered at a future meeting of the USNWG on Belt-Conveyor Scale Systems. The WWMA recommended the alternate proposal remain a Developing item to allow sufficient time for a review by the WG. The CWMA and the SWMA concurred with the WWMA's recommendation.

This WG agrees that there is a need to establish some zero-load test interval for the normal use of a belt-conveyor scale system and that there is also a need to vary the interval (longer interval if the scale is stable; shorter interval if

the zero-load tests require frequent adjustment). The WG has reviewed and discussed this Developing item and submitted a revised proposal to the NIST technical advisor to the S&T Committee.

At its 2007 Annual Meeting, the WWMA believed this item was not sufficiently developed and did not have a consensus from the Belt-Conveyor Scales (BCS) and, therefore, recommended this remain a Developing item on the NCWM S&T Committee agenda.

At its 2007 Interim Meeting, the CWMA recommended this item be Withdrawn.

During the 2008 NCWM Interim Meeting, the Committee was informed that the USNWG on Belt-Conveyor Scales was planning to further develop the proposal during their next meeting on February 27 - 28, 2008, in St. Louis, Missouri. During that meeting, the WG further amended the proposal as shown in the above recommendation and believes that this item is sufficiently developed to be added to the NCWM S&T Committee Agenda as a Voting item.

At its 2008 Annual Technical Conference, the WWMA heard comments from the BCS USNWG that the item is sufficiently developed. The WWMA agreed with the comments and proposed change to add "and after a repair or mechanical adjustment to the conveyor system" in (c) as shown in the above proposal and recommends that this proposal move forward as a Voting item.

At the 2009 NCWM Interim Meeting, the Committee heard comments from Bill Ripka, Thermo Ramsey, who recommends that this item move forward as a Voting item since recent changes to the Belt-Conveyor Scale Systems Code have increased attention to the accuracy of the zero reference on belt-conveyor scales and raised questions on how frequently the zero reference and simulated tests should be conducted between official testing. The language in this proposal would require users to perform tests to monitor the scale's performance at a frequency that would be established either by the official or by recommendations from the manufacturer. Jack Kane, Montana, was concerned that the proposed language appears to rely only on the official's experience and expertise and suggested the scale manufacturer be able to provide input to the frequency of testing. Julie Quinn, Minnesota, stated that this language by itself would imply recordkeeping requirements. The NIST technical advisor stated that the requirements for recordkeeping are supported in paragraph UR.3.3. Retention of Maintenance, Test, and Analog or Digital Recorder Information. The NIST technical advisor stated all the belt-conveyor scale proposals will be reviewed by the BCS WG during their February 2009 meeting.

The Committee agreed with the comments from Jack Kane and amended the proposal as shown in the Committee's recommendation to include the manufacturer's recommendations in determining the frequency of zero and simulated tests between official tests and recommended this item move forward as a Voting item. The Committee also requests input from the BCS WG and other interested parties on the table format for the "actions to be taken as a result" of the zero or simulated tests.

(See also the Committee's 2008 Annual Report for additional background information.)

After the Interim Meeting, the NIST technical advisor developed the following tables, which were based on a suggestion during the open hearing. The following tables represent the above bulleted language in UR.3.3.(c) presented in a table format. The USNWG on Belt Scales will review the alternate format and provide the Committee with its recommendations and additional comments.

Change in Zero Reference Point (Δ 0)	Action to be Taken
If the change in zero is less than ± 0.25 % (Δ 0 < 0.25 %)	Perform zero adjustment and proceed to simulated load test
If the change in zero is ± 0.25 % to ± 0.5 % (0.25 % ≤ Δ 0 ≤ 0.5 %)	Inspect the conveyor and weighing area for compliance with UR.2. Installation Requirements and repeat the zero-load test
If the change in zero is greater than ± 0.5 % (Δ 0 > 0.5 %)	Inspect the conveyor and weighing area for compliance with UR.2. Installation Requirements, repeat the zero-load test, and reduce the interval between zero-load tests.

Change in Reference Point established in N.3.3.(b)	Action to be Taken
If the error is less than 0.25 % (Δ N.3.3.(b) < 0.25 %)	No Action
If the error is at least 0.25 % but not more than 0.6 % (0.25 % ≤ Δ N.3.3.(b) ≤ 0.6 %)	Inspect the conveyor and weighing area for compliance with UR.2. Installation Requirements and repeat the test. If the result of tests, after compliance with UR.2. Installation Requirements is verified, remain greater than ± 0.25 %, a span correction shall be made and the official with statutory authority notified.
If the error is greater than 0.6 % but does not exceed 0.75 % (0.6 % < Δ N.3.3.(b) ≤ 0.75 %)	Inspect the conveyor and weighing area for compliance with UR.2. Installation Requirements, and repeat the test. If the result of tests, after UR.2. Installation Requirements compliance is verified, remains greater than ± 0.25 %, a span correction shall be made, the official with statutory authority shall be notified, and an official test shall be conducted.
If the error is greater than 0.75 % (Δ N.3.3.(b) > 0.75 %)	An official test is required.

321-2 V N.3.1.4. Check for Consistency of the Conveyor Belt Along Its Entire Length

Source: 2008 Western Weights and Measures Association (WWMA) (This item last appeared on the 2008 Committee's Developing agenda as Item 360-2 Part 3 Item 2)

Recommendation: Amend NIST Handbook 44, Section 2.21. Belt Conveyor Scales (BCS) Systems Code, paragraph N.3.1.4. as follows:

N.3.1.4. Check for Consistency of the Conveyor Belt Along Its Entire Length. – <u>During a zero-load test, the total change indicated in the totalizer during one revolution of the belt shall not exceed 0.18 % of the load that would be totalized at scale capacity for the duration of the test. The end value of the zero-load test must meet the ± 0.06 % requirement of paragraphs N.3.1.2. Initial Stable Zero and N.3.1.3. Test for Zero Stability.</u> ~~After a zero-load test with flow rate filtering disabled, the totalizer shall not change more than plus or minus (± 3 d) 3.0 scale divisions from its initial indication during one complete belt revolution.~~

(Added 2002) (Amended 2004 **<u>and 201X)</u>**

Discussion: The BCS WG agrees that the existing language in N.3.1.4. results in an excessive allowance for the variation in a belt. However, for belt-conveyor scales that can benefit from a smaller minimum division, the 3-division requirement can impose an excessively narrow restriction. It should be noted that variations in belt weight tend to be sinusoidal. In other words, the error caused by belt variations would be canceled if the material test were conducted using complete revolutions. The maximum belt variation would occur at 0.5, 1.5., 2.5, etc., revolutions. However, material tests are rarely conducted using complete revolutions of the belt.

The current tolerance of plus or minus 3 divisions can allow belt weight variation to contribute too large a portion to the 0.25 % belt-conveyor scale tolerance. The actual quantity represented by 3 divisions can vary with the belt-conveyor scale application. Paragraph N.2.3. Minimum Totalized Load (b) allows a material test load to be the amount of material to be weighed during one revolution of the belt. If the tolerance for the material test is 0.25 %, then on a root-sum-square basis, the variation in zero resulting from changes in the weight of the belt itself should not exceed 0.18 % (0.25 % times $\{\sqrt{2}\}$ / 2).

Some rationale other than root-sum-square could result in a different allowable variation due to belt weight.

The following example illustrates the difference between divisions and percent for this purpose:

Belt length	= 800 ft,
Division size	= 0.1 ton,
Maximum capacity	= 800 tons/hr, and
Belt speed	= 400 ft/min

These minimum totalized load (MTL) values in paragraph N.2.3. are in a feasible range for an actual application.

N.2.3.(a)	800 divisions	= 80.0 tons
N.2.3.(b)	one revolution	= 26.67 tons, which is (66.67 lb/ft * 800 ft)
N.2.3.(c)	ten minutes	= 133.3 tons

The materials test tolerance (T.1.) based on the MTL in N.2.3.(b) = 0.07 tons.

The allowable variation due to belt weight is ± 3 divisions or ± 0.3 tons. Using ± 0.3 ton error in zero allows a total delivery error that can exceed maintenance tolerance in paragraph T.1. Tolerance values because of acceptable belt weight variation of 0.6 tons currently in HB 44 paragraph N.3.1.4. This tolerance exceeds the 0.25 % tolerance of the weighing system without weighing any material. Even for a 10 min MTL (N.3.1.4.(c)), the allowable error is 0.45 % of 133.3 tons.

The proposed language changes the tolerances in N.3.1.4. from ± 3 divisions to 0.18 %. In the above example, the allowable change in the totalizer readings could be no greater than 0.048 tons [0.18 % x 26.67 tons (MTL)].

NIST HB 44 paragraph N.2. Conditions of Test was amended, and the minimum totalized load (MTL) requirements were amended and renumbered to paragraph N.2.3. Since 10 min of operation in N.3.2.(c) typically results in a test load larger than (a) or (b), the 10 min MTL is used for most BCS installations. Additionally, the words "or a normal weighment" were removed from MTL requirements because, at that time, it was thought the words were no longer needed since language was developed to allow a smaller material test load provided the scale demonstrated compliance with BCS tolerances with the MTL and the smaller test load.

As a result of removing the words "or a normal weighment," it has been reported that the revised MTL requirements were not suitable for BCS installations that issue individual weights for vehicles and railcars. This is due to limitations of the installation and uncertainties in determining the net weights of several vehicles or railcars to compare material test results of the 10 min MTL with the alternate test load of "2 % of the load totalized in 1 hour."

The current NIST HB 44 paragraph N.2.3. permits "a smaller minimum totalized load down to 2 % of the load totalized in 1 hour…." In the above example the minimum load would be 16 tons for this criterion so the belt variation is even a larger percentage of the weighed load.

The change to 0.18 % is a better criterion in several ways.

1. It defines the allowable excursion of the totalized value during the zero procedure. Plus or minus requires some reference value and it is not known at the start of a zero test whether that portion of the belt is heavy or light.
2. It is independent of division size. (But the division size must be small enough to resolve the variation.)
3. It is in harmony with OIML R 50.

In the above example 0.18 % of 26.67 tons is 0.048 tons. This is quite different from 3 divisions or ± 3 divisions.

At its 2007 Annual Meeting, the WWMA heard comments from a device manufacturer who would like to leave the item as either Developing or Withdrawn.

During the 2008 NCWM Interim Meeting, the Committee was informed that the USNWG on Belt-Conveyor Scales was planning to further develop the proposal during their next meeting on February 27 - 28, 2008, in St. Louis, Missouri. During that meeting, the WG discussed this item and concluded that the language needs further development before a consensus can be reached and recommended this item remain as a Developing item.

At its 2008 Annual Technical Conference, the WWMA heard comments that the item is sufficiently developed and is an improvement over the existing language in HB 44. The Committee agrees and recommends that this proposal move forward as a Voting item.

During the 2009 NCWM Interim Meeting, the Committee heard a comment from Bill Ripka, Thermo Ramsey, supporting the proposal as written in the Committee's recommendation and added that the current language in HB 44 stating the current 3 scale interval deviation from an initial indication can lead to significant errors in scale accuracy.

The Committee agreed with the comments from Bill Ripka and recommended this item move forward as a Voting item.

(See also the Committee's 2008 Annual Report for additional background information.)

321-3 V S.1.3.1. For Scales Installed After January 1, 1986 (Value of the Scale Division)

Source: 2008 Western Weights and Measures Association (WWMA)

Recommendation: Amend HB 44 Section 2.21. paragraph S.1.3.1.

S.1.3.1. For Scales Installed After January 1, 1986. *– The value of the scale division shall not be greater than* ***0.125 % (1/800) 0.1 %*** ~~*1/1000*~~ *of the minimum totalized load.*

~~[Nonretroactive as of January 1, 1986]~~(Added 1985) (Amended 2010)

The USNWG on BCS recommended that the above change be made to reconcile the value of the minimum scale division (0.1 % of the minimum totalized load) with the value of the minimum test load (800 divisions) listed in paragraph N.2.3.(a).

At its 2008 Annual Technical Conference, the WWMA heard support for this item as written in its agenda and recommends that the proposal move forward as a Voting item.

During the 2009 NCWM Interim Meeting, the Committee heard support for this item from Bill Ripka, Thermo Ramsey, and recommended that this item move forward as a Voting item.

321-4 V S.1.6.1 Zero-load Indicator

Source: 2008 Western Weights and Measures Association (WWMA)

Recommendation: Add new paragraph S.1.6.1. to HB 44 Section 2.21. as shown:

S.1.6.1. Zero-load indicator. – The integrator shall display an indication that defines a zero-balance condition when the unloaded condition of the belt over a unit revolution or revolutions is within ± 0.12 % of the rated scale capacity.
(Nonretroactive as of January 1, 2011)
(Added 201X)

Background/Discussion: It is apparent to owners, manufacturers, and service agents associated with belt-conveyor scale systems that on systems (particularly those equipped with automatic zero-mechanisms) running at a "no-load" level of operation, that a zero shift may occur and not be readily observed. At its February 2008 meeting, the USNWG on BCS recommended language that would require an indication be present which indicates a zero condition during these low-flow periods when no material is being totalized by an integrator. The recommended addition of the paragraph S.1.6.1. as shown above would require an indication that would notify an operator of an out-of-zero condition and also define the limit of the width of zero for that device.

At its 2008 Annual Technical Conference, the Committee heard support for this item as written in the agenda along with a request to allow additional time for manufacturers to make necessary changes to hardware or software. The Committee agreed with the comments and request and recommends the proposal be amended and moved forward as a Voting item with a 2011 nonretroactive date as shown in the recommendation (effective 18 months after adoption).

During the 2009 NCWM Interim Meeting, the Committee received written comments from Alabama Weights and Measures Division stating that an indicator should serve as a means to alert the operator that a zero condition during low-flow periods has occurred. However, if this indicator is activated, the operator and/or service person should make every effort to locate the possible zero change source before making a zero change/adjustment. The indicator could be indicating an electronic problem, a belt loss condition or another source of zero error. In many cases, problems of a mechanical or material handling nature occur that does affect the zero balance condition. In these cases, zero changes or adjustments must not be made until repairs, adjustments, or cleaning has been accomplished. It should also be understood that all conveyor belt scale operators be required to maintain a constant and thorough inspection process during operation of the scale conveyor system. This would help to reduce unwarranted electronic adjustments to the scale system.

The Committee agrees with the comments from Alabama Weights and Measures Division that any indications such as a change in the zero reference condition of the scale should be acted upon by the user. The Committee suggests that the Belt-Conveyor Scale WG or Alabama Weights and Measures Division develop a proposal for a separate user requirement similar to Scales Code paragraph UR.4.1. Balance Condition. The proposal should require the user to maintain the zero-balance condition when the belt is unloaded, and to include the inspections recommended in the Alabama comments.

The Committee also heard support for this item from Bill Ripka, Thermo Ramsey, supporting the proposal as written in the Committee's recommendation. The Committee agreed to recommend that this item move forward as a Voting item.

321-5 V N.2. Conditions of Tests, N.2.1. Initial Verification and N.3.2. Material Tests

Source: 2008 Western Weights and Measures Association (WWMA)

Recommendation: Amend NIST HB 44 Section 2.21. paragraph N.2. and N.2.1. as follows:

N.2. Conditions of Tests. – A belt-conveyor scale shall be tested after it is installed on the conveyor system with which it is to be used and under such environmental conditions as may normally be expected. Each test shall be conducted with test loads no less than the minimum test load. **Before each test run, check the zero**

setting, and if necessary perform a zero-load test. Zero adjustment between test runs shall not exceed the tolerance of T.1.1.

(Amended 1986 and 2004 **and 201X)**

N.2.1. Initial Verification. – A belt-conveyor scale system shall be ~~**tested**~~**verified with a minimum of two test runs** at **each of the following flow rates:**

1. normal use flow rate,
2. 35 % of the maximum rated capacity, and
3. an intermediate flow rate between these two points.

Test runs may also be conducted~~**The system may also be tested**~~ at any other rate of flow that may be used at the installation. ~~**If the**~~**The official with statutory authority may determine that a minimum of four test runs may be conducted at only one flow rate if evidence is provided that the systems is used to operate at a single flow rate that does not vary by more than ± 5 % of the maximum rated capacity (excluding the time that the flow rate is ramping up or down).**

(Added 2004) **(Amended 201X)**

N.3.2. Material Tests. – Material tests should be conducted using actual belt loading conditions. These belt loading conditions shall include, but are not limited to conducting materials tests using different belt loading points, all types and sizes of products weighed on the scale, at least one other belt speed, and in both directions of weighing.

~~**On initial verification, at least three individual material tests shall be conducted.**~~ On subsequent verifications, at least two individual tests shall be conducted. The results of all these tests shall be within the tolerance limits.

Either pass a quantity of pre-weighed material . . .

(Amended 1986, 1989, 1998, 2000, 2002**, and 2010)**

Background/Discussion: WMD has received inquiries and comments pertaining to whether or not rezeroing of the belt-conveyor scale under evaluation can be done between tests. There is inconsistency between jurisdictions in the way that tests are performed regarding these questions. Due to the requirement (HB 44 Section 2.21. paragraph N.2.1.) during an initial verification, which states that tests (runs) are to be performed at three flow rates and that they must be of 10 minute durations, many hours may be required to complete the testing. This presents a problem with determining if the BCS needs to be rezeroed after each test run regardless of the change in zero or if the BCS only needs to be rezeroed if the change exceeds the requirements in paragraph T.1.1. Tolerance Values – Zero Stability.

Paul Chase (member of the USNWG on Belt-Conveyor Scales) has collected some historical data on two belt-conveyor scale systems where temperature and zero information are available that show a clear trend with temperature. These data indicate that testing over a period of many hours can be affected by a zero shift that occurs during the testing. This could be a result of day-to-night temperature variation. A belt-conveyor scale that exhibits this property should be re-zeroed during normal operation as required to maintain the belt-conveyor scale within tolerance.

The expectation that a device will maintain a consistent zero under these conditions is considered by manufacturers and the USNWG to be an unfair performance standard. At its February 2008 meeting, USNWG recommended that HB 44 be amended as shown in the recommendation above.

Additionally, WMD received requests for clarification on the number of tests to be performed during initial verification. Paragraph N.2.1. Initial Verification, added in 2004, states that the scale be tested at three flow rates. Additionally, the second paragraph in N.3.2. Material Tests states that at least three individual material tests be conducted during initial verification, which was added prior to 1986. Officials and service agents were asking if the minimum number of tests were a total of three (one at each flow rate), or nine (three tests at each flow rate) during

initial verification. The WG confirmed that the language that was added in 2004 intended that at least two material tests at each flow rate were to be performed during an initial verification in order for the test to more closely align with international recommendations. Consequently, the WG recommended language to clarify the number of tests in N.2.1. and to delete the statement regarding the number of tests during initial verification N.3.2. since the language is already addressed in N.2.1.

At its 2008 Annual Technical Conference, the WWMA heard comments supporting this item along with a recommendation from Bill Ripka, Thermo Ramsey, to clarify when testing only at a single flow rate is permitted. The WWMA noted that the proposed change to the language is consistent with testing at different flow rates in paragraph N.2.2. Subsequent Verification. The WWMA agreed with the comments and recommends that this proposal move forward as a Voting item.

During the 2009 NCWM Interim Meeting, the Committee received written comments from Alabama Weights and Measures Division expressing their opposition to this proposal as recommended in the Interim agenda and stated that all conveyor-belt scales being tested for initial verification within the State of Alabama will be tested as follows:

Three (3) individual tests will be performed at each of the following:
- at normal use flow rate,
- 35 % of the maximum rated capacity, and
- at an intermediate flow rate between these points.

The total number of test runs for this initial verification will be nine (9). Alabama believes that in order to establish a pattern of repeatability upon initial verification that three (3) individual tests at each flow rate need to be performed. Alabama notes that the conduct of these tests are only a "snapshot in time," indicating that the scale and scale system as a whole operated or failed to operate as required at that point. Therefore, Alabama believes that the requirement for strong repeatability testing must remain.

Bill Ripka, Thermo Ramsey, supported the item as written as it clarifies the number of tests at each flow rate. He added that language should be included to address the ramping up and down of flow rates on installations that run predominately at a single flow rate, and he suggested that the proposed last sentence in the paragraph could be amended similarly to current paragraph N.2.2. Subsequent Testing, which provides additional guidance on when testing at multiple flow rates may be waived.

The Committee considered the comments from Alabama Weights and Measures Division and agreed that the proposed language is considered a minimum test and that additional testing may be required. Consequently, the Committee amended the proposal as shown in the Committee's recommendation to clarify that the pairs of tests at each flow rate are a minimum test and to provide additional guidance on proposed language in determining when testing at three flow rates may be waived. The Committee amended the proposal to delete the third sentence in paragraph N.3.2. Material Tests. since the sentence conflicts with the language in the current and proposed language in paragraph N.2.1. shown in the recommendation above.

The NIST technical advisor added that this amended proposal will be reviewed by Alabama and by the belt-conveyor scale WG during their February 2009 meeting. The Committee recommends that the item move forward as a Voting item unless it receives information from the WG suggesting that the item is not ready for a vote.

321-6 V T.1.1. Tolerance Values – Test of Zero Stability

Source: 2008 Western Weights and Measures Association (WWMA)

Recommendation: Amend HB 44 Section 2.21. (Belt Conveyor Scale Systems Code) paragraph T.1.1. to coincide with amendment recommended to paragraphs N.2. and N.2.1. in agenda Item 321-5 as follows:

T.1.1. Tolerance Values - Test of Zero Stability. – Immediately after material has been weighed over the belt-conveyor scale during the conduct of ~~**the**~~ **any** material~~**s**~~ test **run**, the zero-load test shall be repeated. The change in the accumulated or subtracted weight on the Master Weight Totalizer during the zero test shall not exceed 0.12 % of the totalized load at full scale capacity for the duration of the test. **If the total range of zero**

adjustment during a complete (official) verification test exceeds 0.18 %, the official with statutory authority may establish an interval for zero-load testing during normal operation.

(Added 2004 **and 2009**)

Background/Discussion: The recommendation to amend the paragraphs N.2. and N.2.1. would necessitate the amendments shown above to reflect the consideration of a tolerance associated with a zero shift in the scale. The U.S. National Work Group on BCS recognized the need and recommends the above wording changes.

At its 2008 Annual Technical Conference, the WWMA heard a comment from a jurisdiction that the proposal places an additional burden on the field inspector having to verify compliance with the frequency of zero and accuracy tests between official tests in order to monitor zero references and calibration stability. WMD noted that paragraph UR.4. Compliance already requires the user to retain records of these tests and that the proposal is only intended to give the inspector some guidance on establishing the frequency of these intermediate tests.

The WWMA considered the comments and recommends that this proposal move forward as a Voting item since it provides the regulatory official with guidance in determining the frequency for conducting zero-load tests between official tests.

During the 2009 NCWM Interim Meeting, the Committee received written comments from Alabama Weights and Measures Division stating that the proposed change from "the materials test run" to "a material test run" seems to indicate that only one material test run be required prior to performing a zero-load test. The State of Alabama requires that when performing initial and follow-up verification tests that three (3) separate material test runs be performed and recommends that the current wording should remain "as is" in order to be able to establish a pattern of repeatability and to insure that the scale is weighing with as much accuracy as possible.

The NIST technical advisor reviewed the summary of the May 2001 Belt-Conveyor Scale Seminar where the original language was developed. The discussions indicated that the participants believed that the zero-load reference be verified after any material test run and developed the language to coincide with language for UR.3.2. Maintenance subparagraph (c) Zero-Load Reference Information that the zero-load test be conducted immediately before and after a delivery when the zero-load information is recorded as part of a delivery.

Bill Ripka, Thermo Ramsey, supports the item as written in the Interim agenda and does not have a problem with the restrictions, but stated that he believes the zero reference should be allowed to drift provided the material test accuracy repeats within tolerances.

The Committee considered the comments and agreed to amend the proposal to clarify that the zero-load test is to be conducted after any material test run and recommended that this item move forward as a Voting item.

321-7 V N.3.1.2. Initial Stable Zero, N.3.1.3. Test of Zero Stability and S.3.1.1. Automatic Zero-Setting Mechanism

Source: 2008 Western Weights and Measures Association (WWMA)

Recommendation: Combine paragraphs N.3.1.2. and N.3.1.3. in HB 44 Section 2.21. resulting in one paragraph N.3.1.2. Test of Zero Stability.

Delete N.3.1.2. and amend N.3.1.3. as follows:

~~**N.3.1.2. Initial Stable Zero. – The conveyor system shall be run to warm up the belt and the belt scale shall be zero-adjusted as required. A series of zero-load tests shall be carried out until three consecutive zero-load tests each indicate an error which does not exceed ± 0.06 % of the totalized load at full scale capacity for the duration of the test. No adjustments can be made during the three consecutive zero-load test readings.**~~

~~**(Added 2002) (Amended 2004)**~~

N.3.1.2~~3~~. Test of Zero Stability. – The conveyor system shall be run to warm up the belt and the belt scale shall be zero adjusted as required. A series of zero-load tests shall be carried out **before weighing material immediately before the simulated or materials test** until three consecutive zero-load tests each indicate an error which does not exceed ± 0.06 % of the totalized load at full scale capacity for the duration of the test. No adjustments can be made during the three consecutive zero-load test readings. **As specified in S.3.1.1., if operable, the automatic zero-setting mechanism shall not obscure any change in zero for integrators manufactured on or after January 1, 2010.**

(Added 2002) (Amended 2004 **and 2010**)

N.3.1.3~~4~~. Check For Consistency of the Conveyor Belt Along Its Entire Length. – After a zero-load test with flow rate filtering disabled, the totalizer shall not change more than plus or minus 3.0 scale divisions (± 3 d) from its initial indication during one complete belt revolution.

(Added 2002) (Amended 2004) **(Renumbered 2010)**

Add new paragraph S.3.1.1. as shown below:

S.3.1.1. Automatic Zero-Setting Mechanism. – The automatic zero-setting mechanism shall not obscure any change in zero.

(Added 201X)

Background/Discussion: At its 2008 Annual Technical Conference, the WWMA reviewed a proposal from the USNWG on Belt Conveyor Scale Systems recommending that paragraphs N.3.1.2. and N.3.1.3. be combined since they are nearly identical in language and to reduce redundant language and to clarify that any change in zero is to be indicated to verify that the total range of zero adjustment during an official test complied with paragraph T.1.1. This combination would result in one paragraph identified as "N.3.1.2. Test of Zero Stability." The group also recommends that paragraph S.3.1.1. be added so that specification requirements within the code coincide with the amendments to paragraph N.3.1.2. The WWMA heard support for the item and recommends that the proposal moves forward as a Voting item.

During the 2009 NCWM Interim Meeting, the Committee heard from Bill Ripka, Thermo Ramsey, in support of the item as written in the Committee's recommendation since it eliminates redundant language in HB 44. The Committee agreed to recommend that this item move forward as a Voting item.

322 AUTOMATIC BULK-WEIGHING SYSTEMS

322-1 I S.2.1. Zero-Load Adjustment

Source: NTETC Weighing Sector

Recommendation: Amend HB 44 Section 2.22. Automatic Bulk-Weighing Systems by amending paragraph S.2.1.3.3. as follows:

S.2.1. Zero-Load Adjustment. – The weighing system shall be equipped with manual or semiautomatic means by which the zero-load balance or no-load reference value indication may be adjusted. **~~An a~~A**utomatic zero-tracking **and automatic zero-setting** mechanism**s ~~is~~are** prohibited.

(Amended 201X)

Background/Discussion: At its 2008 Annual Meeting, the NTETC Weighing Sector held a discussion about the increasing number of scales submitted for NTEP evaluations that include an "automatic zero-setting" feature, which is not addressed in NIST HB 44. It has been noted that many devices are built for a global marketplace and that the operation of this **"**automatic zero-setting" device may be functional on the device when installed in the United States. Currently, HB 44 does not define this function. NCWM Pub 14 has no test to determine if the device submitted for evaluation has such a function, or if it is sealable. The automatic zero-setting mechanism on a scanned/scale submitted to NTEP could be enabled and disabled by means of a bar code read by the scanner.

The Sector established a small WG to develop language to be submitted to the NCWM S&T Committee and make recommendations addressing the suitability of scales with the capability to automatically set a positive weight indication to zero. The group, which included Scott Davidson (Mettler-Toledo), Scott Henry (NCR), Steve Cook (NIST technical advisor), and Stephen Patoray (Consultant on Certification, LLC), volunteered to develop a proposal for the S&T Committee. (Todd Lucas, Ohio NTEP laboratory and Jim Truex, NTEP Administrator, also contributed to the discussions and subsequent proposal.) Additionally, the Sector agreed to review the language developed by the WG to confirm its support of the proposed language.

In the process of developing the proposal, the WG recommended that the automatic zero-setting mechanism be prohibited for devices covered by Section 2.22. Automatic Bulk-Weighing Systems for the same reasons that zero-tracking is prohibited (incorrect net weight determinations may occur when unintentional and unobserved zeroing or tracking off of material retained in a hopper).

See agenda Item 320-3 for additional background information on the development of this proposal.

The Committee agreed that this item should remain as an Informational item pending the development of the proposal to add the term "automatic zero-setting mechanism" in agenda Item 320-2.

324 AUTOMATIC WEIGHING SYSTEMS

324-1 I S.2.1.3. Automatic Zero-Setting Mechanism

Source: 2008 NTETC Weighing Sector

Recommendation: Amend HB 44 Section 2.24. Automatic Weighing Systems by adding new paragraph S.2.1.3. as follows:

S.2.1.3. Automatic Zero-Setting Mechanism – If equipped, an automatic zero-setting mechanism shall operate only when the indication has remained:

(a) stable according to paragraph S.4.2. Damping, and

(b) below zero for at least 5 seconds.

The maximum effect of automatic zero-setting mechanism is limited to 4 % of the nominal capacity of the scale and is a sealable parameter.

(Added 201X)

Background/Discussion: At it 2008 Annual Meeting, the NTETC Weighing Sector discussed an issue about the increasing number of scales submitted for NTEP evaluations that include an "automatic zero-setting" feature not addressed in NIST HB 44. It has been noted that many devices are built for a global marketplace and that the operation of this "automatic zero-setting" device may be functional on the device when installed in the United States. Currently, HB 44 does not define this function. NCWM Pub 14 has no test to determine if the device submitted for evaluation has such a function, or if it is sealable. The automatic zero-setting mechanism on a scanner/scale submitted to NTEP could be enabled and disabled by means of a barcode read by the scanner.

The Sector established a small WG to develop language to be submitted to the NCWM S&T Committee and make recommendations addressing the suitability of scales with the capability to automatically set a positive weight indication to zero. The group (Scott Davidson, Mettler-Toledo; Scott Henry, NCR; Steve Cook, NIST technical advisor; and Stephen Patoray, Consultants on Certification, LLC) volunteered to develop a proposal for the S&T Committee. (Todd Lucas, Ohio NTEP laboratory, and Jim Truex, NTEP Administrator, also contributed to the discussions and subsequent proposal.) Additionally, the Sector agreed to review the language developed by the WG to confirm its support of the proposed language.

In the process of developing the proposal, the WG recommended that the automatic zero-setting mechanism should be permitted for devices covered by Section 2.24. Automatic Weighing Systems since equivalent requirements can be found in OIML R 51 Recommendation for Automatic Catchweighing Instruments.

See agenda Item 320-3 for additional background information on this proposal.

The Committee agreed that this item should remain as an Informational item pending the development of the proposal to add the term automatic zero-setting mechanism in agenda Item 320-3.

324-2A V S.2.2. Tare, S.2.2.1. Scale Interval and Capacity, S.2.2.2. Accuracy, and S.2.2.3. Damping

Source: 2008 Carryover Item 324-2. (This item originated from the S&T Committee and first appeared on the Committee's 2007 agenda.)

Recommendation: (NOTE: This item will be considered jointly with Item 320-1B.) This recommendation clarifies the requirements for tare by modifying paragraph S.2.2. and adding new paragraphs S.2.2.1. through S.2.2.3. that provide new requirements for metrological tare (e.g., tare objects weighed or balanced off at the time of the transaction), and tare accuracy into HB 44 that supports the type evaluation procedures in NCWM Publication 14 and are consistent with OIML R 51 for automatic Catch-weighing Instruments.

Amend paragraph S.2.2. as follows:

> **S.2.2. Tare.** – The tare**-weighing and tare-balancing** mechanism shall operate only in a backward direction (that is, in a direction of underregistration) with respect to the zero-load balance condition of the scale. A device designed to automatically clear any tare value shall also be designed to prevent the automatic clearing of tare until a complete transaction has been indicated.
>
> [**Note:** On a computing scale, this requires the input of a unit price, the display of the unit price, and a computed positive total price at a readable equilibrium. Other devices require a complete weighing operation, including tare, net, and gross weight determination.]
>
> (Amended 2004 **and 2008**)

Add new paragraphs S.2.2.1. through S.2.2.3. as follows:

> **S.2.2.1. Scale Interval (Division) and Capacity. – On any scale (except multi-interval scales when the value of tare is determined in the first weighing segment), the value of the tare division shall be equal to the value of the scale division for any given load and shall not operate above its maximum capacity.**
>
> > **S.2.2.1.1. Multi-interval Scales. – On multi-interval scales, the tare capacity is limited to the capacity of the first weighing segment and the value of the tare division shall be equal to the value of the scale division from the first weighing segment.**
> >
> > **S.2.2.1.2. Multiple Range Scales. – On multiple range scales, the value of the tare division shall be equal to the value of the scale division from the weighing range where the tare was determined.**
>
> **(Added 201X)**
>
> **S.2.2.2. Accuracy. – A tare-weighing or tare-balancing mechanism shall permit setting the net indication to zero with an accuracy equal to or better than:**
>
> > **(a) ± 0.25 d for electronic weighing devices and any weighing device with an analog indication, and**

(b) ± 0.5 d for mechanical weighing devices with a digital indication (e.g., weighbeams with only notched poises and no sliding poises).

On a multi-interval scale, d shall be replaced by d_1 (division value of the first weighing segment).
(Added 201X)

S.2.2.3. Damping for Semi-automatic or Automatic Tare* Balancing or Weighing Mechanisms. – These mechanisms shall be operable or accessible only by a tool outside of and separate from this mechanism or it shall be enclosed in a cabinet, or it shall be operable only when the indication is stable within ± 1 scale division.
***Automatic tare mechanisms are not permitted for direct sales to the public.**
(Added 201X)

Background/Discussion: At the 2007 Interim Meeting, the Committee agreed that for procedural reasons a separate corresponding proposal should have appeared on its 2007 S&T agenda in Section 324 for Automatic Weighing Systems. Therefore, the Committee developed a separate proposal for automatic weighing systems that now appears in this agenda item. The Committee recommended that new S&T Item 324-2, along with a corresponding proposal to apply these definitions to devices that fall under the Scales Code S&T Item 320-1, be discussed and considered jointly during all deliberations and voting procedures. In the interest of brevity, the Committee placed all recommendations, discussion, and background information for this proposal in S&T Item 320-1 because the proposed definitions apply to both applications; this ensures both proposals are addressed collectively.

At their fall 2007 meetings, the CWMA, NTETC WS, and the WWMA supported this item. See additional comments and recommendations from agenda Item 320-1A through Item 3201D.

The Committee did not receive any comments opposing this item and made this a Voting item.

At the 2008 NCWM Annual Meeting, the Committee agreed with the comments that this item needs additional time for review and analysis and that the item be given Informational status. The NIST technical advisor will develop a 1- to 2-hour technical presentation on the proposed tare requirements that will be available to the regional weights and measures associations, the NTETC Weighing Sector, and posted on the WMD website.

324-2B V S.2.2.4. Combined Zero-setting and Tare-balancing Mechanisms (0/T Key)

Source: 2008 Carryover Item 324-2. (This item originated from the S&T Committee and first appeared on the Committee's 2007 agenda.)

Recommendation: (**NOTE:** This item will be considered jointly with Item 320-1A.) This recommendation clarifies the requirements for tare by adding a new paragraph S.2.2.4. that provides identical requirements for accuracy, center-of-zero, and zero tracking on Automatic Weighing Systems (AWS) that use a combined zero/tare key as recommended in the Committee's agenda Item 320-1A.

Add paragraph S.2.2.3. as follows:

S.2.2.4. Combined Zero-setting and Tare-balancing Mechanisms (0/T Key). – Automatic weighing systems may be equipped with a combined zero and tare function key. If the semi-automatic zero-setting mechanism and the semi-automatic tare-balancing mechanism are operated by the same key, the following apply at any load:

(a) After zero/tare-setting, the effect of accuracy of the zero-setting shall be not more than ± 0.25 d.

(b) A "center-of-zero" condition shall either automatically be maintained to ± 0.25 scale division or less, or have an auxiliary or supplemental "center-of-zero" indicator that defines a zero-balance condition to ± 0.25 scale division or less.
[Nonretroactive as of January 1, 2010]

(c) A zero-tracking mechanism, if equipped, shall operate only when:

(1) the indication is at zero, or at a negative net value equivalent to gross zero, and

(2) the weight indication is stable.
[Nonretroactive as of January 1, 2010]

(d) The scale must also be clearly marked on or adjacent to the weight display with the statement "Not for Direct Sales."

(Added 201X)

Background/Discussion: Background information on this item can be found in the Background/Discussion paragraphs on agenda Item 324-2A.

After the NIST presentation on Tare during the 2009 Interim Meeting and considering that very few questions were raised during the discussion on the proposal for scales that have a combined zero/tare key, the Committee agreed to forward the item as a Voting item. Note that the Committee recommends that subparagraphs (a) and (d) be given retroactive status since these requirements have been verified by NTEP since the 0/T feature was included into HB 44 Scales Code.

324-2C I S.2.2.4. Visibility of Operation and S.2.2.5. Subtractive Tare Mechanism

Source: 2008 Carryover Item 324-2. (This item originated from the S&T Committee and first appeared on the Committee's 2007 agenda.)

Recommendation: This recommendation clarifies the requirements for tare by adding new paragraphs S.2.2.4. and S.2.2.5. that provide new requirements for visibility and subtractive tare (i.e., balancing off tare objects does not increase the nominal scale capacity).

S.2.2.4. Visibility of Operation. – Operation of the tare mechanism shall be visibly indicated on the instrument. In the case of instruments with digital indications, this shall be done by marking the indicated net value with the word "NET" or the symbol "N". "NET" may be displayed as "NET", "Net" or "net". If a scale is equipped with an indicator that allows the gross value to be displayed temporarily while a tare mechanism is in operation, the "NET" symbol shall disappear while the gross value is displayed.

(Added 201X)

S.2.2.5. Subtractive Tare Mechanism. – After any tare operation and while subtractive tare is in effect, an indicating or recording element shall not display nor record any values when the gross load (not counting the initial dead load that has been canceled by an initial zero-setting mechanism) is in excess of 105 % of scale capacity after tare has been taken.

(Added 201X)

Background/Discussion: Additional background information on this item can be found in the Background/Discussion paragraphs on agenda Item 320-1.

After the NIST presentation on Tare during the 2009 Interim Meeting, several questions were asked that indicated the need for additional clarification on the indications. Consequently, the Committee recommended that this proposal remain an Informational item and suggested that the Weighing Sector (WS) clarify the proposed language

and consider providing examples of indications and recorded representations when multiple tares are used to determine net weights.

324-2D I S.2.2.6. Consecutive Tare Operations and S.2.2.7. Indication and Printing of Weighing Results

Source: 2008 Carryover Item 324-2. (This item originated from the S&T Committee and first appeared on the Committee's 2007 agenda.)

Recommendation: (**NOTE:** This item will be considered jointly with Item 320-1C.) This recommendation clarifies the requirements for tare by adding new paragraphs S.2.2.6. and S.2.2.7. that clarify the requirements for transactions that use multiple tare, tare mechanisms, and the indications and recording of weighing results.

S.2.2.6. Consecutive Tare Operations. – Repeated operation of a tare mechanism (including preset tare) is permitted for single transactions with one gross, one net, and multiple tare values. If more than one tare mechanism is operative at the same time, tare weight values shall be clearly designated (identified) with either "T" for tare or "PT" for preset tare, as appropriate, when indicated or printed.

(Added 201X)

S.2.2.7. Indication and Printing of Weighing Results.

(a) Gross weight values may be printed without any designation or by using a complete word or symbol. For a designation by a symbol, only uppercase "G" is permitted.

(b) If only net weight values are printed without corresponding gross or tare values, they may be printed without any designation or by using a complete word or symbol. The complete word (as shown in S.2.2.3. Visibility of Operation) or symbol "N" shall be used to designate a net weight. This applies also where semi-automatic zero-setting and semi-automatic tare balancing are initiated by the same key.

(c) Gross, net, or tare values determined by a multiple range instrument or by a multi-interval instrument need not be marked by a special designation referring to the (partial) weighing range.

(d) If net weight values are printed together with the corresponding gross and/or tare values, the net and tare values shall be identified at least by the corresponding symbols "N" and "T" or by complete words using all upper-case letters, all lower-case letters, or a combination of upper- and lower-case letters.

(e) If net weight values and tare values determined by different tare mechanisms are printed separately for single transactions with multiple gross, tare, and net values, they shall be suitably identified (e.g., vehicle sequentially loaded with mixed commodities).

(Added 201X)

Background/Discussion: Additional background information on this item can be found in the Background/Discussion paragraphs on agenda Item 320-1A.

During the NIST presentation on Tare during the 2009 Interim Meeting, the Committee heard several questions that indicated the need for additional clarification on the value of specifying acceptable words and abbreviations for Gross, Tare, Preset Tare, and Net.

Consequently, the Committee recommends that this proposal remain an Informational item and suggests that the WS further clarify the proposed language and consider providing examples of 1) indications and recorded representations of tare and preset tare in consecutive tare transactions, and 2) indications and recorded representations when multiple tares and preset tares are used to determine net weights.

324-2E I S.2.3. Preset Tare Mechanism and S.2.3.1. Indication of Operation

Source: 2008 Carryover Item 324-2. (This item originated from the S&T Committee and first appeared on the Committee's 2007 agenda.)

Recommendation: (**NOTE:** This item will be considered jointly with Item 320-1D.) This recommendation clarifies the requirements for tare by adding new paragraphs S.2.3. and S.2.3.1. that provide new requirements for metrological tare (e.g., tare objects weighed or balanced off at the time of the transaction), tare accuracy, operating range, visibility, and preset tares (e.g., manually entered or stored tares for multiple transactions).

Add new paragraphs S.2.3. and S.2.3.1. as follows:

S.2.3. Preset Tare Mechanism, Operation. – In addition to the provisions of paragraphs S.2.2. Tare and S.2.2.1. Scale Interval, a preset tare may be operated together with one or more tare devices provided:

(a) the preset tare mechanism complies with paragraph S.2.2.6. Consecutive Tare Operations,

(b) the preset tare operation cannot be modified or cancelled as long as any tare mechanism operated after the preset tare operation is still in use,

(c) the preset tare associated with a price look-up (PLU) shall be automatically cancelled at the same time a PLU is cancelled, and

(d) the preset tare values are designated by the symbol "PT"; however, it is permitted to replace the symbol "PT" with complete words.

A preset tare may operate automatically only if the preset tare value is clearly identified with the load to be measured (e.g., part of the product look-up information).

S.2.3.1. Indication of Operation. – It shall be possible to temporarily indicate the preset tare value (e.g., pressing a tare display button or a negative net weight indication with no load on the load-receiving element). Additionally, paragraph S.2.2.7. Indication and Printing of Weighing Results applies accordingly, provided the calculated net value is printed and at least the preset tare value is printed, with the exception of:

(a) a Class II or a Class III automatic weighing system with a maximum capacity not greater than 100 kg (200 lb) used in direct sales to the public, and

(b) automatic weigh/price labeling systems.

(Added 201X)

Background/Discussion: Background information on this item can be found in the Background/Discussion paragraphs on agenda Item 320-1A.

During the NIST presentation on Tare during the 2009 Interim Meeting, the Committee heard several questions that indicated the need for additional clarification on:

- are itemized indications and recorded representations required for each tare; and
- are different indications and recorded representations required for each tare value when tare and preset tare are used in the same transaction?

Consequently, the Committee recommends that this proposal remain an Informational item and suggests that the WS further clarify the proposed language and consider providing examples of 1) indications and recorded

representations of tare and preset tare in consecutive tare transactions and 2) indications and recorded representations when multiple tares and preset tares are used to determine net weights.

330 LIQUID-MEASURING DEVICES

330-1 I Temperature Compensation for Liquid-Measuring Devices Code

Source: 2008 Carryover Item 330-1. This item originated from the NCWM S&T Committee and first appeared on the Committee's 2007 agenda.

Recommendation: The Committee is considering a proposal to make the following modifications to Section 3.30. Liquid-Measuring Devices (LMD) Code to recognize temperature compensation for retail devices. The Committee has modified the proposal based on comments received as of the 2009 NCWM Interim Meeting.

S.1.6.8. Recorded Representations from Devices with Temperature Compensation. – Receipts issued from devices or systems with activated automatic temperature compensation must include a statement that the volume of the product has been adjusted to the volume at 15 °C for liters or the volume at 60 °F for gallons.
[Nonretroactive as of January 1, 201X]

(Added 201X)

Renumber existing S.1.6.8. Lubricant Devices, Travel of Indicator to S.1.6.9., accordingly.

S.2.7. ~~Wholesale~~ Devices Equipped with Automatic Temperature Compensators.

S.2.7.1. Automatic Temperature Compensation. – A device may be equipped with an automatic means for **~~adjusting~~conversion of** the indication and registration of the measured volume of product to the volume at 15 °C **for liters or ~~(~~**60 °F**~~)~~ for gallons.**

S.2.7.2. Display of Temperature. – For test purposes, on a device equipped with active automatic temperature compensation, means shall be provided to indicate or record the temperature determined by the system sensor to an a resolution of no greater than 0.2 °F.
[Nonretroactive as of January 1, 201X]

S.2.7.~~2~~3. Display of Net and Gross Quantity and Provision for Deactivating. – A device or system equipped with an active electronic automatic temperature-compensating mechanism shall indicate or record both the gross (uncompensated) and net (compensated) volume for testing purposes. On a device **or system** equipped with a**~~n~~ mechanical** automatic temperature-compensating mechanism that will indicate or record only in terms of **~~gallons~~liters** compensated to 15 °C **or gallons compensated to ~~(~~**60 °F**~~)~~**, provision shall be made for deactivating the automatic temperature-compensating mechanism so that the meter can indicate**~~, and record if it is equipped to~~or** record**~~,~~** in terms of the uncompensated volume. **It is not necessary that both net and gross volume be displayed simultaneously on a device or system equipped with either mechanical or electronic temperature-compensating mechanisms.**
(Amended 1972 **and 201X**)

S.2.7.~~3~~4. Provision for Sealing Automatic Temperature-Compensating Systems. – Provision shall be made for applying security seals in such a manner that an automatic temperature-compensating system cannot be disconnected and that no adjustment **that detrimentally affects the metrological integrity of the device** may be made to the system without breaking the seal **or automatically providing a record (e.g., audit trail) of the action**.

(Amended 201X)

S.2.7.4.1. Provision for Sealing the Temperature Sensor. – Provision shall be made for applying security seals in such a manner that the temperature sensor cannot be removed or disabled without breaking the seal or providing a record (e.g., audit trail) of the action.
[Nonretroactive as of January 1, 201X]

S.2.7.4.~~4.~~5. Temperature Determination with Automatic Temperature Compensation. – For test purposes, means shall be provided (e.g., thermometer well) to determine the temperature of the liquid either:

(a) in the liquid chamber of the meter, or

(b) immediately adjacent to the meter in the meter inlet or discharge line.

(Amended 1987)

S.4.3.~~2.~~ Temperature Compensation. – If a device **or system** is equipped with **active** automatic temperature compensation, the primary indicating elements, recording elements, **~~or~~and** recorded representation shall be clearly and conspicuously marked to show that the volume delivered has been adjusted to the volume at 15 °C **for liters or ~~(~~**60 °F**~~)~~ for gallons.**

(Amended 201X)

Renumber existing paragraphs and subparagraphs S.4.3. Wholesale Devices, Discharge Rates and S.4.4. Retail Devices accordingly.

N.4.1.1. ~~Wholesale~~ Devices Equipped with Automatic Temperature-Compensating Systems. – On **~~wholesale~~** devices equipped with **active** automatic temperature-compensating systems, normal tests shall be conducted:

(a) by comparing the **net (**compensated**)** volume indicated or recorded to the actual delivered volume **~~corrected~~ adjusted** to 15 °C **for liters or ~~(~~60 °F~~)~~ for gallons, and**

(b) **~~with the temperature-compensating system deactivated,~~** comparing the **gross (**uncompensated**)** volume indicated or recorded to the actual delivered volume. **(For some devices this may require that the temperature compensator be deactivated.)**

The first test shall be performed with the automatic temperature-compensating system operating in the "as found" condition. On devices that indicate or record both the compensated and uncompensated volume for each delivery, the tests in (a) and (b) may be performed as a single test.

(Amended 1987 **and 201X**)

N.5. Change in Product Temperature ~~Correction on Wholesale Devices~~. – **~~Corrections~~ Adjustments** shall be made for any changes in volume resulting from the differences in liquid temperatures between time of passage through the meter and time of volumetric determination in the prover **or test measure**. When adjustments are necessary, appropriate petroleum measurement tables **~~should~~ shall** be used.

(Amended 1974 **and 201X**)

UR.3.6. Temperature Compensation~~, Wholesale~~.

UR.3.6.1. Automatic.

UR.3.6.1.1. ~~When to be~~ Use~~d~~ of Automatic Temperature Compensation. – If a device is equipped with **~~a mechanical~~ active** automatic temperature **~~compensator~~ compensation**, it shall be connected, operable, and in use at all times. An electronic or mechanical automatic temperature-compensating system may not be removed, nor may a compensated device be replaced with an uncompensated device, without the written approval of the **~~responsible~~** weights and measures jurisdiction **with statutory authority over the device**.

[**Note:** This requirement does not specify the method of sale for product measured through a meter.] (Amended 1989 **and 201X**)

OR

UR.3.6.1.1. ~~When to be~~ Use~~d~~ of Automatic Temperature Compensation. – If a device is equipped with a mechanical automatic temperature compensator, it shall be connected, operable, and in use at all times. **Once used, ~~A~~an** electronic or mechanical automatic temperature-compensating system may not be removed **nor deactivated**, nor may a compensated device be replaced with an uncompensated device, without the written approval of the **~~responsible~~** weights and measures jurisdiction **with statutory authority over the device**.
[**Note:** This requirement does not specify the method of sale for product measured through a meter.] (Amended 1989 **and 201X**)

UR.3.6.1.2. Condition of Use. – At a business location which offers fuel products for retail sale on the basis of a temperature-compensated volume, all devices used for retail sales shall have active automatic temperature compensation and all fuel products offered for retail sale shall be dispensed on the basis of temperature-compensated volume.

UR.3.6.1.~~2~~3. Recorded Representations (Invoices, Receipts, and Bills of Lading).

(a) A**n** ~~**written**~~ invoice based on a reading of a device **or recorded representation issued by a device or system** that is equipped with an **active** automatic temperature compensator shall show that the volume delivered has been adjusted to the volume at 15 °C **for liters or ~~(~~**60 °F**~~)~~ for gallons and decimal subdivisions or fractional equivalents thereof.**

(b) The invoice issued from an electronic wholesale device equipped with an automatic temperature-compensating system shall also indicate:

(1) the API gravity, specific gravity or coefficient of expansion for the product;

(2) product temperature; and

(3) gross reading.

(Amended 1987 **and 201X)**

UR.3.6.1.4. Temperature Determination. – The means for determining the temperature of measured liquid in a device with an activated automatic temperature-compensating system shall be so located and designed that, in any "usual and customary" use of the system, the resulting indications and/or recorded representations are within applicable tolerances.
(Added 201X)

UR.3.6.4. Temperature-Compensated Sale. – All sales of products, when the quantity is determined by an approved measuring system with temperature compensation, shall be in terms of the liter at 15 °C or the U.S. gallon of 231 in^3 at 60 °F.

(Added 201X)

Background/Discussion: Prior to the 2007 NCWM Interim Meeting, the Committee recognized, via reports from the regional L&R Committees and other sources, that there was increasing support within the weights and measures community to address temperature compensation features for the retail sale of petroleum products in the Liquid-Measuring Devices Code. In response to these concerns and to encourage uniformity in applications where temperature compensation is being used, the Committee developed a proposal to provide design, performance requirements, and testing criteria for retail metering systems that incorporate temperature compensation capability. The Committee was also concerned that if the current L&R Committee-proposed language for the Method of Sale of Commodities in NIST HB 130 is adopted, retail motor-fuel devices could be placed in service with no guidelines in NIST HB 44 for type approval and field testing. The language proposed by the L&R Committee at that time would permit the temperature-compensated sale of petroleum products at all levels of distribution.

At the 2007 Interim Meeting, the Committee considered moving the proposal forward as a priority Voting item. However, the Board instructed the Committee to retain the item as Informational and established a steering committee to provide the S&T and L&R Committees with guidance on temperature compensation issues.

As of the 2008 Interim Meeting, the Committee received comments from the WWMA supporting the use of 15.56 °C and presenting the item for a vote and from the CWMA supporting 15 °C and retaining the item as Informational. NEWMA proposed the inclusion of proving equations based on OIML R 120. The SWMA forwarded comments about the printing of a statement regarding the temperature-compensated values.

At the 2008 Interim Meeting, the Committee made some additional modifications to the proposal, including changing the reference to metric units to 15.56 °C based on the ATC Steering Committee recommendation. The Committee did not believe Handbook 44 was the appropriate place to add proving equations based on OIML R 120, noting that, if needed, these would be more appropriately addressed as an example in the EPOs. At that point, the Committee believed the proposal to be essentially complete and, after considerable deliberations and based on urging from officials who anticipated installation of ATC equipment in their jurisdictions, the Committee agreed to designate Item 310-1 as a Voting item on its agenda for the 2008 Annual Meeting.

In its spring 2008 meeting report, the CWMA S&T Committee stated that it heard comments that this item should not move forward for a vote at that time due to the lack of a method of sale regulation. The report also noted that some jurisdictions adopt NIST HB 44 in its entirety and do not have a law that prohibits ATC, and inclusion of ATC criteria in this case could make ATC permissible.

NEWMA reported discussing this item at length during its spring 2008 meeting. Initially it was suggested that this item go back to Informational status but an attendee suggested that it should either be withdrawn or put up for a vote. Another attendee suggested making this item Informational until the report on ATC from the California Energy Commission is released. NEWMA submitted the following concerns and recommended that the item remain Informational:

- A statement similar to the one in the Vehicle Tank Meter (VTM) code which addresses states that prohibit ATC by state law should appear in the text of this item.

- One member referenced the 1978 S&T Committee report which discussed a cost benefit consideration and the desire that the S&T and L&R move forward in unison. The NEWMA membership generally agreed with these points.

- NEWMA continues to believe that it is appropriate to place in HB 44 reference calculations for determining volume at 60 ºF. It is also appropriate to reference the specific API tables including version and date. Placing this information in publications such as EPOs would have no legal standing if we were challenged in the future.

At the 2008 NCWM Annual Meeting, the Committee heard numerous comments on the proposed changes to include specifications, test procedures, and user requirements for devices equipped with automatic temperature compensation systems.

Comments/questions were raised about specific items in the proposed language, including:

- The term "active" is not used consistently in all references to "automatic temperature compensation." For example, it appears in paragraph S.2.7.2., but it does not appear in paragraph S.1.6.8.

- There is a reference to the accuracy requirements for the temperature sensor in paragraph S.2.7.3.; however, there is not a requirement specifying the division size of the temperature sensor.

- Should a corresponding reference to the accuracy requirements for the temperature sensor be included in the "Tolerances" section of the code?

- Is there an expectation that there will be a field test of the temperature sensor? If so, there is not a corresponding test note to indicate this, nor is it clear how the test will be done in the field.

- A user requirement is needed to specify that, if a single business offers product for sale on the basis of a temperature-compensated volume, all devices in that business shall be equipped with automatic temperature-compensating systems. [**Note:** During the Committee's work discussions, it was noted that Canada permitted a phase-in period based on product or product grades.]

- There is concern about using 15.56 ºC rather than 15 ºC. In addition to being different from use in international arenas, including Canada, the bulk of the devices in the field, including the retail motor fuel dispensers and the temperature standards used by field officials, do not have the capability to display temperature to two decimal places.

- Devices currently in the field may not have the capability to automatically sense when the device is or is not in the automatic temperature-compensating mode with respect to the requirement to identify volumes as "corrected" volumes on printed indications.

- Although a corresponding paragraph already appears in Section 3.32. LPG and Anhydrous Ammonia Liquid-Measuring Devices Code, the language in paragraph UR.3.6.1.3. needs clarification.

The Committee asked that the NCWM Automatic Temperature Compensation Steering Committee assist in addressing these issues and encourages interested parties to submit comments to the Steering Committee or provide additional comments to the S&T Committee.

The Committee heard numerous comments encouraging the Committee to delay a vote on this issue while the corresponding method of sale and related requirements are being further developed by the L&R Committee and while other studies in the community are being completed. Comments were also received that cost-benefit analysis of equipment implementation needs to be considered.

Although the Committee did hear opposition to moving forward on this item, the Committee also heard comments in support of moving the item forward for a vote. Some members commented that, if this proposal were adopted, the proposed specifications, tolerances, notes, and user requirements would be available for use in a timelier manner by jurisdictions that do not specifically prohibit the use of temperature compensation. This would encourage uniformity in the implementation of such requirements among those jurisdictions and prevent inconsistencies for consumers doing business in various jurisdictions.

Based on the many suggestions that it heard between the 2008 Interim and Annual Meetings to allow time for additional study and development of the related method of sale requirements, the Committee decided to change the status of this item from Voting to Informational at the 2008 Annual Meeting.

During the 2008 WWMA Annual Technical Conference an update on the California Energy Commission (CEC) cost benefit analysis was given. The WWMA was told that the study is being delayed due to difficulty in obtaining device information. The CEC report to the California legislature, due December 2008, was granted an extension until February 2009, after the NCWM Interim Meeting. Several industry members and weights and measures officials stated that the S&T and L&R Committees needed to work in concert; therefore, this item should remain Informational until the CEC and GAO reports are completed.

One jurisdiction stated during the WWMA meeting that they would like to see technically sound language in HB 44 in the event that temperature-compensated devices are installed and activated. No jurisdictions reported ATC devices in operation at this time. However, one jurisdiction stated that California type approved devices have been installed but the ATC feature has not been activated. Another jurisdiction stated that a company informed them they were considering ATC but would not take action until after the NCWM had made their decision on the L&R and S&T proposals. For these reasons, the WWMA agreed this item should remain Informational.

At its 2008 Interim Meeting, the CWMA took the position that having guidelines in Handbook 44 does have a value in the event that a model law is passed. However, the CWMA believes that until a model law is passed, the guidelines cannot be fully drafted for this item. Therefore, the CWMA recommends this item be a Developing item.

At its 2008 Interim Meeting, NEWMA discussed the following points related to this item:

1. waiting for GAO and California study;
2. financial impact to consumer and retail station owners;
3. extra time for testing and cost of additional equipment;
4. several problems with language of item (e.g., 15.56 ºC vs. 15 ºC, gravity to be used?);
5. connection to L&R item; and
6. possible perpetuation of fraud.

NEWMA recommends this item be made Developing.

The SWMA heard comments during the open hearings at its 2008 Annual Meeting that the item should remain Informational to allow time for additional information to be gathered. The SWMA also heard that there may be additional information provided from the California Energy Commission study (due to be completed in February 2009, with a possible draft available in December 2008) and the GAO study (due to be completed in the fall of 2008. With regard to the proposed changes to the LMD Code, the SWMA heard suggestions that the requirements for indicating temperature-compensated deliveries be examined to ensure that existing equipment can meet the requirements, particularly with regard to the service station consoles. The SWMA also heard a suggestion that action on the proposed changes to the LMD Code be held off until the NCWM L&R Committee completes its deliberations on the method of sale issue. The SWMA noted the NCWM S&T Committee raised a number of questions during its deliberations in July and asks that, in addition to the NCWM ATC Steering Committee, people provide input to assist the national S&T Committee in its deliberations on this issue. Because of the comments received and the number of outstanding issues, the SWMA decided to maintain this item as Informational on its agenda.

The Committee received copies of the GAO study (available on the GAO website at www.gao.gov) as well as a draft of the California Energy Commission study. (**Technical Advisor's Note:** A final version of this report is now available from the CEC at www.energy.ca.gov.)

The Committee received comments from several members of the ATC Steering Committee in response to the questions it raised in July. A copy of these comments is included in Appendix B of the Committee's Interim Report.

Based on input from these Steering Committee members and the regional weights and measures associations, comments received at the 2009 Interim Meeting, and the Committee's deliberations at the 2009 Interim, the Committee addressed the points it raised in its 2008 Final Report as follows:

- **The reference to the word "active."** The Committee reviewed the paragraphs and inserted the word as appropriate. The Committee noted that the original intent of paragraph UR.3.6.1.1. was that mechanical compensators should be activated and in use at all times.

- **Division size of temperature sensor.** The Committee changed the reference to "resolution" rather than accuracy. (See S.2.7.3. below.)

- **Should there be a corresponding reference to the accuracy requirements for the temperature sensor in the Tolerances section?** The Committee changed the reference to "resolution" rather than accuracy. (See S.2.7.3. below.)

- **Should inspector test accuracy of temperature sensor?** There is no intention for an inspector to test the temperature sensor in the field. The proposed requirements will be patterned after other NIST Handbook 44 code references in which the results of gross and net test drafts are compared against a specified tolerance.

- **A User Requirement is needed to specify that, if a single business offers products for sale on the basis of a temperature-compensated volume, all devices in that business shall be equipped with active automatic temperature compensation systems.** The Committee agreed that a similar paragraph to that being considered in agenda Item 331-2 should be included in the LMD Code. The proposed paragraph is included as UR.3.6.1.2. as outlined in the recommendation above.

- **Reference to 15.56 ºC.** The Committee agreed to change the reference to 15 ºC.

- **Ability to sense when a device is in the ATC mode.** The Committee heard mixed opinions on this issue, with some manufacturers and officials commenting that equipment should be able to automatically detect when in the ATC mode and print and display accordingly and some officials stating that equipment should not be required to automatically detect this. The Committee also noted that a longer lead time could be given on the non-retroactive status of the requirement. The Committee is interested in comments on how this point should be addressed.

- **UR.3.6.1.3. needs clarification.** The Committee made some changes to the language to improve the clarity of the paragraph, including clarifying that this requirement applies to systems with activated ATC.

At the 2009 NCWM Interim Meeting, the Committee heard a number of suggestions for changes to specific portions of the recommendation and addressed these comments in its recommendation as follows:

- **S.1.6.8. Recorded Representations from Devices with Temperature Compensation**

  - **Question/Comment:** Depending upon method of sale requirements adopted in a given jurisdiction, devices equipped with electronic temperature compensation systems may not be required to have the ATC feature activated. Shouldn't the provision of S.1.6.8. only apply to systems with activated ATC?
  - **Conclusion:** The Committee agrees and added the word "activated" to clarify that the paragraph only applies to systems with the feature activated.

- **S.2.6. Temperature Determination**

  - **Question/Comment:** Should the term wholesale be deleted? If so, this will require a thermometer well even on non-ATC RMFDs.
  - **Conclusion:** The Committee agreed that the intent was not to require the installation of thermometer wells on existing RMFDs that are not equipped with ATC. Since S.2.7. includes provisions for a

thermometer well or other means for determining the temperature at the meter on liquid-measuring devices equipped with ATCs, the Committee deleted the proposed change to S.2.6. and has eliminated the proposed change from the recommendation above.

- **S.7.2. Display of Net and Gross Quantity and S.2.7.4. Display and Provision to Deactivate**

  - **Question/Comment:** Is it necessary to have both paragraphs S.7.2. and S.2.7.4. as shown in the Publication 15 proposal? Could these paragraphs be combined?
  - **Conclusion:** The Committee agreed that the paragraphs can be combined, noting that the language needs to reflect the differences between provisions for mechanical and electronic ATC mechanisms. The proposed paragraph numbered S.2.7.2. in the Committee's Interim agenda has been deleted and its provisions incorporated into the existing S.2.7.2. In making these revisions, the Committee also noted that existing User Requirement paragraph UR.3.6.1.1. requires a mechanical compensator to be activated and in use at all times.

- **S.2.7.3. Display of Temperature**

  - **Question/Comment:** Is this paragraph intended to specify a tolerance for the temperature sensor? If so, will this be a field test?
  - **Conclusion:** Based on guidance provided by the ATC Steering Committee, the Committee agreed to change "accuracy" to "a resolution of no greater than" in proposed paragraph S.2.7.2. (shown as S.2.7.3. in the Committee's Interim agenda). The Committee also agreed that the intent was not to test the accuracy of the system's temperature sensor in the field. The approach for testing devices with ATCs will continue to be a comparison between compensated and non-compensated test drafts.

- **UR.3.6.1.1. Use of Automatic Temperature Compensation**

  - **Question/Comment:** Should the words "once used" be inserted prior to "it shall be connected" to clarify that some systems may be equipped with the feature, but the feature may not be activated.
  - **Conclusion:** The Committee notes that the intent of the original User Requirement paragraph UR.3.6.1.1. was that mechanical compensators should be activated and in use at all times.

- **References to 15.56 ºC:**

  - The Committee changed all references to 15 ºC to correspond with the proposals on the L&R Committee's agenda for method of sale. The Committee acknowledged that 15.56 ºC is an exact conversion for 60 °F. However, the Committee agreed that 15 ºC is more appropriate since this is the value used internationally and in light of comments from industry questioning whether or not existing equipment can display values to two decimal places.

- **The Committee also made the following editorial corrections/changes based on comments received:**

  - **UR.3.6. Temperature Compensation**. – The word "wholesale" should appear at the end of the title as struck since it is currently in the code.
  - **S.4.3. Temperature Compensation.** – The word "active" should not be in italics.

The Committee discussed whether or not this item is ready to move forward for a vote at the 2009 Annual Meeting. The Committee recognizes the need for standards to be in place to encourage uniform evaluation of RMFDs equipped with ATC, and acknowledges that some jurisdictions are already facing the imminent possibility of such equipment in their jurisdictions. While the Committee believes that these standards are necessary whether or not the issue of a model method sale regulation has been resolved, based on the number of comments received on the proposed changes to the LMD code, the Committee believes that the item should be retained as an Informational item until the changes outlined above have been studied by interested stakeholders. The Committee also acknowledged that the General Code paragraph G-A.3. Special and Unclassified Equipment coupled with relevant provisions in existing code paragraphs can be used by jurisdictions to address equipment with ATC features in the

meantime. The Committee also does not believe that delaying the revisions to the LMD code should delay a decision on the method of sale item before the L&R Committee.

(See also the Committee's 2007 and 2008 Final Reports for additional background information on this issue.)

330-2 V N.4.6. Pour and Drain Times for Hand-held Test Measures

Source: 2008 Carryover Item 330-2. This item originated from the CWMA and first appeared on the Committee's 2008 agenda. See also note in Background/Discussion section below regarding the origin of this item.

Recommendation: The Committee is considering a proposal to add a new paragraph N.4.4. Field Standards to address the selection and use of field standards for inspecting and testing liquid-measuring devices covered under the Liquid-Measuring Devices Code.

N.4.4. Pour and Drain Times.

N.4.4.1. Pour and Drain Times for Hand-held Test Measures. – Hand-held test measures require a 30-second (± 5 seconds) pour followed by a 10-second drain, with the measure held at a 10-degree to 15-degree angle from vertical during use.

N.4.4.2. Drain Times for Bottom Drain Test Measures or Provers. – Bottom drain field standard provers require a 30-second drain time after main flow cessation.

(Added 2009)

Background/Discussion: Following deliberations at the 2008 NCWM Interim Meeting, Item 330-2 was deleted from the Committee's agenda and the issue addressed under new Item 310-4 as a proposal to add a paragraph to the General Code to designate general requirements for all field standards. At the 2008 NCWM Annual Meeting, the Committee decided (as a result of comments received following the Interim Meeting) to reinstate Item 330-2 (which proposes an addition to the Liquid-Measuring Devices Code to specify pour and drain times for measuring device test standards) as an Informational item based upon the rationale described below. Note that the Committee retained Item 310-4 and presented that item as a Voting item at the Annual Meeting, but that item did not receive sufficient votes either in support or opposition for further action, so the item was returned to the Committee. See Item 310-4 for the Committee's original recommendation and background information and the outcome of that discussion.

The Committee received comments from the CWMA and heard comments during the 2008 NCWM Annual Meeting open hearing that specific hand-held test measure use requirements are still needed in the LMD Code for weights and measures officials and service agents. The Committee also heard comments that key elements for the use of test measures and provers should be included in the Notes section of the LMD Code. In response to the comments, the Committee expanded the proposal to include drain requirements for bottom drain provers and test measures.

The Committee agreed to amend the original proposal to cite the specific document in addition to the test measure use requirements to read as shown in the recommendation above.

At its 2008 Annual Technical Conference, the WWMA supported this companion item to 310-4 and recommended it be a Voting item. To be consistent with other codes in HB 44 and to make the information more prominent, the WWMA believes the item deserves its own paragraph and supports it as a Voting item.

N.6. Field Standards. – Field standards shall be certified to meet the accuracy requirements of NIST Handbook 105-3, Specifications and Tolerances for Graduated Neck-Type Volumetric Field Standards (or other suitable and designated standards) or the accuracy requirements expressed in Fundamental Considerations, paragraph 3.2. (i.e., one-third of the smallest tolerance applied).

N.6.1. Pour and Drain Times for Hand-held Test Measures. – Hand-held test measures require a 30-second (± 5 seconds) pour followed by a 10-second drain, with the measure held at a 10-degree to 15-degree angle from vertical during use.

N.6.2. Drain Times for Bottom Drain Test Measures or Provers. – Bottom drain field standard provers require a 30-second drain time after main flow cessation.

(Added 200X)

At its 2008 Interim Meeting, the CWMA recommended this item move forward as a Voting item.

At its 2008 Interim Meeting, NEWMA heard discussion that this item is more suitable for EPOs. Therefore, NEWMA recommends this item be Withdrawn.

The SWMA received no comments on this item during the open hearings at its 2008 Annual Meeting. During its work sessions, the SWMA S&T Committee was unable to reach a consensus on this item. Some Committee members questioned the need for the proposal at all given the current references in the Fundamental Considerations and the corresponding proposal to include a reference in the General Code. One Committee member questioned whether or not the 30-second drain time for the bottom drain provers was necessary and questioned if any study of the time was being done by any metrology labs. One Committee member supported the proposal as written. Some Committee members commented that having something specific regarding pour and drain times would be helpful in getting service technicians as well as weights and measures officials to use the proper procedures, whereas other Committee members acknowledged that even specifying such procedures would not produce a change in the actual practices in the field.

Because of the range of positions among its members, the SWMA S&T Committee did not believe it would reach a consensus on the item. Rather than holding the item up for those who felt the proposal had benefit, the Committee decided to forward the item to the NCWM S&T Committee with a recommendation that it be made a Voting item.

At the 2009 NCWM Interim Meeting, the Committee heard additional support regarding the need for a reference in the LMD Code in addition to any reference in the General Code. Judy Cardin, Wisconsin Weights and Measures, reported that service companies are not able to work with the Fundamental considerations and they are finding many different drain times and procedures in use. Steve Malone, Nebraska Weights and Measures, encouraged the Committee to make the references to the NIST Handbook 105 series identical to that used in the Scales and other codes.

Based on comments received and its deliberations during the Interim Meeting, the Committee agreed that the general references to the NIST Handbook 105 series are adequately addressed in the proposed language in corresponding General Code Item 310-4. The Committee also agreed to modify this text by extracting references from existing language in the Fundamental Considerations rather than modifying the original proposed N.4.4. Consequently, the Committee deleted the reference in the LMD code and retained only the references to pour and drain time as shown in the recommendation above. With these changes, the Committee believes that the remaining proposed paragraphs are most appropriately placed as a subparagraph under N.4. Testing Procedures.

The Committee agreed to recommend this item for a Vote at the 2009 Annual Meeting.

330-3 I Price Posting and Computing Capability and Requirements for a Retail Motor-Fuel Dispenser (RMFD)

Source: 2008 Carryover Item 330-3. This item originated from WMD and the regional associations and first appeared on the Committee's 2007 agenda. This item was previously a Developing item under 360-2, Part 3, Item 2.

Recommendation: The Committee is considering a proposal to make the following modifications to Section 3.30. Liquid-Measuring Devices (LMD) Code to address price posting and computing capability for retail motor-fuel dispensers as follows:

S.1.6.4. Display of Unit Price and Product Identity.

S.1.6.4.1. 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) 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 be displayed or shall be capable of being displayed on the dispenser using controls available to the customer 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. This subsection shall not apply to fleet sales, other contract sales, ~~or~~ truck refueling sales**, or all purchases of fuel accompanied by an automatically printed receipt of the transaction containing the discount unit price, the total gallons delivered, and total price of the sale**.*

[Effective and nonretroactive as of January 1, 1991]

(Amended 1989**, ~~and~~** 1997**, and 201X**)

***S.1.6.5.4. Selection of Unit Price.** – 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)**, and purchases where an automatic printed receipt of the transaction containing the discount unit price, the total gallons delivered, and total price of the sale**, when a product or grade is offered for sale at more than one unit price through a computing device, the selection of the unit price shall be made prior to delivery using controls on the device or other customer-activated controls.* A system shall not permit a change to the unit price during delivery of product.

[Nonretroactive as of January 1, 1991]

(Added 1989) (Amended 1991, 1992, 1993, **~~and~~** 1996**, and 201X**)

***S.1.6.7. Recorded Representations.** – 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.

[Nonretroactive as of January 1, 1986]

(Added 1985) (Amended 1997)

UR.3. Use of Device.

UR.3.2. 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 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.1.6.4.1. 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.

(Amended 1972, 1983, 1987, 1989, 1992, and 1993)

UR.3.3. Computing Device. – Any computing device used in an application where a product or grade is offered for sale at one or more unit prices shall be used only for sales for which the device computes and displays the sales price for the selected transaction.

(Added 1989) (Amended 1992)

The following exceptions apply:

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

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

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

(Added 1993)

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

(Added 1993)

(c) All purchases of fuel accompanied by an automatically printed receipt of the transaction containing the discount unit price, the total gallons delivered, and total price of the sale.

(Added 201X)

UR.3.4. Printed ~~Ticket~~ Receipt. – Except for purchases conducted under UR.3.3(c) (*see note below), ~~T~~the total price, the total volume of the delivery, and the price per **unit ~~liter or gallon~~** shall be shown, **on a receipt by** either **being automatically** printed or **printed** in clear hand script**~~, on any printed ticket issued by a device and containing any one of these values~~**.

***Note: Purchases conducted under UR.3.3(c) shall only be automatically printed, containing at minimum the total price, the total volume of the delivery, and the discount price per unit.**

(Amended 2001 **and 201X**)

Background/Discussion: In the early 1990s, various sections of the Liquid-Measuring Devices Code in HB 44 (including paragraphs S.1.6.4. Display of Unit Price and Product Identity, S.1.6.5.4. Selection of Unit Price, UR.3.2. Unit Price and Product Identity, and UR.3.3. Computing Device) were modified to address multi-tier pricing applications such as cash or credit. Since that time, marketing practices have evolved to include the addition of new practices such as frequent shopper discounts and club member discounts. Numerous questions have been posed to WMD regarding the requirements for posting unit prices, calculation of total price, customer-operated controls, and other related topics such as the definitions for associated terminology.

It is clear from these questions that changes are needed to HB 44 to ensure the requirements adequately address current marketplace conditions and practices. WMD has raised this issue with the Committee and has also discussed a variety of pricing practices with individual state and local weights and measures jurisdictions.

The WMD reviewed the existing requirements and their application to current market practices and collected information on a number of scenarios, including the following:

(1) Frequent shopper discounts
(2) Club member discounts
(3) Discount for prepaying cash (to prevent "drive-offs")
(4) Prepay at the cashier for credit sales
(5) Discounts for purchasing store products
(6) Discounts for purchasing a service (e.g., carwash)
(7) Targeted group discounts (e.g., Tuesday – ladies 5 cents off per gallon)
(8) Full service
(9) Self service
(10) Progressive discounts based on volume of motor-fuel purchased
(11) Coupons for discounts on immediate or future purchases
(12) Rebates (e.g., use of oil company credit card)
(13) Day-of-the-week discounts

Note: The conditions under some of these scenarios may not typically fall under the authority of weights and measures jurisdictions.

The WMD expressed an interest in receiving input from the weights and measures community about the various practices and pricing structures in use, and indicated it welcomed opportunities to discuss this item at regional weights and measures associations to ensure the item is adequately addressed.

The WWMA acknowledged that marketing practices change on a daily basis and the task to ensure HB 44 codes address each scenario is monumental. However, the WWMA encouraged NIST in its efforts to tackle this ongoing issue. Therefore, the WWMA recommended this item be considered and move forward to the national level as a Developing item as did the SWMA and NEWMA.

At its 2007 Annual Meeting the SWMA was informed that the National Association of Convenience Stores recognized a problem with the current price posting and computing capability requirements in HB 44 and was currently working on information on this item to provide to the NCWM S&T Committee.

At the 2008 Interim Meeting, Ohio Weights and Measures submitted a proposal to the Committee that included specific language for modifying Section 3.30. to address the various pricing and marketing structures being used in retail motor-fuel applications. Based on its review of that proposal, the fact that a specific proposal has now been developed and presented, and the number of jurisdictions reporting a need to move forward with this item, the Committee decided to elevate the status of this item from Developing to Informational. Consequently, the Committee is considering the specific language submitted by Ohio and encourages the weights and measures community to review the proposal and submit comments on this item.

At its spring 2008 meeting, the CWMA S&T Committee reported hearing comments that current language does not meet the needs of what is actually happening in the marketplace. Currently, there are economic issues dealing with fair competition, and there are numerous marketing techniques that the language in NIST HB 44 cannot address. The CWMA S&T Committee believes the item as proposed is a good start on addressing this issue, but it does not entirely provide adequate language to aid in enforcement. The CWMA S&T recommended that a WG be formed to further evaluate this item. Some examples of the panel discussion were, but not limited to:

1. discounts calculated at the pump and other at the counter,
2. level of consumer responsibility,
3. can the dispensers do tier pricing,
4. competitors complaining about non-uniformity of enforcement,
5. discounts should be done electronically, and
6. all is okay as long as the receipt explains the transaction.

NEWMA's spring 2008 meeting report stated that this is a very important item and NEWMA supports continued work on it as an Informational item. One member suggested that at the next NEWMA Interim Meeting a WG spend some time coming up with suggestions for this item.

At the 2008 Annual Meeting, the Committee heard comments on the proposed changes to the Liquid-Measuring Devices Code. Several weights and measures officials expressed concern about the provision in the proposed language that would allow discounts to be calculated at the console after the customer has dispensed product. These officials felt that devices should be able to compute the total sales price at the unit price at which the product is offered for sale. Several industry members expressed support of the proposed language. One member stated that it is important for retailers with mechanical dispensers to be able to offer their customers a cash discount.

Current NIST Handbook 44 requirements state that the selection of the unit price must be made by the customer using controls on the device or other customer-activated controls. One industry member questioned whether making arrangements for a given method of payment at the console might be considered as satisfying that requirement since the customer is initiating the sale and the conditions of payment prior to the transaction. Weights and measures officials acknowledged the comment, but emphasized the need for the customer to retain control over the selection of the price, preferably by making a selection at the dispenser or using customer controls.

The Committee expressed appreciation for the work that had been done thus far, acknowledging that additional work is needed on this item and noted that a WG is being formed to develop this item. The Committee looks forward to receiving input and suggestions from the WG and encourages interested parties to participate in the WG and/or forward comments to the Committee.

A meeting was held on July 15, 2008, (in conjunction with the NCWM Annual Meeting) of individuals interested in the issue of pricing requirements for retail motor-fuel dispensers. Participants in the meeting included weights and measures officials, gasoline pump manufacturers, and other interested parties. The purpose of the meeting was to establish an informal WG to review the issue of price posting and computing capability for retail motor-fuel dispensers. The WG will focus on the development of proposed changes to NIST Handbook 44 necessary to provide flexibility to marketers while ensuring that the buyer and seller have adequate information about all aspects of the transaction with respect to the pricing and method of payment. The CWMA had suggested the formation of this small WG to study this issue with the idea that the issue could be more thoroughly developed than could be done in the limited time available during the NCWM Interim and Annual Meetings. Note that this work does not replace the discussion of this issue at the NCWM Interim and Annual Meetings, but rather is intended to supplement the work and provide the S&T Committee with some proposals to consider.

Participants at that meeting were asked to indicate their interest in the work as either "work group participants" (expected to regularly participate and contribute to the work) or "observers" (will be kept abreast of WG activities, including meeting agendas and summaries). Because there is no budget to support the cost of regular face-to-face meetings, the WG will attempt to accomplish its objectives through e-mail and other electronic communication. Anyone interested in the details of this work should contact Tina Butcher (NIST WMD) by e-mail at tbutcher@nist.gov or by telephone at (301) 975-2196.

During the open hearings at its 2008 Annual Technical Conference, the WWMA received comments that the Committee wait until a national WG is established to develop this item further. The WWMA agreed that the item should be Informational.

During its 2008 Interim Meeting, the CWMA heard the following comments during discussions of this item:

- Lighten the rules of dispensing so consumer can see the actual sale – transparency in the marketplace
- Not enough room on marquee or on pump for posting all prices
- What will appear on customer receipt or final receipt

The CWMA agrees that the item should be Informational until more information is obtained from the national work group.

At its 2008 Interim Meeting, NEWMA supported work on this item and looks forward to information from the WG.

At its 2008 Annual Meeting, the SWMA acknowledged the need to review and revise the requirements in the Liquid-Measuring Devices Code regarding price posting and computing capability. However, the SWMA does not support the proposed language as written. The SWMA heard comments in opposition to the proposed changes to the LMD Code. The SWMA S&T Committee noted that it is important for consumers to have full information about the purchase price of the product before they dispense the fuel and to be able to follow all aspects of the transaction. Also, the Committee is concerned that the proposed language does not provide for this.

The SWMA heard from Tina Butcher, NIST, that a WG has been established to study this issue. The group met in conjunction with the NCWM Annual Meeting in July, and anyone interested in participating in the work should contact Tina. The SWMA supports the continued efforts of the WG and encourages interested parties to provide comments to the WG. Because of the ongoing efforts to develop this item, the SWMA agrees that this item should remain an Informational item and encourages people to study the proposal that has been presented thus far.

At the 2009 NCWM Interim Meeting, the Committee heard from Tina Butcher, NIST WMD, who indicated that, due to staff shortages, she has not been able to devote time to work on this issue further. Several NCWM members offered help in continuing the work, including John Eichberger, National Association of Convenience Stores, who indicated he could coordinate assistance from some of the association's interested members.

The Committee also heard some specific comments on the proposed language from Will Wotthlie, Maryland Weights and Measures, who noted that, should the Committee proceed with its consideration of the proposed changes in the recommendation; the following issues should be addressed:

- Paragraphs S.1.6.4.1.(a); UR.3.2.(a)(1); UR.3.2.(b)(1) and (2) are already in the handbook and should not be underlined. (**Technical Advisor's Note:** These corrections have been made in the report.)
- Where did the printed receipt referenced in S.1.6.4.1.(b) and in UR.3.3.(c) originate?
- Could the references to "computing or money-operated devices" currently found in paragraph S.1.6.4.1. be carried over into paragraph UR.3.3. in the lead statement: "Any computing or money-operated device…"?
- In the proposed changes to UR.3.4., should the reference to "printed" in the phrase "or printed in clear hand script" be "written" instead?
- Does the note under UR.3.4. Printed Ticket infer that all computing devices will be required to have a printer?

The Committee believes that additional work is required on this proposal before it is ready to move forward for a Vote and the Committee supports continued work by the WG. The Committee agreed to maintain this item as an Informational item.

330-4 W T.5. Predominance – Retail Motor-Fuel Devices

Source: Central Weights and Measures Association (CWMA). This item appeared on the Committee's 2008 agenda as Developing Item Part 4, Item 1.

Recommendation: The CWMA recommends the following new proposal developed by the Nebraska Weights and Measures Division to add a new paragraph T.5. to HB 44 Section 3.30. as follows:

T.5. Predominance - Retail Motor-Fuel Devices. – The retail motor-fuel devices in service at a single place of business shall be considered maintained in proper operating condition when evaluation of normal test results indicate the following parameters are met:

(a) The number of meters with minus test errors in excess of one-half maintenance tolerance shall be less than 60 % of the meters at the location, and

(b) When there are three or more meters of a single grade or type of fuel, the average error of the meters shall not be a minus value exceeding one-half maintenance tolerance. Meter test results

that exceed maintenance tolerance shall not be included in determining the average meter error of a single grade or type of fuel.

(Added 200X)

Background/Discussion: In 1991 this same topic was brought before the NCWM as an Informational item. The intent of the proposal at that time was to provide guidance to states in the interpretation of General Code paragraph G-UR.4.1. Maintenance of Equipment. In 1993 the State of Wisconsin adopted a policy that defined "predominance" as shown in the proposal. That policy was similar to the one proposed in 1991, except Wisconsin felt that one-third acceptance tolerance was too stringent because there was a need to take into account normal variability in testing procedures, equipment, and environmental conditions found in the field. Wisconsin, therefore, adopted a "greater than one-third" maintenance tolerance guideline. In 2003 the Wisconsin policy was further refined by deleting the language "all devices are found to be in error in a direction favorable to the device user." The new guideline for permissible errors was "60 % or more of the devices are found to be in error in favor of the device owner/user by more than one-third of the maintenance tolerance." Both of these criteria were seldom used in the field because they made the policy confusing.

Just prior to 2005, NIST conducted a national survey of retail motor-fuel dispenser testing, and the results pointed to a need to gain more uniformity in the application of tolerances. The CWMA noted there is a wide variation in how different states handle the "predominance" question. Strides should be continually made to gain uniformity. Adoption of the proposed new paragraph G-UR.4.1.1. would be one step toward gaining greater uniformity. With more than five years of history using the proposed criteria, Wisconsin saw a relatively low number of devices rejected on the basis of "predominance," and most station owners and all service companies have a working understanding of predominance.

In 2005 the CWMA agreed to submit the modified proposal to the NCWM S&T Committee with a recommendation that it be placed on the Committee's agenda as a Developing item.

At their fall 2006 meetings, NEWMA, the SWMA, and the WWMA considered an earlier CWMA proposal to modify a General Code requirement and set limits on how to determine predominance in favor of the device operator. NEWMA believed the item was addressed adequately in HB 44 and recommended it be withdrawn from the NCWM S&T Committee's 2007 agenda. The SWMA recommended this item remain Developing as a user requirement in the General Code. The SWMA encouraged the jurisdictions to review the proposed policy and try it out. The WWMA considered the limits in the proposal too stringent given the effects of temperature and other uncertainties. The WWMA was concerned dispensers would be set to the limits in the proposal rather than as close as practical to zero error. Since the current General Code adequately addresses predominance, jurisdictions may establish policy to gain uniformity in determining predominance. Consequently, the WWMA recommended this proposal be withdrawn from the agenda.

At the 2007 NCWM Interim Meeting, the Committee considered proposals to withdraw this item from its agenda. However, because a jurisdiction involved in developing the current proposal indicated their intention to provide the Committee with considerable data and continue further development of the item, the Committee agreed to keep the item on its agenda as a Developing item through 2007.

At its 2007 Annual Meeting, the WWMA heard comments from state and local jurisdictions stating they have been able to enforce G-UR.4.3. Predominance through administrative policies and rules.

The WWMA believed that:

- existing language in NIST Handbook 44 was sufficient,
- the definition of predominance is anything over 50 %,
- a potential conflict exists with paragraph G-UR.4.3. Use of Adjustments,
- the CWMA proposal addressed only retail motor-fuel devices and a review should also be considered for other weighing and measuring devices, e.g., point-of-sale scales and vapor meters,
- the proposed language did not take into account devices that were clearly out of tolerance, and
- the proposed language did not take into account the uncertainty of the test equipment, reading errors, and temperature changes between device calibration and official test.

The WWMA recommended the CWMA proposal to add paragraph T.5. Predominance to Section 3.30. be withdrawn. The WWMA further recommended the following alternate proposal to address some of the WWMA concerns listed above:

G-UR.4.1. Maintenance of Equipment. – All **weighing and measuring** 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**, by group or entirety,** at a single place of business found to be in error predominantly in a direction favorable to the device **owner or** user shall not be considered "maintained in a proper operating condition."

(Amended 1973**,** ~~**and**~~1991**, and 200X**)

For measuring devices, the term "predominantly" applies to any single product, grade, service level, or payment method, with errors in favor of the device owner or user.

(Added 200X)

At its 2007 Interim Meeting, the CWMA heard comments in favor of this item and from state and local jurisdictions that they have been able to enforce G-UR.4.3. Predominance through administrative policies and rules. However, there was some concern that the proposed tolerance was not stringent enough and allowed meters to be set at acceptance tolerance values. By adding part (c), the concern of misuse of tolerance was adequately addressed.

The CWMA supported the following language as proposed.

T.5. Predominance - Retail Motor-Fuel Devices. – The retail motor-fuel devices in service at a single place of business shall be considered maintained in proper operating condition when evaluation of normal test results indicate the following parameters are met:

(a) The number of meters with minus test errors in excess of one-half maintenance tolerance shall be less than 60 % of the meters at the location, and

(b) When there are three or more meters of a single grade or type of fuel, the average error of the meters shall not be a minus value exceeding one-half maintenance tolerance. Meter test results that exceed maintenance tolerance shall not be included in determining the average meter error of a single grade or type of fuel.

(c) Upon initial verification or re-inspection of devices rejected for predominance, the criteria for acceptance using paragraphs (a) and (b) shall be based on minus errors greater than 2 in^3 rather than 3 in^3.

(Added 200X)

G-UR.4.1. Maintenance of Equipment. – All **weighing and measuring** 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**, by group or entirety,** at a single place of business found to be in error predominantly in a direction favorable to the device **owner** ~~**or user**~~ shall not be considered "maintained in a proper operating condition."

For measuring devices, the term "predominantly" applies to any single product, grade, service level, or payment method, with errors in favor of the device owner ~~**or user.**~~

At its 2007 Interim Meeting, NEWMA stated that they continue to oppose this item and recommended it be withdrawn as it was already adequately addressed in the General Code.

At its 2008 Annual Meeting, the CWMA recommended the item be Withdrawn. At its 2008 Interim Meeting, the CWMA recommended this item go forward as a Voting item.

The WWMA received no comments on this Developing item during its 2008 Annual Technical Conference open hearings. The WWMA made no changes to the proposal and recommends the item remain Developing.

At the 2009 Interim Meeting, the Committee heard comments supporting the proposal from Judy Cardin, Wisconsin, who indicated that some states are finding it difficult to enforce the general requirement for maintenance of equipment in G-UR.4.1. and citing concerns about lack of uniformity in how the paragraph is enforced. Steve Malone, Nebraska, also supported the proposal, noting his belief that it is being left up to the individual inspector to decide on compliance with the current G-UR.4.1. Julie Quinn, Minnesota, supported the need for a standard interpretation, but supported only paragraph (b) of the proposal. Will Wotthlie, Maryland, opposed the proposal, expressing concern that consideration had not been given for other device types that weights and measures officials inspect. Will also had concern about specifying a specific percentage value since companies may target these values, further noting that, if service companies are not adjusting as close to zero as practical, then the provisions of G-UR.4.3. Use of Adjustments can be used to address the problem. Bob Atkins, San Diego County, California, also expressed concern about specific percentage values and thresholds, noting that this gives the appearance of establishing a tolerance within a tolerance and may encourage adjustments to those thresholds; he also emphasized that the burden of proof is on the inspector to prove predominance, using judgment, information, and an individual assessment of each situation. Mike Cleary, speaking on his own behalf, noted that it is inappropriate to quantify intent with a percentage value. He believes the current paragraph is clear and echoed Bob's concerns that making changes as outlined in the proposal will encourage companies to target these numbers in their adjustments.

While the Committee recognizes the need to encourage uniformity in implementation of handbook paragraphs, the Committee believes that existing General Code requirements, including G-UR.4.1. Maintenance of Equipment, G-UR.4.3. Use of Adjustments, and other handbook provisions are adequate to address the concerns raised. There are other similarly broad paragraphs in the General Code and in the specific codes that are designed to allow for interpretation by the jurisdiction and assessment of individual situations. In addition, the Committee recognized that many jurisdictions have implemented policies to help encourage uniformity among their inspectors and service companies. This allows jurisdictions to retain the flexibility to use other information such as service records and compliance history to more properly assess intent with regard to equipment maintenance and use of adjustments. After reviewing the history of this item, input from the regions, and comments from the Interim Meeting, and after discussing these points, the Committee concluded that there is not enough support for this item to move forward for a vote. Consequently, the Committee has Withdrawn this item from its agenda.

331 VEHICLE-TANK METERS

331-1 I T.2.1. Automatic Temperature-Compensating Systems

Source: 2008 Carryover Item 331-2. This item originated from the Western Weights and Measures Association (WWMA) and first appeared on the Committee's 2008 agenda.

Recommendation: Amend paragraph T.2.1. as follows:

> **T.2.1. Automatic Temperature-Compensating Systems.** – The difference between the meter error (expressed as a percentage) for results determined with and without the automatic temperature-compensating system activated shall not exceed:
>
> (a) ~~**0.4**~~**0.2 %** for mechanical automatic temperature-compensating systems; and
>
> (b) ~~**0.2**~~**0.1 %** for electronic automatic temperature-compensating systems.
>
> The delivered quantities for each test shall be approximately the same size. The results of each test shall be within the applicable acceptance or maintenance tolerance.
>
> **(Amended 201X)**

Background/Discussion: For more than 13 years, Alaska has been testing mechanical and electronic temperature-compensating vehicle-tank meters with flow rates ranging from 100 gal/min to 300 gal/min. They have applied the

tolerances of 0.2 % for mechanical and 0.1 % for electronic wholesale meters as specified in the LMD Code, and have found that the devices are fully capable of meeting these tolerances. When devices are found out of tolerance, it is usually because of a broken cable at the probe for the mechanical devices, an electrical fault at the probe on electronic devices, or an incorrect API setting. By keeping the current tolerances that are double the equivalent tolerances in the LMD Code, there is a risk these problems will be missed.

To illustrate how the current tolerances may mask problems such as broken temperature probes or incorrect settings, consider the following example:

1000 gal prover
Diesel #2
API 34.5
Temperature 60 °F
Mechanical compensated VTM

- A net test draw is run and the result is +2.0 gal or +0.2 %. This meets the maintenance tolerance of 0.3 % or 3.0 gal.
- A gross draw is run and the result is –2.0 gal or –0.2 %. This still meets the tolerance and the difference between the two runs is 0.4 %.
- With the temperature of the fuel at 60 °F, both of these runs should have been equal.
- If an inspector used the system indication of temperature rather than using a certified thermometer in the meter temperature well, calculations show that the current tolerance of 0.4 % for a mechanical automatic temperature-compensating system could allow a system malfunction that provided a temperature error of up to 9 °F difference from the actual temperature taken in the prover and not be recognized as being caused by a faulty system.

At its 2007 Annual Meeting, the WWMA recommended that the item move forward for a Vote. The WWMA was presented with a letter from a meter manufacturer in support of the proposal based on a request from Alaska Weights and Measures for input from manufacturers of the mechanical and electronic compensators. The letter states that the proposed changes will align the VTM tolerances for the difference between meter error for results determined with and without the automatic temperature-compensating system activated with the LMD Code. Current NIST HB 44 language will require this manufacturer to produce different stationary and vehicle-mounted meters; the proposed change will align the United States with Canada and OIML, who currently do not have different standards for these meters.

At the 2008 Interim Meeting, the Meter Manufacturers Association (MMA) and some individual manufacturers opposed this proposal. While they were comfortable with a tighter tolerance being used during type evaluation they were concerned with the impact of a tighter tolerance during routine field examinations. During routine field evaluations, it becomes more difficult to control the influence factors that impact the measurement process leading to higher uncertainty in the accuracy of the test results. The Committee agreed with comments from the CWMA's 2007 Interim Meeting that more information is needed before moving the item forward and, consequently, made 331-2 an Informational item on its 2008 agenda.

In their spring 2008 meeting reports, the CWMA and NEWMA stated that there is not enough data to support the proposed changes in tolerance and recommended that the item remain an Informational item. WMD submitted comments supporting the collection of additional data, and suggested that the tolerances for stationary and vehicle-mounted meters be re-examined and compared to ensure consistency across codes for the same meter type. Additionally, WMD noted that as the use of VTMs with ATC increase, there may be a period of transition as jurisdictions and companies become accustomed to the test procedures and application of tolerances for these systems, and this experience may provide a good indication of how the uncertainties involved in the test process will impact the proposed tolerance change.

At the 2008 NCWM Annual Meeting, the Committee reported that it has not received additional data from other jurisdictions on the impact of this proposal on existing devices. The Committee also heard comments that the tolerances in the VTM code need to be less stringent than equivalent tolerances in the LMD code since VTM meters and accessories are mobile devices that are subject to road vibrations and other environmental factors. The

Committee does not understand the rationale for the comment since the tolerances for Accuracy Class 0.3 in Table T.1. for VTMs are tighter than Accuracy Class 0.3 devices in the LMD code.

The Committee is interested in receiving compliance data from jurisdictions that are enforcing ATC tolerance requirements on VTMs. If no information is received, the Committee will consider recommending that this item move forward as a Voting item in 2009.

No comments were received during the WWMA 2008 Annual Technical Conference open hearing. The WWMA recommends this item remain Informational pending receipt of data from other jurisdictions. At its 2008 Interim Meeting, the CWMA and NEWMA recommended waiting for more information to be submitted before the NCWM Interim Meeting in January 2009. If no more information is received the CWMA and WWMA recommends the item be moved forward as a Voting item.

During open hearings at its 2008 Annual Meeting, the SWMA heard concerns about whether or not existing equipment, particularly electronic equipment can meet the proposed smaller tolerances. The Committee heard that the harsher environment of the vehicle-mounted application may make it difficult for devices to meet the tolerances. The SWMA agreed with the NCWM S&T Committee that additional data is needed prior to making a decision about the proposed tolerance change. Consequently, the SWMA maintained this as an Informational item on its agenda. The SWMA encourages jurisdictions that have VTMs equipped with automatic temperature compensating systems in their jurisdictions to forward compliance data to the NCWM S&T Committee so that a better assessment can be made about the proposed tolerances.

At the 2009 Interim Meeting, the Committee heard from the MMA in opposition to the proposal, citing the need for additional data prior to moving the item for a Vote. Steve Malone, Nebraska, urged caution prior to making the proposed changes noting that inspection procedures such as how the temperature probes are read can have a significant impact on the decision to tighten a tolerance. Juana Williams, NIST WMD, presented technical input noting concerns that have been raised by some members of the community regarding the importance of using NIST Handbook 105-compliant and traceable standards such as thermometers and following appropriate test procedures for assessing compliance with ATC tolerances. Juana also noted the importance of data supporting the proposed changes and commented on WMD's concern over the continued disparity between the tighter VTM tolerances for normal and special tests and the less stringent tolerances for identical meters used in stationary applications. Ross Andersen, New York, noted that some have questioned whether or not we should be establishing tolerances and test procedures for checking the accuracy of the probe; however, the approach we have taken is to establish a tolerance for both the temperature probe and the algorithm used to calculate net values.

Committee technical advisor, Tina Butcher, noted that supporting data has been received from only one source. No data has been submitted to indicate that the proposed change is not appropriate. Tina reported distributing a note to the NIST WMD weights and measures Directors list serve asking for input. She also contacted by telephone the majority of northern tier states who might be likely to have experience testing VTMs with ATC systems. Tina was unable to obtain any additional data, noting that many jurisdictions reported not having VTMs equipped with active ATC systems. Some jurisdictions that do have such systems in their jurisdictions do not have specific data on the compliance of the device with the ATC tolerances. Several states offered to attempt to collect additional data over the next six months and provide any input available to the Committee.

After considering the comments from the open hearings and the regions, the Committee decided to retain this as an Informational item on its agenda. While no data has been provided to support the opposing comments on this item, the Committee is reluctant to propose a change as significant as that of changing a tolerance based upon data from a single source. The Committee appreciates the data provided by Alaska and emphasizes that this position should not be taken to imply that the Committee questions the validity of the data or procedures used in collecting it.

The Committee reiterates its request for jurisdictions to supply test data in support or opposition of the proposal to assist the Committee in making a decision on the item. The Committee also invites input of data from equipment manufacturers.

331-2 V UR.2.5. Automatic Temperature Compensation for Refined Petroleum Products, UR.2.5.1. Use of Temperature Compensation System

Source: 2008 Carryover Item 331-3. This item originated from the Southern Weights and Measures Association (SWMA) and first appeared on the Committee's 2008 agenda.

Recommendation: Add the following subparagraphs to the Vehicle-Tank Meters Code:

UR.2.5. Automatic Temperature Compensation for Refined Petroleum Products.

UR.2.5.1. Use of Temperature Compensation System.

UR.2.5.1.1. When to be Used. – In a state that does not prohibit, by law or regulation, the sale of temperature-compensated product, a device equipped with an ~~operable~~ automatic-temperature compensator shall be connected, operable, and in use at all times. An electronic or mechanical automatic temperature-compensating system may not be removed, nor may a compensated device be replaced with an uncompensated device, without the written approval of the responsible weights and measures jurisdiction.

Note: This requirement does not specify the method of sale for products measured through a meter.

UR.2.5.1.2. Period of Use. – When fuel is bought or sold on an automatic temperature compensation basis, it shall be bought or sold using this basis over at least a consecutive 12-month period unless otherwise agreed to by both the buyer and seller in writing.

Discussion: Currently there are no published guidelines for how a company has to use or operate their VTM with or without temperature compensation. They could choose to operate only part of their fleet with ATC or use ATC only part of the year when it is to their benefit. They may choose to use ATC only on certain products such as home heating oil and not use ATC with diesel, kerosene, or gasoline.

The Committee was originally asked by the SWMA to consider adding two paragraphs intended to help (1) to eliminate the potential for facilitation of fraud with ATC; and (2) to eliminate consumer confusion regarding why certain products are currently sold using ATC and others are not.

The Committee considered several iterations of the original proposal based on the following points raised in open hearings and regional associations in 2008. Details can be found in the Committee's 2008 Final Report.

- The proposal should only apply to fuel products.
- A number of people voiced concern over the possibility of consumers (who generally are not educated regarding the import of compensated versus uncompensated deliveries) unwittingly signing contracts agreeing to gross or net deliveries that may put them at a disadvantage.
- Questions were raised over uniformity between buyer and seller agreements at the retail level.
- The numbering of the proposals is not consistent with current code format.
- Would the language inappropriately allow a seller to include a shorter time period than 12 months facilitating use of the system when it is of most advantage to the business?

Based on the comments received, the Committee decided to change the status of this item from Voting to Informational at the 2008 NCWM Annual Meeting and sent the proposal in the following form to the regional associations for review.

During open hearings at its 2008 Annual Technical Conference, the WWMA heard comments from one jurisdiction questioning why this item is proposed in HB 44 and suggesting that a more appropriate place might be HB 130 since it relates to method of sale. The WWMA noted that similar language exists in another HB 44 Code (LMD Code UR.3.6.1.1.).

The WWMA reviewed the alternative language developed by the Committee at the 2008 NCWM Annual Meeting, and noted that it recommended strikethrough of "unless otherwise agreed to by both the buyer and seller in writing." This would be inconsistent with LMD Code UR.3.6.1.1., and the WWMA recommended this item remain Informational to allow for further discussion.

During the 2008 CWMA Interim Meetings, one jurisdiction stated they would not support this item with UR.2.5.2.2. Condition of Use. This jurisdiction believes that all VTMs at a location should not be made to be temperature-compensate at a given facility. Other jurisdictions attending the meeting supported the item. For clarification purposes, the CWMA recommends the words "through a vehicle-tank meter" (see italics type below) be inserted after the words "offered for sale…" in UR.2.5.2.2. Condition of Use.

The CWMA recommended this item be moved to a Voting item with the following changes.

UR.2.5.2.1. Period of Use. – When fuel is bought or sold on an automatic temperature compensation basis, it shall be bought or sold using this basis over at least a consecutive 12-month period unless otherwise agreed to by both the buyer and seller in writing.

UR.2.5.2.2. Condition of Use. – At a business location, which offers fuel products for sale on the basis of a temperature-compensated volume, all vehicle-tank meters shall have active automatic temperature compensation and all fuel products offered for sale *through a vehicle-tank* meter shall be dispensed on the basis of temperature-compensated volume.

At its 2008 Interim Meeting, NEWMA heard discussion that allowing uncompensated sales when agreed to by both parties could result in consumers getting sales contracts that contained this language, and consumers may not understand fully what this means. When the phrase "unless otherwise agreed to by both the buyer and seller in writing" language is removed, it appears that UR.2.5.1. already addresses this issue.

Consequently, NEWMA recommends the following changes:

~~**UR.2.5.2.1. Period of Use. – When fuel is bought or sold on an automatic temperature compensation basis, it shall be bought or sold using this basis over at least a consecutive 12-month period unless otherwise agreed to by both the buyer and seller in writing.**~~

UR.2.5.2.~~2~~1. Condition of Use. – At a business location which offers fuel products for sale on the basis of a temperature-compensated volume, all vehicle-tank meters shall have active automatic temperature compensation and all fuel products offered for sale shall be dispensed on the basis of temperature-compensated volume.

NEWMA recommends this item be made Informational.

At its 2008 Annual Meeting, the SWMA raised the following concerns and questions about the proposal:

- The SWMA questioned the need for the new proposed paragraph UR.2.5.1. since the VTM Code currently includes a paragraph (also numbered UR.2.5.1.) that appears to cover similar criteria.

- The SWMA heard a suggestion to eliminate the phrase "unless otherwise agreed to by both the buyer and the seller" from the proposed UR.2.5.1. The Committee noted that the same language is already included in the Liquid-Measuring Devices Code; however, the references in that code are to wholesale meters and the buyer and seller are fully educated and understand the ramification of a temperature-compensated vs. non-temperature-compensated sale.

- The SWMA questioned how the proposed paragraph UR.2.5.2.2. is intended to apply to metering devices at a single location. Does the reference to "all fuel products" in this paragraph refer to all vehicle-tank meters? Or does it refer to vehicle-tank meters as well as RMFDs at a single location?

- The SWMA questions the proposed numbering of the paragraphs and whether or not the proposed paragraphs should be included under the section of "invoices" or in another section.

The SWMA also considered a suggestion to split the item into two parts in order to facilitate addressing these and other concerns. While the SWMA is amenable to this approach, it believes the above concerns and questions should be addressed prior to taking additional action.

The SWMA believes that additional work is needed on this item to resolve the above and other concerns. Consequently, the SWMA maintained this as an Informational item on its agenda.

At the 2009 Interim Meeting, Joe Buxton, stated that the MMA supports the proposal with the changes suggested by the CWMA. Bob Atkins, San Diego County, California, expressed support for the item, noting that when ATC is used, it should be used consistently. Tim Tyson, Kansas, opposed the item, noting that there are a few applications in which a company has a VTM dedicated to serving only one business; forcing ATC for all VTMs in the company would be a problem. Ross Andersen, New York, agreed with the first paragraph.

Based on comments received on this issue, the Committee felt that there was general support for paragraph UR.2.5.2.1. Period of Use, but additional work would be needed before paragraph UR.2.5.2.2. Condition of Use is ready for further action. Rather than delay action on the "Period of Use" requirement, which some comments indicate are needed by officials more immediately, the Committee decided to propose UR.2.5.2.1. (as renumbered in the recommendation above) for a Vote. The Committee agreed to create a new item (Item 331-3) under which the originally proposed paragraph UR.2.5.2.2. Condition of Use can be further refined to best meet the needs of the weights and measures community.

331-3 I UR.2.5.2.1. Automatic Temperature Compensation for Refined Petroleum Products

Source: 2008 Carryover Item 331-3. This item originated as a companion proposal to 2009 Interim agenda Item 331-2.

Recommendation: Add the following subparagraphs to the Vehicle-Tank Meters Code:

> **<u>UR.2.5.1.X. Condition of Use. – At a business location which offers fuel products for sale on the basis of a temperature-compensated volume, all vehicle-tank meters shall have active automatic temperature compensation and all fuel products offered for sale shall be dispensed on the basis of temperature-compensated volume.</u>**

Note: If the proposed changes in Item 331-2 are adopted, the above paragraph will be numbered UR.2.5.1.3.

Discussion: Currently there are no published guidelines for how a company has to use or operate their VTM with or without temperature compensation. They could choose to operate only part of their fleet with ATC or use ATC only part of the year when it is to their benefit. They may choose to use ATC only on certain products such as home heating oil and not use ATC with diesel, kerosene, or gasoline.

The Committee was originally asked by the SWMA to consider adding two paragraphs intended to help (1) to eliminate the potential for facilitation of fraud with ATC; and (2) to eliminate consumer confusion regarding why certain products are currently sold using ATC and others are not. The Committee was able reach agreement on a proposal to address the "Period of Use" as outlined in Item 331-2; if adopted these changes will address restrictions on the time period for use of ATC systems. The Committee was not, however, able to reach agreement on the "Conditions of Use" for ATC systems; that is, criteria for stipulating how ATC is used to sell similar products within a single company. Consequently, the Committee created this item at the 2009 Interim Meeting as a companion to Item 331-2 to enable further review and discussion of the proposed criteria.

Concerns were expressed that the language in the recommendation may not allow a business that has a VTM dedicated to serving a single customer to have the option of providing the sale on an uncompensated basis. Comments in support of the language indicate that this will prevent business owners from selectively using a VTM without ATC to serve retail customers (who are not generally well educated with respect to the distinction between

compensated and non-compensated deliveries) when a non-compensated sale would be disadvantageous to the customer. The CWMA has proposed alternative language as shown in Item 331-2 to emphasize that the paragraph applies only to VTM sales by a business, not all of the business' fuel sales (for example, fuel sales made through loading-rack meters also operated by the business).

The Committee invites additional comments and suggestions on how to modify the proposed language to address the concerns raised. The Committee is also interested in comments on how the issue of a meter that can be programmed with multiple products should be addressed; specifically, whether such a meter should be permitted to be programmed to offer compensated and non-compensated sales through the same meter and, if so, what language is needed to address its use. The Committee agreed to keep this proposal on its agenda as an Informational item.

See Item 331-2 for additional background information and a summary of comments on the proposed UR.2.5.1.X. Condition of Use.

336 WATER METERS

336-1 V S.1.1.3. Value of Smallest Unit and S.1.1.6. Proving Indicator

Source: Western Weights and Measures Association (WWMA). This item appeared as Part 5, Item 1 on the Committee's 2008 agenda as a Developing item under consideration by the SWMA.

Proposal: Harmonize HB 44 value of the smallest unit requirements and indicator specifications with American Water Works Association (AWWA) standards by amending paragraph S.1.1.3. subsection (a) and adding a new paragraph S.1.1.6. Proving Indicator as follows:

S.1.1.3. Value of Smallest Unit. – The value of the smallest unit of indicated delivery and recorded delivery, if the device is equipped to record, shall not exceed the equivalent of:

(a) 50 L (10 gal**, 1 ft^3**) on utility-type meters**, sizes 1 in and smaller,** or

(b) **500 L (100 gal, 10 ft^3) on utility-type meters, sizes 1½ in and 2 in**, or

(c) 0.2 L ($^1/_{10}$ gal, **$^1/_{100}$ ft^3**) on batching meters delivering less than 375 L/min (100 gal/min, **13 ft^3/min**), **or**

(d) 5 L (1 gal, **$^1/_{10}$ ft^3**) on batching meters delivering 375 L/min (100 gal/min, **13 ft^3/min**) or more.

Add new paragraph S.1.1.6. as follows:

S.1.1.6. Proving indicator. – Utility-type meters shall be equipped with either a mechanical-type proving indicator, or a high-resolution digital proving indication. The individual graduations on a mechanical proving indicator shall indicate volumes no larger than $^1/_{100}$ of the value of the smallest unit of indicated delivery required in S.1.1.3. For digital proving indications, the smallest unit of volume displayed shall be no larger than $^1/_{1000}$ of the value of the smallest unit of indicated delivery required in S.1.1.3.

Add a reference to Code Section 3.36. to the definition for "Proving Indicator" in Appendix D as follows:

proving indicator. The test hand or pointer of the proving or leak-test circle on the meter register or index. [3.33**, 3.36**]

Background/Discussion: At its 2007 Annual Meeting, the SWMA received a request from a meter manufacturer for clarification of the intent of S.1.1.3. Along with the request, the manufacturer stated that, "our assumption is that this refers to the value of each graduation of the primary indicating element." If this is indeed the intention of S.1.1.3., then the S.1.1.3.(a) requirement of 10 gal would pose no problem for utility-type meters. However, this would represent very poor resolution for smaller water meters. Again, if S.1.1. is indeed referring to the values for individual graduations, values for utility-type meters under S.1.1.3. should instead be separated into three cateogries: 0.1 gal for meters 1 in and smaller, 1.0 gal for meters 1½ in through 3 in, and 10 gal for meters 4 in and larger.

Similarly, metric "smallest unit" values would also be in three categories: 1 L for meters 1 in and smaller, 10 L for meters 1½ in through 3 in, and 100 L for meters 4 in and larger.

For meters indicating in inch-pound units, utility-type water meters 1 in and smaller have 10 gal test circles with 100 graduations (i.e., 0.1 gal increments). Utility-type meters 1½ in through 3 in have 100 gal test circles with 100 graduations (i.e., 1 gal increments), and utility-type meters 4 in and larger have 1000 gal test circles with 100 graduations (i.e., 10 gal increments). Comparable registration details are available in metric offerings (with 0.1 m^3, 1.0 m^3, and 10 m^3 test circle offerings for progressively larger meter sizes).

The SWMA also heard comments from the manufacturer that several other water meter manufacturers were having difficulty meeting HB 44 requirements for repeatability that were added in 2002. Additionally part of the problem was the determination of what constitutes the smallest unit of measure for various sizes of their utility meters. The manufacturer is requesting a change to the test draft requirements and/or smallest unit of measure requirements to be more appropriate for the meters they and others manufacture. The SWMA agreed to forward the proposal to the NCWM S&T Committee for consideration.

Just prior to the 2008 NCWM Annual Meeting, the NCWM S&T Committee received a proposal from Scott Swanson, with Sensus Metering Systems, on behalf of five water meter manufacturers, including Badger Meter, Inc., Elster Metering, Master Meter, Neptune Metering, and Sensus Metering to modify the proposed language as outlined in the recommendation above. During the Committee's open hearings, the S&T Chairman notified NCWM members that copies of this information were available to interested parties and noted that the above proposal will be included in the Committee's final report.

The five water meter manufacturers state that the vast majority of utility-type water meters sold in the United States are designed to comply with ANSI/AWWA meter standards. All AWWA utility-type meter designs share a common meter proving resolution of 100 scale divisions per revolution of the pointer to verify meter accuracy. All utilities use the odometer indicating device on the dial face of the meter for billing purposes. These utility-type meter designs are quite different from those used for batching-type meters. HB 44 currently addresses the value of the smallest unit for utility-type meters as being 50 L regardless of the size of the meter. As a result, larger utility-type meters are required to be more sensitive than smaller utility-type meters.

For utility-type meters 1 in and smaller, meter registration test hands (proving indicators) have graduations with resolution down to 0.1 gal or 0.01 ft^3. For meters 1½ in and 2 in, test hands have graduations with resolution down to 1.0 gal or 0.1 ft^3. The smallest unit of indicated delivery is then given by one full revolution of the test hand (amounting to 100 graduations).

During open hearings at the WWMA 2008 Annual Technical Conference, the water meter manufacturers gave a presentation on their justification for the proposed changes which included reducing the uncertainty in testing procedures by increasing the test draft size; clarifying the values for the smallest unit of measure based on utility-type meter size; and limiting the number of graduations of the sweep hand to ≥100 graduations. Additionally, the proposals are intended to align HB 44 test requirements with AWWA standards and test criteria.

The WWMA discussed the difference between the smallest unit and the value of the proving indication. The intent is that the proving indicator only be used in the verification of the device and the "Value of the Smallest Unit" applies to the meter reading for billing purposes (e.g., beginning and ending readings on a utility bill). This would be analogous to Scales Code verification division sizes where d (smallest division that can be indicated) can be different from e (verification scale division by which tolerance values apply). It was noted that similar language and terminology for "Values of the Smallest Unit" and "Proving Indicator" exists in Section 3.33. Hydrocarbon Gas Vapor-Measuring Devices Code (see paragraphs S.1.1.3. and S.1.1.5. in that code).

The WWMA recommends that this item be forwarded to the NCWM S&T Committee as a Voting item.

At its 2008 Interim Meeting, NEWMA heard a presentation from Andre Noel, Neptune. NEWMA has limited experience testing water meters but recognizes the logic of this item. NEWMA has no position at this time.

CWMA heard no comments on this item at its 2008 Interim Meeting and took no position on this item.

The SWMA S&T Committee heard no comments on this item. Because the SWMA S&T Committee members have little experience with water meters, the Committee took no position on the item and the SWMA agreed the item should remain Developing until additional support is heard.

At the 2009 Interim Meeting, the Committee heard comments in support of this item from water meter manufacturers' representatives George DeJarlais (Badger), Andre Noel (Neptune), and Alex Watson (Elster Amco Water). The Committee also received letters of support from Ron Koch (Master Meter, Inc.) and Scott Swanson (Sensus Metering Systems) (see Appendix C, Written Comments Received by the Committee). The Committee also heard support of this issue from members of WWMA. Hearing no opposition to this issue, the Committee decided to recommend this item for a Vote.

336-2 W T.1.1. Repeatability

Source: Western Weights and Measures Association (WWMA)

Recommendation: Amend T.1.1. Repeatability and add new Tables T.1.1. and T.1.2. in HB 44 Section 3.36.

T.1.1. Repeatability. – When multiple tests are conducted at approximately the same flow rate, the range of the test results shall not exceed 0.6 % for tests performed at the normal and intermediate flow rates, and 1.3 % for tests performed at the minimum flow rate, and each test shall be within the applicable tolerances. **When repeatability tests are performed, test draft sizes shall comply with Tables T.1.1. and T.1.2. Repeatability Testing for Utility-Type Water Meters. Repeatability tests shall be conducted during type evaluation testing.**

(Amended 200X)

Table T.1.1. Flow Rate and Draft Size for Utility-Type Water Meters
Normal Tests for Repeatability

Meter Size (inches)	Rate of Flow (gal/min)	Maximum Rate	
		Meter Indication/Test Draft	
		gal	ft^3
Less than 5/8	8	100	10
5/8	15	100	10
5/8 x ¾	15	100	10
¾	25	100	10
1	40	100	10
1½	50	400	40
2	100	500	40

(Table Added 200X)

Table T.1.2. Flow Rate and Draft Size for Utility-Type Water Meters
Special Tests for Repeatability

Meter Size (inches)	Intermediate Rate			Minimum Rate		
	Rate of Flow (gal/min)	Meter Indication/Test Draft		Rate of Flow (gal/min)	Meter Indication/Test Draft	
		gal	ft^3		gal	ft^3
Less than 5/8	2	40	4	¼	20	2
5/8	2	40	4	¼	20	2
5/8 x ¾	2	40	4	¼	20	2
¾	3	40	4	½	20	2
1	4	40	4	¾	20	2
1½	8	400	40	1½	200	20
2	15	500	40	2	200	20

(Table Added 200X)

Background/Discussion: This proposal was originally included with Developing Item Part 4, Item 1 (now Item 336-3) Water Meters. Scott Swanson, with Sensus Metering Systems, on behalf of five water meter manufacturers including Badger Meter, Inc., Elster Metering, Master Meter, Neptune Metering, and Sensus Metering, submitted a proposal to the WWMA suggesting that the proposed changes to paragraph T.1.1. Repeatability in that Developing item be addressed separately. A copy of this proposal was also provided to the NCWM S&T Committee in July 2008 and appears as an Appendix to the Committee's 2008 Final Report.

Mr. Swanson and the other meter manufacturers provided the following justification for the proposed change to the repeatability requirements:

> When agencies use inadequate test draft quantities, erroneous test results can be produced. These erroneous test results have and are continuing to have ***serious financial consequences to manufacturers and distributors***.
>
> The vast majority of utility-type water meters sold in the United States are designed to comply with ANSI/AWWA meter standards. Coupled with actual utility metering practices in the field, the result is meter designs sharing common meter reading resolution. These designs are quite different from those used for batching-type meters.
>
> For utility-type meters 1 in and smaller, meter registration test hands (proving indicators) have graduations with resolution down to 0.1 gal or 0.01 ft^3. For meters 1½ in and 2 in, test hands have graduations with resolution down to 1.0 gal or 0.1 ft^3. In visually reading the test hand position relative to these graduations, resolution is limited to a range of roughly ⅓ or ½ of an individual graduation (at both the start of each test and at then at the end of each test).
>
> A test draft equal to only 100 graduations, while adequate for accuracy testing, will be insufficient when testing for repeatability (given the five-fold tighter tolerance for meter repeatability, compared to the tolerance for meter accuracy). For example, an uncertainty of ⅓ graduation at the initial meter reading, and an additional reading uncertainty of ⅓ graduation at the end of the test, would result in a cumulative meter reading uncertainty of 0.67 %, for such a 100-graduation test. Test draft sizes need to be increased, so that meter reading uncertainties do not consume more that ¼ of the total allowable tolerances for this testing. For a repeatability range requirement of 0.6 %, test draft size should equal 400 graduations of the test index in order to have acceptable meter reading resolution. Similarly, for a repeatability range requirement of 1.3 %, test draft size should be equal to 200 graduations of the test index.

In its review of this issue and 2008 Developing item Part 4, Item 1, Water Meters, N.3. Test Drafts and N.4. Testing Procedures at its 2008 Annual Technical Conference, the WWMA agreed to address this issue separately and agreed to forward this item to the NCWM S&T Committee with a proposal that the item be made a Voting item on the Committee's 2009 Interim agenda. The WWMA noted that repeatability tests of utility-type meters are currently being conducted during the type evaluation process, but are seldom performed in field tests.

The SWMA heard no comments on this item at its 2008 Annual Meeting. In its review of the item, the SWMA S&T Committee raised the questions and concerns outlined below.

- The table is specifying test draft criteria rather than tolerances and, consequently, should appear in the Notes section rather than in the Tolerances section.

- The table is confusing as currently presented. Although the table is patterned after similar paragraphs in the Notes section of the water meters code, there is explanatory text in those paragraphs which assists the user in understanding how the table is to be applied. Such text is missing from the proposed changes to paragraph T.1.1.

- The SWMA S&T Committee believes that the option of running the repeatability test in the field should be retained. While the proposed language does not prohibit conducting a repeatability test in the field, a statement should be included to note that it is permissible to conduct a repeatability test in field.

- The SWMA S&T Committee is concerned about the difference in draft sizes for normal and special tests and repeatability tests. If an inspector conducts a normal test and suspects a problem with repeatability, the inspector is forced to obtain a different test measure/prover in order to conduct the repeatability tests. This does not seem technically logical.

Because of these concerns, the SWMA could not support the proposal as written. The SWMA believes that this item should be made a Developing item until additional input is provided.

At the 2009 NCWM Interim Meeting, the Committee heard support for this proposal from representatives of several water meter manufacturers, including George DeJarlais, Badger Meter; Andre Noel, Neptune; and Alex Watson, Elster Amco Water. In addition, Mr. DeJarlais presented letters from Ron Koch, Master Meter, Inc., and Scott Swanson, Sensus Metering Systems, supporting the proposal (see Appendix C, Written Comments Received by the Committee). Comments from the manufacturers present also indicated that failure to harmonize test draft sizes for water meter tests with current American Water Works Association (AWWA) standards will result in economic harm to U.S. water meter manufacturers. The Committee heard opposition to the proposal from Ed Williams, Director, California Division of Measurement Standards, who commented that there is no justification for increasing test drafts for type evaluation testing and that repeatability test drafts should be the same size as those for normal and special test drafts. Mr. Williams also cited a NIST WMD quarterly newsletter article on "repeatability" by Juana Williams, which described the purpose of repeatability tests, noting that while the purpose of repeatability tests and normal and slow tests are different, it is necessary to have a means for comparing the results from those tests. Juana Williams, commented on behalf of NIST WMD, that the General Code requires that a device be capable of repeating its indications, including normal and slow flow test drafts; it is technically inconsistent to require an inspector to change the size of the test draft in order to compare the results of consecutive tests run under the same conditions.

The Committee acknowledged the concerns expressed by the water meter manufacturers regarding the importance of selecting an appropriate size test draft as one means of reducing uncertainties in the test process. Based on input from the manufacturers and from some weights and measures officials, the Committee believes there may be merit to linking the test draft size to at least the quantity indicated in one revolution of the dial on a mechanical water meter as a means to reduce uncertainties. However, the Committee believes that, if the current test draft size is contributing a significant uncertainty to the test process, this concern would apply equally to all accuracy tests, not just repeatability tests. The Committee also had remaining questions about how one might define the test draft size relative to the indications on a dial, given the wide variety of indicator types in use in the marketplace.

Because members of the WWMA were not convinced at the WWMA's September 2008 meeting that the contribution of errors from the existing test draft size warranted a change in the test draft size for normal and slow flow tests, the Committee was reluctant to support the proposed change in test draft size for repeatability tests alone. The Committee heard that the California Division of Measurement Standards will be working with jurisdictions in California to collect additional data in conjunction with the Developing item on normal and special test draft sizes, and this information may provide a better indication of which proposal will be acceptable to the weights and measures community. The Committee also noted that some of the proposed changes to test draft size in this item and in a corresponding Developing item (previously designated Item 360-2, Part 4, Item 1; now Item 336-3) are larger than current AWWA standards. The Committee believes that the issue of test draft size must be considered jointly for all accuracy tests to ensure consistent application of these principles. Consequently, the Committee withdrew this item from its agenda and suggested that the idea of increased test drafts for repeatability tests be considered in conjunction with Item 336-3, N.3. Test Drafts and N.4. Testing Procedures.

336-3 I N.3. Test Drafts and N.4. Testing Procedures

Source: Southern and Western Weights and Measures Associations (SWMA and WWMA); this item originally appeared as Part 4, Item 1 on the Committee's 2009 Interim agenda.

Recommendation: The Committee is studying the following recommendation and encourages input from interested parties.

Amend requirements in paragraphs N.3. Test Drafts and N.4. Testing Procedures Section 3.36. Water Meters as follows by changing the test draft quantities of Tables N.4.1. and N.4.2. of HB 44 as follows:

N.3. Test Drafts. – ~~The normal test of a meter shall be made at the maximum discharge rate developed by the installation. Meters with maximum gallon per minute ratings higher than the values specified in Table N.4.1. Flow Rate and Draft Size for Water Meters Normal Tests may be tested up to the meter rating, with meter indications no less than those shown.~~

~~(Amended 1990, 2002, and 2003)~~

(a) Non Utility-Type Water Meters. – Test drafts should be equal to at least the amount delivered by the device in 2 minutes and in no case less than the amount delivered by the device in 1 minute at the actual maximum flow rate developed by the installation. The test draft sizes shown in Table N.4.1. Flow Rate and Draft Size for Non Utility-Type Water Meters Normal Tests, and in Table N.4.2. Flow Rate and Draft Size for Non Utility-Type Water Meters Special Tests, shall be followed as closely as possible.

(b) Utility-Type Water Meters. – The test draft sizes shown in Table N.4.X. and N.4.Y. shall be followed as closely as possible. Testing shall be done in like volumes (meters with gallon registration tested in gallon volumes, meters with cubic feet registration tested in cubic feet volumes).

Table N.4.1. Flow Rate and Draft Size for Non Utility-Type Water Meters Normal Tests			
Meter Size (inches)	**Rate of Flow (gal/min)**	**Maximum Rate**	
		Meter Indication/Test Draft	
		gal	**ft^3**
Less than 5/8	8	50	5
5/8	15	50	5
¾	25	50	5
1	40	100	10
1½	80	300	40
2	120	500	40
3	250	500	50
4	350	1000	100
6	700	1000	100

(Table Added 2003) **(Amended 201X)**

Table N.4.X. Flow Rate and Draft Size for Utility-Type Water Meters Normal Tests			
Meter Size (inches)	**Rate of Flow (gal/min)**	**Maximum Rate**	
		Meter Indication/Test Draft	
		gal	**ft^3**
Less than 5/8	**8**	**100**	**10**
5/8	**15**	**100**	**10**
5/8 x ¾	**15**	**100**	**10**
¾	**25**	**100**	**10**
1	**40**	**100**	**10**
1½	**50**	**300**	**40**
2	**100**	**500**	**40**

(Table Added 201X)

Table N.4.2. Flow Rate and Draft Size for Non Utility-Type Water Meters Special Tests						
Meter Size (inches)	Intermediate Rate			Minimum Rate		
	Rate of Flow (gal/min)	Meter Indication/Test Draft		Rate of Flow (gal/min)	Meter Indication/Test Draft	
		gal	ft^3		gal	ft^3
Less than or equal to 5/8	2	10	1	1/4	5	1
¾	3	10	1	1/2	5	1
1	4	10	1	3/4	5	1
1½	8	50	5	1½	10	1
2	15	50	5	2	10	1
3	20	50	5	4	10	1
4	40	100	10	7	50	5
6	60	100	10	12	50	5

(Table Added 2003) **(Amended 201X)**

Table N.4.Y. Flow Rate and Draft Size for Utility-Type Water Meters Special Tests						
Meter Size (inches)	Intermediate Rate			Minimum Rate		
	Rate of Flow (gal/min)	Meter Indication/Test Draft		Rate of Flow (gal/min)	Meter Indication/Test Draft	
		gal	ft^3		gal	ft^3
Less than 5/8	2	10	1	¼	10	1
5/8	2	10	1	¼	10	1
5/8 x ¾	2	10	1	¼	10	1
¾	3	10	1	½	10	1
1	4	10	1	¾	10	1
1½	8	100	10	1½	100	10
2	15	100	10	2	100	10

(Table Added 201X)

Background/Discussion: At its 2007 Annual Meeting, the SWMA received a proposal from a meter manufacturer with two options for modifying Section 3.36. as shown above. The manufacturer provided the following justification for the modification:

For proposal A: Water meter "transaction" volumes are based on billing cycles of monthly or quarterly "reads." As such, each transaction for a residential meter may be on the order of 3000 gal to 30 000 gal. Commercial/industrial accounts with larger meters may have transaction volumes that are one or two orders-of-magnitude larger than this. Meter repeatability over the course of a pattern approval test volume (currently as little as 5 gal for a residential meter, for example) is, therefore, not relevant. Utility-type water meters are not designed to provide the resolution required to meet the Section 3.36. repeatability requirements under typical test drafts.

For Proposal B: The graduations on the primary indicating element for the meter under test can normally be read within an uncertainty of roughly ⅓ of a graduation. This is the result of limits in optical discernment, minor parallax, minor asymmetries in mechanical gear trains, minor asymmetries in graduation printing, etc. Combining the meter's reading uncertainty at the start of any single test run with the uncertainty at the end of this same test run, total meter reading uncertainty is, therefore, roughly ⅔ of a graduation. Keeping in mind there are other resolution/repeatability concerns for any given test series (resolution in reading the reference volume/mass, ability to duplicate parameters such as flow rate, water temperature, water pressure, evaporative losses, etc.), the uncertainty

limitations for reading the meter under test should not "consume" more than ¼ of the total repeatability requirement. For the 1.3 % repeatability requirement at the minimum flow rate, this corresponds to a test draft equal to roughly 200 graduations of the primary element. For the 0.6 % repeatability requirement at the intermediate rate, this corresponds to a test draft equal to roughly 400 or 450 graduations of the primary element. Test draft volumes for the maximum flow rate must be even larger since these drafts must address other sources of error unique to testing at higher flow rates (for example, errors due to ramping up and ramping down the flow rates at the beginning and end of the test, which must be done slowly enough so as to not cause water hammer, or mechanical impulse loading of the meter registration device).

The SWMA also heard comments from the manufacturer that several other water meter manufacturers were having difficulty meeting HB 44 requirements for repeatability that were added in 2002. Additionally part of the problem was the determination of what constituted the smallest unit of measure for various sizes of their utility meters. The manufacturer is requesting a change to the test draft requirements and/or smallest unit of measure requirements to be more appropriate for the meters they and others manufacture. The SWMA agreed to forward the proposal to the NCWM S&T Committee for consideration.

Just prior to the 2008 NCWM Annual Meeting, the Committee received a proposal for changes to this item from Scott Swanson, with Sensus Metering Systems, on behalf of five water meter manufacturers, including Badger Meter, Inc., Elster Metering, Master Meter, Neptune Metering, and Sensus Metering. During the Committee's open hearings, the S&T Chairman notified NCWM members that copies of this information were available to interested parties and noted that a copy of the following three proposals will be included in the Committee's final report.

The five water meter manufacturers recommend that the tables in paragraph N.4. Testing Procedures be amended (as outlined in the proposal above) to address specific issues related to utility-type water meters. The three related proposals are to add subsections under paragraph N.3., change the title of Tables N.4.1. and N.4.2., and to incorporate two new tables to N.4. that speak directly to utility-type water meters.

1. The first part of this proposal is to amend paragraph N.3.

2. The second part of this proposal is to amend the titles of Table N.4.1. and Table N.4.2., changing the words "for Water Meters" to read "for Non Utility-Type Water Meters."

3. The third part of this proposal is to include in Sections N.4.1. and N.4.2. two new tables that harmonize test flow rates and draft sizes listed in Section 3.36. with that of the AWWA specification found in the AWWA M6 Manual, Table 5.3.

Note that Mr. Swanson, on behalf of the five water meter manufacturers, further suggested that the proposed changes to T.1.1. Repeatability and its associated tables that were outlined in the original recommendation be separated from this item and addressed as an independent issue. A separate proposal was submitted to reflect this suggestion.

The submitter provided the following justification for the proposed changes to paragraphs N.3., N.4., and associated tables:

Erroneous test results can be produced when agencies use inadequate test draft quantities. These erroneous test results have and are continuing to have serious financial consequences to manufacturers and distributors.

The vast majority of utility-type water meters sold in the United States are designed to comply with ANSI/AWWA meter standards. All AWWA utility-type meter designs share a common meter proving resolution of 100 scale divisions per revolution of the pointer to verify meter accuracy. All utilities use the odometer indicating device on the dial face of the meter for billing purposes. These utility-type meter designs are quite different from those used for batching-type meters.

For utility-type meters 1 in and smaller, meter registration test hands (proving indicators) have graduations with resolution down to 0.1 gal or 0.01 ft^3. For meters 1½ in and 2 in, test hands have graduations with resolution down

to 1.0 gal or 0.1 ft^3. In visually reading the test hand position relative to these graduations, resolution is limited to a range of roughly ⅓ or ½ of an individual graduation (at both the start of each test and at then at the end of each test).

As a result, a test draft equal to only 50 graduations will result in large meter reading uncertainties (cumulative uncertainty range on the order of 1.2 % or worse). Compared to the accuracy tolerances for water meters, this level of reading uncertainty is unacceptable, and larger test drafts must be used. See AWWA M6 for examples of the larger test drafts that are required, given these reading resolution limitations.

During the Committee's open hearings, Jeff Humphreys, Los Angeles County, provided a letter and some additional data to consider in conjunction with this item. This information was included in the Committee's final report and is also included in Appendix D in this report. Additionally, concerns were expressed regarding whether or not the size of the test draft for larger meters is realistic. A manufacturer of test equipment noted that the largest prover being manufactured at present is 2000 gal.

During the open hearings at the 2008 WWMA Annual Technical Conference, water meter manufacturers gave a presentation on the justification for the proposed changes which included reducing the uncertainty in testing procedures by increasing the test draft size, clarifying the values for the smallest unit of measure based on utility-type meter size, and limiting the number of graduations of the sweep hand to 100 graduations or more. Additionally, the manufacturers reiterated that the proposals are intended to align HB 44 test requirements with AWWA standards and test criteria.

The WWMA S&T Committee also reviewed the letter and test data submitted by Los Angeles County Weights and Measures about the comparison of failure rates for utility-type meters between current test of 5 gal draft size and a test draft of 20 gal for ⅝-in utility-type meters. They summarized their results as follows:

> "The enclosed information also shows that very few positive displacement meters fail tolerance tests at any of the current HB 44 flow rates. The claim has been made that the tests as currently being conducted have seriously impacted meter sales for several water meter manufacturers. Our tests show that manufacturers of positive displacement meters should not be negatively impacted by being tested at the current established flow rates."

According to the data from Los Angeles County, the average error for the 28 new meters that failed the test using the 5 gal test draft was -4.45 %, and -4.32 % for the 10 gal test draft. There was no data for repeatability in this series of data.

The WWMA S&T Committee also received two letters in support of the items from water manufacturers that were not in attendance.

The WWMA acknowledges that there is an increased potential for uncertainty with the current test draft. Manufacturers state that the test should include at least one complete revolution of the dial indicator. However, the data submitted by Los Angeles County suggested that the increase in the test draft size is not justified.

One meter manufacturer submitted test data for five new ⅝ in positive displacement meters to the Committee. Results showed that three tests out of fifteen failed the accuracy test with a 5 gal test draft size for low flow. When draft size was increased to 10 gal, all meters passed and the range of results decreased by a factor of two. When testing repeatability at low flow, two out of five failed with a 5 gal draft; none failed with a 10 gal draft. At intermediate flow, fifteen out of fifteen passed at 10 gal draft size for accuracy, and four out of five meters failed repeatability at the current 10 gal draft size.

Another meter manufacturer submitted test data for four new ⅝ in positive displacement meters. Results showed that three out of eight failed the accuracy test with a 5 gal test draft size for low flow. When draft size was increased to 10 gal, all meters passed and the range of results decreased dramatically. When testing repeatability at low flow, four out of four failed with a 5 gal draft; zero failed with a 10 gal draft. At intermediate flow, eight out of eight passed at 10 gal draft size for accuracy, and one out of four meters failed repeatability at the current 10 gal draft size.

The WWMA recommends renaming the item to "N.4. Testing Procedures." It further recommends the item be given Developing status and requests additional data from industry, California DMS, and other jurisdictions comparing test results between the current and proposed test draft sizes. Data submitted should include information on the proving methods (e.g., narrow neck prover, gravimetric, etc). Additionally, the Committee is interested in the requirements and test methods used by Measurement Canada and additional information on International Activities. It should be noted that the AWWA M-6 Manual has guidelines for accuracy testing but no guidance on repeatability.

The Committee also recommends that the proposed language for paragraph N.3. and Tables N.4.1., N.4.X., and N.4.Y. remain Developing due to insufficient test data to justify the proposed change. Additionally, the Committee recommends that the repeatability and test draft sizes in tolerance paragraph in T.1.1. and Tables T.1.1. and T.1.2. be separated as an independent item (see Committee agenda Item 336-2) since the data submitted by the California CTEP lab indicates a high failure rate with the current tests for repeatability.

At its 2008 Interim Meeting, NEWMA heard a presentation from Andre Noel, Neptune. NEWMA has limited experience testing water meters but recognizes the logic of this item. NEWMA has no position at this time.

At their fall 2008 meetings, the CWMA and SWMA heard no comments and took no position on this item.

At the 2009 NCWM Interim Meeting, the Committee heard comments from Andre Noel, Neptune, indicating that failure to harmonize test draft sizes for water meter tests with current AWWA standards will result in economic harm to U.S. water meter manufacturers. Mr. Noel also noted that AWWA standards are used by over 60 000 utilities. George DeJarlais, Badger Meter, asked the Committee to consider moving this item from Developing status to Voting and provided letters (see Appendix C, Written Comments Received by the Committee) from Ron Koch, Master Meter, and Scott Swanson, Sensus Metering Systems, voicing support for this item as well. Alex Watson, Elster Amco Water, provided similar comments of support for moving the item to a Voting status. Kurt Floren, Los Angeles County Weights and Measures, noted that the data provided by their jurisdiction indicates that two thirds of the meters tested would continue to fail even with larger test draft sizes. Thus, he believes that the increased test time to 90 minutes with the larger test draft sizes is not justified. Ed Williams, Director, California Division of Measurement Standards, indicated his jurisdiction intends to collect additional data, which could be available as early as May 2009.

Given the possibility of additional data, the Committee discussed whether or not sufficient information and justification had been provided to support moving this item from a Developing status to an Informational or Voting status. The Committee acknowledges concerns on both sides of this issue and is particularly sensitive to the reported potential for economic impact of delays to change this standard; however, the Committee did not feel elevating the status of the item to Voting was appropriate without additional support from the region that presented the item as a Developing item (the WWMA). The Committee's chief concern on this point was that the WWMA did not, as of its fall 2008 meeting, support elevating the item to either an Informational or Voting status, and its members did not agree to accept the proposed changes without additional work. While some WWMA members present at the 2009 NCWM Interim Meeting indicated support for elevating the item to a Voting status, the Committee was concerned that other WWMA members who had expressed concerns about the proposal thus far were not present at the NCWM Interim Meeting to provide comment. Because the other regional associations have essentially deferred to the WWMA's position and the WWMA's support in the event of a vote is questionable, the Committee did not feel it was appropriate to advance this item to a Voting status. However, given the possibility of additional data prior to the 2009 Annual Meeting, the Committee did agree that the item could be elevated to an Informational status; this would allow a higher degree of visibility for an issue which is of evident concern to the manufacturers without compromising the due process for issue development.

360 OTHER ITEMS

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

Many issues before the OIML, the Asian-Pacific Legal Metrology Forum (APLMF), and other international groups are within the purview of the Committee. Additional information on OIML activities will appear in the Board of Directors agenda and Interim and Final Reports and on the OIML website at http://www.oiml.org. NIST WMD staff will provide the latest updates on OIML activities during the open hearing sessions at NCWM meetings. For

more information on specific OIML-related device activities, contact the WMD staff listed in the table below. The OIML projects listed below represent only currently active projects. For additional information on other OIML device activities that involve WMD staff, please contact WMD using the information listed below:

NIST Weights and Measures Division (WMD) Contact List for International Activities	
Contact Information	**Responsibilities**
Postal Mail and Fax for All Contacts:	NIST WMD 100 Bureau Drive MS 2600 Gaithersburg, MD 20899-2600 Tel: (301) 975-4004 Fax: (301) 975-8091
Mr. John Barton (LMDG) (301) 975-4002	•R 21 "Taximeters" •R 50 "Continuous Totalizing Automatic Weighing Instruments (Belt Weighers)" •R 60 "Metrological Regulations for Load Cells" (jointly with Ken Butcher) •R 106 "Automatic Rail-weighbridges"
Mr. Kenneth Butcher (LMG) (301) 975-4859 kenneth.butcher@nist.gov	•D 1 "Elements for a Law on Metrology" •TC 3 "Metrological Control" •TC 3/SC 1 "Pattern Approval and Verification" •TC 3/SC 2 "Metrological Supervision" •TC 6 "Prepackaged Products" •R 60 "Metrological Regulations for Load Cells" (jointly with John Barton)
Mr. Steven Cook (LMDG) (301) 975-4003 steven.cook@nist.gov	•R 76 "Non-automatic Weighing Instruments"
Dr. Charles Ehrlich (ILMG) (301) 975-4834 charles.ehrlich@nist.gov	•CIML Member •B3 "OIML Certificate System for Measuring Instruments" •B6 "OIML Directives for the Technical Work" •B 10 "Framework for a Mutual Acceptance Arrangement (MAA) on OIML Type Evaluations" •TC 3/SC 5 "Expression of Uncertainty in Measurement in Legal Metrology Applications," "Guidelines for the Application of ISO/IEC 17025 to the Assessment of Laboratories Performing Type Evaluation Tests" •TC 3 "Metrological Control"
Mr. Richard Harshman (LMDG) (301) 975-8107 Richard.harshman@nist.gov	•R 51 "Automatic Catchweighing Instruments" •R 61 "Automatic Gravimetric Filling Instruments" •R 107 "Discontinuous Totalizing Automatic Weighing Instruments" (totalizing hopper weighers) •R 134 "Automatic Instruments for Weighing Road Vehicles In-Motion and Measuring Axle Loads"
Ms. Diane Lee (LMDG) (301) 975-4405 diane.lee@nist.gov	•R 59 "Moisture Meters for Cereal Grains and Oilseeds" •R 92 "Wood Moisture Meters – Verification Methods and Equipment" •R 121 "The Scale of Relative Humidity of Air Certified Against Saturated Salt Solution" •TC 17/SC 8 "Measuring Instruments for Protein Determination in Grains"

NIST Weights and Measures Division (WMD) Contact List for International Activities	
Contact Information	**Responsibilities**
Mr. Ralph Richter (ILMG) (301) 975-3997 ralph.richter@nist.gov	•R 35 "Material Measures of Length for General Use" •R 49 "Water Meters" (Cold Potable Water & Hot Water Meters) •R 71 "Fixed Storage Tanks" •R 80 "Road and Rail Tankers" •R 85 "Automatic Level Gauges for Measuring the Level of Liquid in Fixed Storage Tanks" •R 105 & R 117 "Measuring Systems for Liquids Other Than Water" (all measuring technologies) •R 118 "Testing Procedures and Test Report Format for Pattern Examination of Fuel Dispensers for Motor Vehicles" •TC 3/SC 4 "Verification Period of Utility Meters Using Sampling Inspections" •R 137 "Gas Meters" (Diaphragm, Rotary Piston, & Turbine Gas Meters) •R 140 "Measuring Systems for Gaseous Fuel" (i.e., large pipelines)
Dr. Ambler Thompson (ILMG) (301) 975-2333 ambler@nist.gov	•D 11 "General Requirements for Electronic Measuring Instruments" •D 16 "Principles of Assurance of Metrological Control" •D 19 "Pattern Evaluation and Pattern Approval" •D 20 "Initial and Subsequent Verification of Measuring Instruments and Processes" •D 27 "Initial Verification of Measuring Instruments Using the Manufacturer's Quality Management System" •R 34 "Accuracy Classes of Measuring Instruments" •R 46 "Active Electrical Energy Meters for Direct Connection of Class 2" •TC 5/SC 2 "General Requirements for Software Controlled Measuring Instruments"
Ms. Juana Williams (LMDG) (301) 975-3989 juana.williams@nist.gov	•R 81 "Dynamic Measuring Devices and Systems for Cryogenic Liquids" •R 139 "Compressed Gaseous Fuels Measuring Systems for Vehicles"

LIST OF ACRONYMS			
B	Basic Publication	LMDG	Legal Metrology Devices Group
CIML	International Committee of Legal Metrology	P	Project
D	Document	R	Recommendation
ILMG	International Legal Metrology Group	SC	Subcommittee
LMG	Laws and Metrics Group	TC	Technical Committee

The WWMA and the SWMA support these issues and the related device activities as an Informational item.

360-2 Developing Items

The NCWM established a category of items called "Developing items" as a mechanism to share information about emerging issues which have merit and are of national interest, but have not received sufficient review by all parties affected by the proposal or that may be insufficiently developed to warrant review by the Committee. The Developing items are currently under review by at least one regional association, technical committee, or organization.

Developing items are listed in Appendix A according to the specific HB 44 code section under which they fall. Periodically, proposals will be removed from the Developing item agenda without further action because the submitter recommends it be withdrawn. Any remaining proposals will be renumbered accordingly.

The Committee encourages interested parties to examine the proposals included in Appendix A and send their comments to the contact listed in each item. The Committee asks that the regional associations and NTETC sectors continue their work to develop each proposal fully. Should an association or sector decide to discontinue work on an item, the Committee asks that it be notified.

Todd Lucas, Ohio, Chairman

Brett Saum, San Luis Obispo County, California
Kristin Macey, California
Steve Giguere, Maine
Kenneth Ramsburg, Maryland

Ted Kingsbury, Measurement Canada, Technical Advisor
Steven Cook, NIST, Technical Advisor
Tina Butcher, NIST, Technical Advisor

Specifications and Tolerances Committee

Appendix A

Item 360-2: Developing Items

Part 1, Item 1 Scales: S.1.4.6. Height and Definition of Minimum Reading Distance, UR.2.10. Primary Indicating Elements Provided by the User, UR.2.11. Minimum Reading Distance and Definitions of Minimum Reading Distance and Primary Indications

Source: NTETC WS

Note: This proposal was Carryover Item 320-2 which first appeared in the Committee's 2006 agenda and again on the Committee's 2007 agenda as Item 320-4. (This item originated from the 2005 NTETC WS.) The Committee believes that although the proposal has merit there does not appear to be a consensus on the size and quality of primary indication information on devices used in direct and indirect sales transactions or an enforcement date for such requirements. Therefore, the Committee removed Item 320-4 from its agenda and made it a Developing item to allow sufficient time for the community to fully develop requirements acceptable to those affected.

At its 2008 September meeting, the NTETC Weighing Sector discussed the NTEP labs' recommended changes to the proposal along with the labs' recommendation to move forward with this proposal as a Voting item for the S&T Committee. It was noted that the CWMA and WWMA recommended that the proposal be withdrawn unless it received additional support from the industry. Measurement Canada added that they do not have the 9.5 mm requirement in their laws and regulations.

During the WS discussions, a vote to forward the NTEP labs' proposal to the S&T Committee was conducted. Seven members voted in favor and nine members voted against forwarding the NTEP labs' alternate proposal to the S&T Committee. The NIST technical advisor to the WS believes that the results of the vote indicated that there is no consensus between the NTEP labs' and device manufacturers and agreed to forward the WS discussions to the S&T Committee.

The Committee agreed to remove the Developing agenda item from Appendix A since the CWMA and WWMA recommended that the proposal be Withdrawn and that the proposal cannot be further developed due to a lack of consensus in the WS.

Part 2, Item 1 Belt-Conveyor Scale Systems: UR.3.2.(c) Maintenance; Zero Load Tests

Source: 2005 Western Weights and Measures Association (WWMA)

Recommendation: Modify UR.3.2.(c)

During the 2008 NCWM Interim Meeting, the Committee was informed that the USNWG on Belt-Conveyor Scales was going to further develop the proposal during their next meeting on February 27 - 28, 2008, in St. Louis, Missouri. During that meeting, the WG further amended the proposal as shown in the above recommendation and believes that this item is sufficiently developed to be added to the NCWM S&T Committee agenda as a Voting item. At its 2008 meeting, the WWMA agreed with the WG. The proposal can be found on the Committee's agenda as Item 321-1.

Part 2, Item 2 Belt-Conveyor Scale Systems: N.3.1.4. Check for Consistency of the Conveyor Belt Along Its Entire Length

Source: 2005 Western Weights and Measures Association (WWMA)

Recommendation: Amend NIST Handbook 44, Section 2.21. Belt Conveyor Scales (BCS) Systems Code, paragraph N.3.1.4.

During the 2008 NCWM Interim Meeting, the Committee was informed that the USNWG on Belt-Conveyor Scales was going to further develop the proposal during their next meeting on February 27 - 28, 2008, in St. Louis, Missouri. During that meeting, the WG further amended the proposal as shown in the above recommendation and believes that this item is sufficiently developed to be added to the NCWM S&T Committee agenda as a Voting item. At its 2008 meeting, the WWMA agreed with the WG. The proposal can be found on the Committee's agenda as item 321-2.

Part 3, Item 1 Vehicle-Tank Meters: T.4. Product Depletion Test

Source: Northeast Weights and Measures Association (NEWMA)

Proposal: Amend paragraph T.4. as follows:

T.4. Product Depletion Test. – The difference between the test result for any normal test and the product depletion test shall not exceed **one-half (0.5 %) percent of the volume delivered in one minute at the maximum flow rate marked on the meter. Tolerances for typical meters are** ~~**tolerance**~~ shown in Table T.4. Test drafts shall be of the same size and run at approximately the same flow rate.

[**Note:** The result of the product depletion test may fall outside of the applicable test tolerance as specified in Table 1.]

Table T.4. Tolerances for Typical Vehicle-Tank Meters on Product Depletion Tests, Except Milk Meters Refer to T.4. for meters with maximum flow rates not listed.	
Meter ~~Size~~ Maximum Flow Rate	**Maintenance and Acceptance Tolerances**
~~**Up to, but not including, 50 mm (2 in)**~~ **114 LPM (30 GPM)**	~~**1.70 L (104 in^3)[1]**~~ **0.57 L (0.15 gal) (34.6 in^3)[1]**
~~**From 50 mm (2 in) up to, but not including, 75 mm (3 in)**~~ **225 LPM (60 GPM)**	~~**2.25 L (137 in^3)[1]**~~ **1.1 L (0.30 gal) (69.3 in^3)[1]**
~~**75 mm (3 in) or larger**~~ **378 LPM (100 GPM)**	~~**3.75 L (229 in^3)[1]**~~ **1.9 L (0.5 gal) (115 in^3)[1]**
758 LPM (200 GPM)	**3.8 L (1.0 gal) (231 in^3)[1]**
[1] Based on a test volume of at least the amount specified in N.3.	

(Table Added 2005) **(Amended 201X)**

Alternative language for T.4. with larger tolerance for smaller meters.

T.4. Product Depletion Test. – The difference between the test result for any normal test and the product depletion test shall not exceed one-half (0.5 %) percent of the volume delivered in one minute at the maximum flow rate **marked on the meter for meters rated higher than 378 LPM (100 GPM), or six-tenths (0.6 %) percent of the volume delivered in one minute at the maximum flow rate marked on the meter for meters rated 378 LPM (100 GPM) or lower. Tolerances for typical meters are** ~~**tolerance**~~ shown in Table T.4. Test drafts shall be of the same size and run at approximately the same flow rate.

[**Note:** The result of the product depletion test may fall outside of the applicable test tolerance as specified in Table 1.]

Table T.4. Tolerances for Typical Vehicle-Tank Meters on Product Depletion Tests, Except Milk Meters Refer to T.4 for meters with flow rates not listed.	
Meter ~~Size~~ Maximum Flow Rate	**Maintenance and Acceptance Tolerances**
~~Up to, but not including, 50 mm (2 in)~~ **114 LPM (30 GPM)**	**~~1.70 L (104 in^3)[1]~~** **0.57 L (0.18 gal) (41.6 in^3)[1]**
~~From 50 mm (2 in) up to, but not including, 75 mm (3 in)~~ **225 LPM (60 GPM)**	**~~2.25 L (137 in^3)[1]~~** **1.1 L (0.36 gal) (83.2 in^3)[1]**
~~75 mm (3 in) or larger~~ **378 LPM (100 GPM)**	**~~3.75 L (229 in^3)[1]~~** **1.9 L (0.6 gal) (139 in^3)[1]**
758 LPM (200 GPM)	**3.8 L (1.0 gal) (231 in^3)[1]**
[1] Based on a test volume of at least the amount specified in N.3.	

(Table Added 2005) **(Amended 201X)**

Background/Discussion: This item was submitted to NEWMA at its 2008 Interim Meeting as an alternative to Item 331-1 (S.5.7. Meter Size) in 2008 Publication 16. It would base the tolerances for the product depletion test on a percentage of the maximum flow rate rather than meter size. Justification provided to NEWMA by the submitter is as follows:

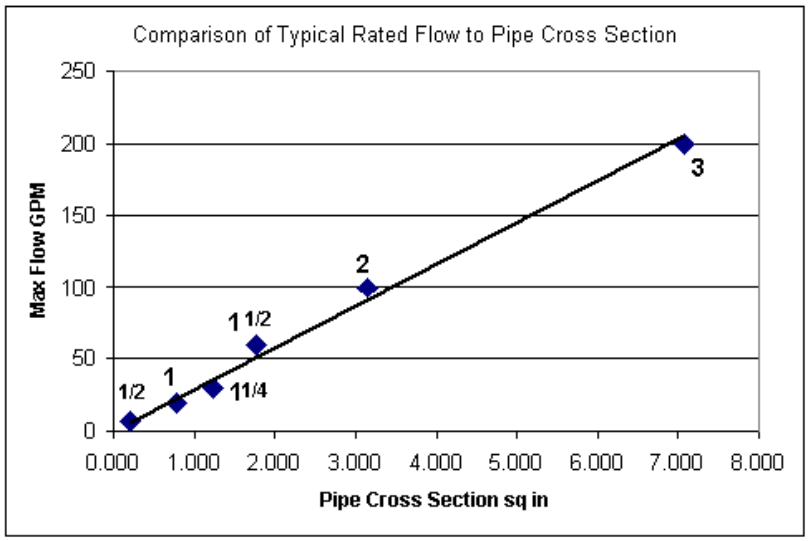
> The S&T Committee received a proposal to add new marking requirements to provide inspectors with a basis on which to assess tolerances since the meter size in inches is not currently marked on meters used in VTM systems. This solution would add a new marking requirement non-retroactively which will not solve the problem until the entire fleet of meters presently in use are replaced with new meters. This could take a very long time since VTMs can see many years of service. In addition, the compromise made when this item originally passed did not address the possibility that smaller meters, e.g., down to ¼ in could be mounted on a vehicle and thus subject to these tolerances. Allowing the smallest current tolerance (104 in^3) on a ¼-in meter delivering 2 GPM would be 22.5 % relative error for one minute of flow due to air passing through the meter. Even at 20 GPM for a 1-in meter, the relative error only drops to 2.25 %. That seems unconscionable. New York recommends going back to the 0.5 % of 1 minute of flow at the maximum rated flow rate for the meter that was part of the original proposal. The max flow rate must be marked on every meter under current HB 44 requirements and thus the inspector will have the information necessary to correctly apply the tolerance. We further recommend that the table provide tolerances for the common meter sizes which will handle most cases encountered in the field (i.e., 1¼-, 1½-, 2- and 3-inch meters with 30, 60, 100 and 200 GPM respectively).
>
> There may be concern that users will move to larger meter sizes to take advantage of the larger tolerances. We do not think that will happen since these systems cannot deliver much over 100 GPM without damaging storage tanks. In fact most systems we have seen delivering heating oil are actually delivering at less than 80 GPM. If they move to a 200 GPM, 3-inch meter, rated at 40 to 200 GPM, they will then have to meet acceptance tolerances all the way down to 60 GPM which we don't think they can do on a consistent basis. We believe the typical 2-inch system will remain the mainstay of the industry.
>
> Graphs of the relationship of typical meter ratings to pipe cross section area show that PD flow rates are clearly a function of pipe size. Any tolerance that does not reflect that relationship is fundamentally flawed in our view. For comparison, we have included a graphic comparison of the proposed tolerances.

The submitter also noted the following:

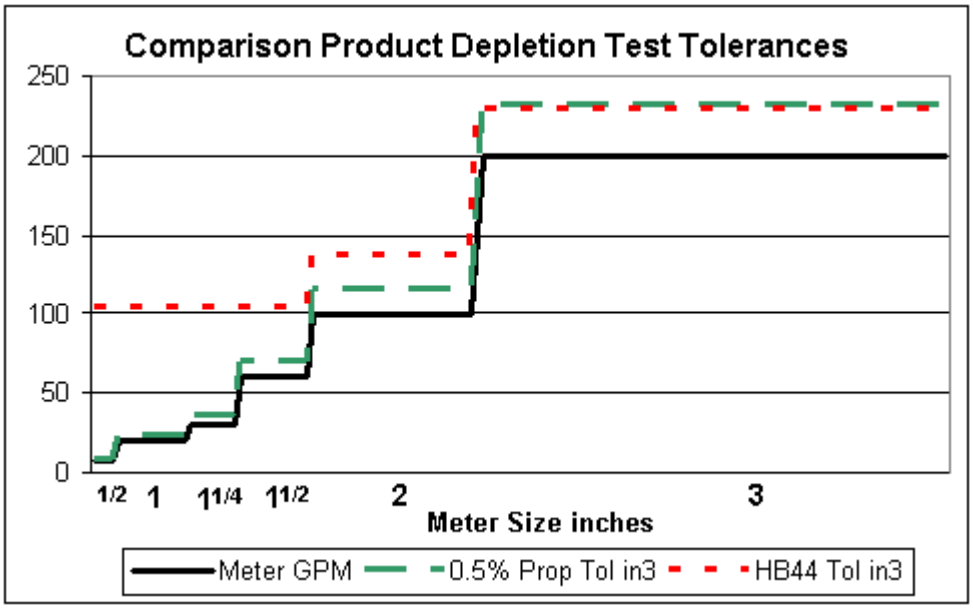
> We recognize that the tolerances proposed will reduce the tolerances for meter sizes 2 inch and under. We could support some compromise to recognize diminishing returns on smaller meters and thus allow a slightly

larger tolerance (e.g., 0.6 %) at or below 100 gpm rated flow rate. At 0.6 for a 2 inch (100 gpm) meter the tolerance would be 139 in^3, virtually identical to the existing tolerance.

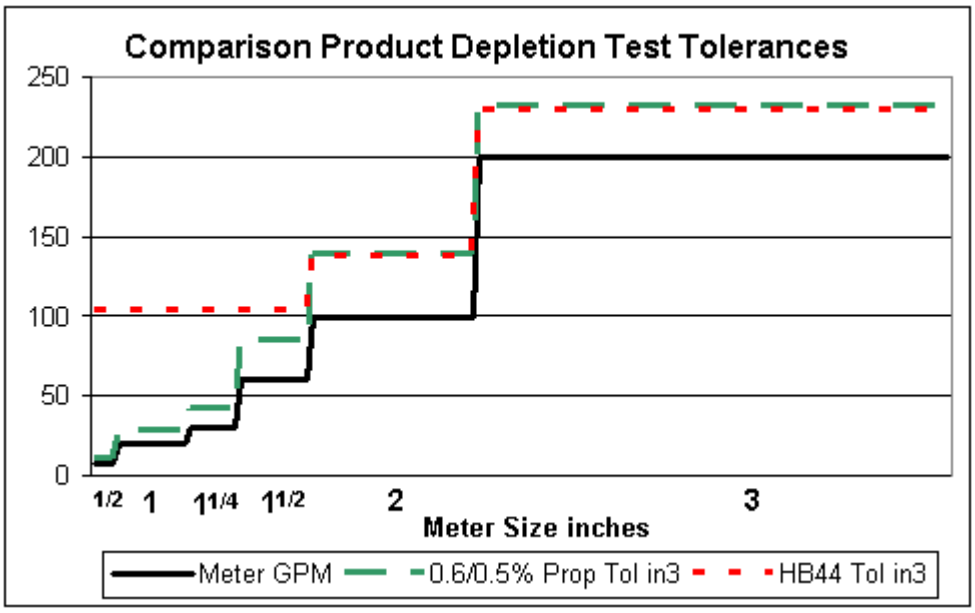
The submitter also provided the following supporting graphics:



Option 1 – 0.5 % across the board:



Option 2 – 0.6 % up to and including 100 gpm and 0.5 % thereafter:



In reviewing this item at its 2008 Interim Meeting, some NEWMA members felt that what is currently in HB 44 is sufficient and did not feel there was a problem determining meter size. Until NEWMA hears further about problems determining meter size from other states it recommends this item be made Informational.

Part 4, Item 1 Farm Milk Tanks: N.5.1. Verification of Master Metering Systems

Source: Central Weights and Measures Association (CWMA)

Recommendation: Amend paragraph N.5.1. as follows:

> **N.5.1. Verification of Master Metering Systems.** – A master metering system used to gauge a milk tank shall be verified before and after the gauging process. A master metering system used to calibrate a milk tank shall be verified before starting the calibration and reverified every quarter of the tank capacity or every 2000 L (500 gal), whichever is greater. **A master metering system capable of operating within 25 % of the applicable tolerance in T.3. Basic Tolerance Values needs only be verified before and after the gauging process.**
>
> **(Added 201X)**

Background/Discussion: The CWMA received a proposal at its fall 2008 Interim Meeting to modify paragraph N.5.1. Verification of Master Metering Systems in NIST Handbook 44 Section 4.42. Farm Milk Tanks. USDA provided data suggesting that mass flow meters currently used to test milk tanks would not have to be verified every quarter of the tank capacity, or every 2000 L (500 gal), whichever is greater. The CWMA does not have data that supports that all mass flow meters will perform to the same standard. Based on this information the CWMA recommends this proposal be Informational and is considering the proposal outlined in the recommendation above.

At its fall 2008 Interim Meeting, NEWMA recommended this proposal be Informational. NEWMA forwarded the following additional justification for the proposed change from Mr. Richard Koeberle, Federal Milk Market Administrator:

> The use of a mass flow meter has eliminated the variations seen in other types of meters used to calibrate or check farm bulk milk tanks. The reverification of the meter at every quarter of tank capacity adds time and potentially introduces errors by requiring the hose or valves to be moved before the tank is totally filled.

This proposal originated by Tom MacNish from the Cleveland Market Administrator and was presented to the CWMA in September. Mass flow meters have been used extensively in their market with excellent results.

Data submitted with this item is posted on the S&T Committee's web page on the Members Only section of the NCWM website at:

http://www.ncwm.net/members/index.cfm?fuseaction=st

Part 5, Item 1 Hydrogen: New Code: 3.3X. Draft Hydrogen Gas-Measuring Devices

Source: U.S. National Work Group for the Development of Commercial Hydrogen Measurement Standards

Recommendation: Review and comment on a DRAFT Hydrogen Gas Measuring Devices Code and modifications to relevant Appendix D – Definitions in NIST Handbook 44 (HB 44) (as outlined in the current USNWG draft found on the USNWG website at www.nist.gov/owm) to address gaseous hydrogen refueling applications.

Discussion: Currently, the U.S. National Work Group (USNWG) for the Development of Commercial Hydrogen Measurement Standards is working to draft a new Hydrogen Gas-Measuring Devices Code and add new and modify existing definitions in Appendix D of NIST Handbook 44. The work to develop the code is an ongoing effort and the USNWG will submit a final draft of the code as soon as its work is complete. The draft code and definitions address legal metrology requirements for the newly emerging hydrogen refueling technology. The USNWG believes the code has merit and wants to provide the weights and measures community with this information since 18 states now have hydrogen refueling stations in operation. The weights and measures community must have time to consider requirements for hydrogen-refueling dispensers before this application is available for public access at corner service stations. The USNWG began work on this project in October 2007, although a draft code was distributed to the community in February 2005. Version 3.1 is provided with this proposal and will receive further review at the August 2008 USNWG meeting. The USNWG is also submitting a corresponding proposal to the L&R Committee that addresses method of sale and engine fuel quality requirements for hydrogen in NIST Handbook 130 (HB 130).

At its 2008 Annual Technical Conference, the WWMA heard comments supporting the work of the USNWG. The WWMA also heard from Kristin Macey (CA DMS) that the draft code has been further amended at the recent meeting of the USNWG. The WWMA agrees that the item remain Developing.

At the 2009 NCWM Interim Meeting, the Committee heard comments from Ed Williams, Director California Division of Measurement Standards supporting this item as a Developing item. The Committee also heard from Kristin Macey, Chairman of the USNWG on Hydrogen Devices Subcommittee, who encouraged those eighteen states who have hydrogen dispensers installed in their jurisdictions to become more actively involved in the USNWG and/or provide input on the draft code. Juana Williams, USNWG technical advisor, thanked those who have participated in the work group's efforts and other NIST-DOE workshops and encouraged participation from the community. Juana also provided an updated copy of the draft code to the Committee and reminded Interim Meeting participants that current information can be found on the NIST WMD website as described below. A copy of the version ("Draft 3.3") provided to the Committee can be found on the Committee's website at: http://www.ncwm.net/members/index.cfm?fuseaction=st. Note that the USNWG is actively working on this code and posts updated drafts to their website as they are issued; therefore, readers are encouraged to consult the USNWG's website (see below) for current versions.

More information on the work by the USNWG is available on the NIST WMD website at www.nist.gov/owm under the W&M Resources link to "Developing Commercial Hydrogen Measurement Standards." To comment on this proposal, contact Juana Williams, NIST WMD, at juana.williams@nist.gov, by telephone at (301) 975-3989, by fax at (301) 975-8091 or by postal mail at NIST WMD, 100 Bureau Drive, MS 2600, Gaithersburg, MD 20899-2600.

Appendix B

Comments from the NCWM ATC Steering Committee Members Ross Andersen, Don Onwiler, and Henry Oppermann to the S&T Committee on 330-1 Temperature Compensation for Liquid-Measuring Devices Code

August 2008

COMMENT 1: The term "active" is not used consistently in all references to "automatic temperature compensation." For example, it appears in paragraph S.2.7.2., but does not appear in paragraph S.1.6.8.

> ***S.1.6.8. Recorded Representations from Devices with Temperature Compensation. – Receipts issued from devices or systems with automatic temperature compensation must include a statement that the volume of the product has been adjusted to the volume in liters at 15.56 °C for liters or the volume in gallons at 60 °F for gallons.***
> ***[Nonretroactive as of January 1, 200X]***
>
> **(Added 200X)**
>
> ***S.2.7.2. Display of Net and Gross Quantity. – A device equipped with active automatic temperature compensation shall indicate or record, both the gross (uncompensated) and net (compensated) volume for testing purposes. It is not necessary that both net and gross volume be displayed simultaneously.***
> ***[Nonretroactive as of January 1, 200X]***

Don's Comments: It is reasonable to assume that there may be devices in commerce at some point that have ATC capability, but not activated. The term "active" is used in recognition of this possibility. I suggest amending S.1.6.8. as follows to address the concern raised in this comment.

> ***S.1.6.8. Recorded Representations from Devices with Temperature Compensation. – Receipts issued from devices or systems with automatic temperature compensation activated must include a statement that the volume of the product has been adjusted to the volume in liters at 15.56 °C for liters or the volume in gallons at 60 °F for gallons.***
> ***[Nonretroactive as of January 1, 200X]***
>
> **(Added 200X)**

ATC Committee Member Feedback:

Ross's Comments: I like Don's wording of S.1.6.8. but that is not going to solve the underlying problem. This requirement is borderline between Specification and User Requirement. Note that the dispenser manufacturer usually provides two face plates where units of measure may differ, since the units are hard printed on firmware and not software selectable. NTEP simply looks at the two face plates and if they comply, the manufacturer has met the requirement. That of course does not mean the device will comply in the field. It remains up to the installer and/or the user to select the right one for their application. My recommendation would be to duplicate the requirement in the UR section, particularly since the use of ATC will be selectable. Otherwise, we are forcing the dispenser manufacturer to build in alpha displays and software control, at considerable cost. How about broadening UR.3.6.1.2. to include indications as follows?

> UR.3.6.1.2. Indications, Recorded Representations, Receipts and Bills of Lading
>
> (a) Indications of volume delivered on a device that is equipped with an active automatic temperature compensator shall be marked with a statement that the volume of the product has been adjusted to the volume in liters at 15.56 °C for liters or the volume in gallons at 60 °F for gallons.

Renumber original (a) and (b) to (b) and (c), respectively.

Henry's Comments: I suggest that we consider the language and approach used in the LPG Code and for wholesale meters in the LMD Code that already address this point. I agree with Ross that user requirements are needed to clarify this situation because RMFDs may be equipped with ATC capability, but it may not be operating in all cases. Hence, the language will have to be modified to address this situation, since both the LPG and LMD codes assume that if a meter is equipped with ATC, then it must be used. Both codes have user requirements that state, "If a device is equipped with a mechanical automatic temperature compensator, … it shall be connected, operable, and in use at all times." We may have to add the words "once used, it shall be …". For reference, in the LMD Code, see the paragraphs under S.2.7. and UR.3.6.1.; in the LPG Code see S.2.6., S.4.4., and the paragraphs under UR.2.4.

COMMENT 2: There is a reference to the accuracy requirements for the temperature sensor in paragraph S.2.7.3.; however, there is not a requirement specifying the division size of the temperature sensor.

S.2.7.3. Display of Temperature. – For test purposes, on a device equipped with active automatic temperature compensation, means shall be provided to indicate or record the temperature determined by the system sensor to an accuracy of 0.2 °F.
[Nonretroactive as of January 1, 200X]

Don's Comments: We do not put accuracy requirements in specifications. I wonder if the intent was for a resolution requirement instead of an accuracy requirement. That would make sense to me. Maybe Tina will have some S&T Committee documentation that would disclose the intent. I propose amending the paragraph as follows.

S.2.7.3. Display of Temperature. – For test purposes, on a device equipped with active automatic temperature compensation, means shall be provided to indicate or record the temperature determined by the system sensor to ~~an accuracy of~~ a resolution no greater than 0.2 °F.
[Nonretroactive as of January 1, 200X]

ATC Committee Member Feedback:

Ross's Comments: Don is right on target here. The issue is resolution of the sensor and not the accuracy. I strongly urge the S&T Committee to work on clarifying that the net/gross agreement tolerance is the HB 44 means of ensuring accuracy of the temperature sensor. I was on the S&T Committee when that requirement was added for other ATC systems and that was indeed the purpose. That decision was made on the basis of two important issues. First, verifying the accuracy of a temperature probe installed in a dispenser to accuracy better than 0.5 F is almost impossible. That's tough enough in a lab environment. Second, the temperature probe is only one part of the compensation process. By validating the outcome, we have not only verified the probe accuracy but also verified that the API gravity or CoE is correctly programmed and the software program making the correction is functioning correctly. At the Type Evaluation level this may pose some interesting problems. NTEP will have to evaluate over temperature ranges large enough to cover reasonable use. That includes Arizona and Alaska. Measurement Canada used a probe simulator to do that. The other issue is response time and personally I think this is only a minor issue. Because the system is typically pulsing 0.001 gallons for RMFDs and the system can poll the temperature system several times a second, the probe need only react reasonably fast to still maintain 0.1 % agreement gross/net.

Henry's Comments: I agree with Don and Ross; the reference should be to resolution. I agree with Ross that the sensor is part of the ATC system and should not be tested separately.

COMMENT 3: Should a corresponding reference to the accuracy requirement for the temperature sensor be included in the "Tolerances" section of the code?

Don's Comments: It is the responsibility of the inspector to determine if the system provides measurements within performance tolerances. If the device fails to do that, it may be because the temperature sensor in the

delivery system is faulty, but it is not the inspector's responsibility to determine cause of failure. By modifying S.2.7.3. as recommended above, I think this question is no longer relevant.

ATC Committee Member Feedback:

Ross's Comments: I agree 100 % with Don. The issue is moot when you change accuracy to resolution. NTEP can deal with this within the 0.1 % agreement tolerance and the specific test methods they choose.

Henry's Comments: I agree with Don and Ross.

COMMENT 4: Is there an expectation that there will be a field test of the temperature sensor? If so, there is not a corresponding test note to indicate this, nor is it clear how the test will be done in the field.

Don's Comments: I do not foresee inspectors testing the accuracy of the temperature sensor in the delivery system. If the sensor is faulty, it should be reflected in the results of the test of the measuring system.

ATC Committee Member Feedback:

Ross's Comments: See Comment 1. Inspectors should not be even thinking about verifying probe accuracy.

Henry's Comments: I agree with Don and Ross.

COMMENT 5: A user requirement is needed to specify that, if a single business offers products for sale on the basis of a temperature-compensated volume, all devices in that business shall be equipped with automatic temperature-compensating systems. [**Note:** During the Committee's work discussions, it was noted that Canada permitted a phase-in period based on product or product grades.]

Don's Comments: While this is really a method of sale issue, it may be important to provide such guidance in HB 44 as well as HB 130. All states adopt HB 44 in one form or another, but not all adopt the HB 130 Method of Sale Regulation. Still, I think it is best to let the L&R Committee agenda item make the determinations on this matter and then amend HB 44 to reflect a uniform requirement.

ATC Committee Member Feedback:

Ross's Comments: I agree that this needs to be worked out with L&R, particularly in terms of a phase-in process. I do think it is an important concern when we are looking at dispensers within the single station.

Henry's Comments: I agree with Don and Ross. A consistent approach across the country is needed. I believe that if a station uses ATC on some dispensers, it should be required to be used on all of the dispensers within the station to reduce the potential for confusion.

COMMENT 6: There is concern about using 15.56 °C rather than 15 °C. In addition to being different from use in international arenas, including Canada, the bulk of the devices in the field, including the retail motor fuel dispensers and the temperature standards used by field officials, do not have the capability to display temperature to two decimal places.

Don's Comments: When the Committee deliberated on this item, we noted three things that I believe are critical in the decision. 1) The wholesale system in the U.S. uses 60 °F. 2) Gallon provers/test measures are calibrated to 60 °F. 3) 60 °F and 15 °C are not equivalent. The difference is significant and it was necessary to carry the conversion out two decimal places to ensure clarity that 15 °C is not acceptable.

Our intent was to set the U.S. standard temperature. Our intent was not for 15.56 °C to be used. Manufacturers will use 60 °F. Including the metric equivalent is consistent with the practice implemented by NIST years ago to always do so in our model standards. I recommend we stay the course on this one and recognize 15.56 °C as the metric equivalent to the U.S. standard of 60 °F.

ATC Committee Member Feedback:

Ross's Comments: I agree with Don. The issue here is that 1 gallon at 60 °F has to equal 3.785412 liters at 15.56 °C in order to maintain the relative size of units. That will not be true if we use 15 °C for liters because the reference will be different. I believe the Steering Committee considered the enormous cost to change the entire U.S. infrastructure to a 15 °C (59 °F) reference as the alternative and found that that was not feasible.

Henry's Comments: I have to disagree with Don and Ross on this point. If the United States were using the metric system, we should and would use 15 °C. Due to the coefficients of expansion of steel and stainless steel, there is not much difference in the capacity of metal volume standards whether the reference temperature is 60 °F or 15 °C. There is a difference of 0.07 % in the volume of gasoline based upon 60 °F or 15 °C. If the volume measurement is expressed in gallons, then businesses should use 60 °F as the reference temperature. If the volume measurement is in liters, then the reference temperature should be 15 °C. I don't think that we want the United States to be out of step with the rest of the world if and when we change to the SI. This is a point on which we should get input from the manufacturers and oil companies, who routinely deal in the international market.

Ross's Counterargument: The 15 ºC vs. 60 ºF issue is going to be difficult. Henry makes some very valid points but I think misses the most important. We have a significant infrastructure that is tied to gallon units and a 60 ºF reference. I find it highly unlikely that this will change in our lifetimes. In addition, if I understand it correctly, using the 15 ºC would require anyone who wishes to change to liters at 15 ºC to deliver 0.07 % more product for the equivalent volume in gallons at 60 ºF. That is simply the physics, because 15 ºC is 0.56 ºC colder than 60 ºF. All of a sudden you have lost equivalency that 3.785412 liter = 1 gallon and replaced it with a new factor that ~3.788 liters of gasoline = 1 gallon when both are at 60 ºF (15.56 ºC). Until the U.S. is willing to change its entire infrastructure to liters and retool the equipment for a 15 ºC reference, I cannot support that move as cost beneficial in any sense. It just doesn't make any sense. Also consider that choosing the 15 ºC reference actually discourages conversion to liters since in the conversion you would be placed at a competitive disadvantage to those selling in gallons. That 0.07 % increased delivery is certainly not trivial in this large-volume business. It's more than the typical 0.05 % accuracy target at terminal meters. I like liters and don't think we should enact laws and regulations that put conversion at a competitive disadvantage. I welcome additional input from the industry on this subject and thought that we got that at the Chicago meeting before making the decisions to stay with 15.56 ºC as the reference.

COMMENT 7: Devices currently in the field may not have the capability to automatically sense when the device is or is not in the automatic temperature-compensating mode with respect to the requirement to identify volumes as "corrected" volumes on printed indications.

Don's Comments: It is my understanding that no devices have been installed in the U.S. marketplace with ATC capability. This is at least true with Gilbarco according to Gordon Johnson. Even if this is incorrect, I believe it is imperative to require this disclosure to the consumer, especially if there is a temporary or permanent permissive method of sale. I think the requirement should remain.

ATC Committee Member Feedback:

Ross's Comments: This goes back to the user requirement UR.3.6.1.2. That requirement already exists for wholesale devices and should absolutely be extended to retail. Since it is a user requirement, the manufacturer may help meet it, but third party consoles and registers are dominant in the market and thus it must remain at the user level. I am not too concerned about the manual nature of this process since it will typically not happen more than once. It will happen when the system is initially changed from gross to net. After that we should not see any further changes back to gross.

Henry's Comments: While printed receipts should (must) identify when the volume is temperature-corrected, I don't believe that it is necessary to require the dispenser or metering system to automatically detect when the ATC is operating or not. There are many meter parameters in Handbook 44 that must be selected at the time of installation. Selecting the proper message for printers with ATC operating and use is just one more metrological parameter. Neither the LPG or LMD (wholesale meter) Codes require that the operating condition

of the ATC be automatically detected for printing. We allow decals to be applied to the display panel of the dispenser, which requires a "mechanical" action. We should not require that the printer automatically detect the operating status of the ATC.

COMMENT 8: Although a corresponding paragraph already appears in Section 3.32. LPG and Anhydrous Ammonia Liquid-Measuring Devices Code, the language in paragraph UR.3.6.1.3. needs clarification.

> **UR.3.6.1.3. Temperature Determination. – Means for determining the temperature of measured liquid in an automatic temperature-compensating system shall be so designed and located that, in any "usual and customary" use of the system, the resulting indications and/or recorded representations are within applicable tolerances.**
>
> **(Added 200X)**

Don's Comments: I can only speculate that the intent was to have the thermometer well located in a position to ensure there is not a significant difference in product temperature at the thermometer well versus the metering chamber. Otherwise, the net indicated or recorded delivery may fall outside the tolerances. I agree that, whether I interpreted this correctly or not, it is poorly worded and can be improved upon – any suggestions?

ATC Committee Member Feedback:

Ross's Comments: I believe that Measurement Canada specified a fixed distance along the flow path either before or after the measuring element. The approach taken here is to leave that to the manufacturer to ensure the system can maintain compliance with tolerances. I am okay with this since the manufacturers have already dealt with it under the Canadian system and it works. I can't imagine they will use some other system here.

Henry's Comments: I don't see a need to clarify UR.3.6.1.3. Ross probably remembers as he refers to the S&T discussions in his remarks under Comment 2 that the S&T purposely chose not to specify the distance between the thermometer well and the meter temperature sensor. The device manufacturer had to pass the performance requirement on the ATC system regardless of where the thermometer well is installed. We should state this simply as a performance requirement and allow the manufacturers to decide how best to meet the requirement. Whenever possible, W&M should not tell manufacturers how to design their equipment.

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Appendix C

Water Meter Correspondence

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101 REGENCY PARKWAY
MANSFIELD, TX 76063
817-842-8000
FAX 817-842-8100

January 7, 2009

To Whom It May Concern:

Please consider this letter as recognition of Master Meter, Inc. full support for the three agenda items for consideration by the S&T Committee being presented by the water meter manufacturers led by George DeJarlais and Andre Noel. These three items are:

Item 1 - Water Meters (Sec. 3.36): V S.1.1.3 Value of the Smallest Unit labeled as

Item 336-1.

Item 2 – Amending T.1.1. (Repeatability) labeled as

Item 336-2.

Item 3 - N.3. Test Drafts and N.4. Testing Procedures labeled as

Item 360-2

Please feel free to contact me for any additional information needed at 412-847-2097 or at Cell Phone 412-551-2663.

Thank you.

Sincerely,

Ron Koch

Ron Koch
Director of Business Development
Master Meter, Inc.

SENSUS
METERING SYSTEMS

January 7, 2009

To Whom It May Concern:

A representative from Sensus Metering Systems will not be able to attend the conference, but please accept this letter giving our full support to the three agenda items being considered by the S&T Committee as presented by the water meter manufacturers led by George DeJarlais, Andre Noel and Alex Watson.

These three items are:

Item 1 - Water Meters (Sec. 3.36): V S.1.1.3 Value of the Smallest Unit labeled as Item 336-1.

Item 2 – Amending T.1.1. (Repeatability) labeled as Item 336-2.

Item 3 - N.3. Test Drafts and N.4. Testing Procedures labeled as Item 360-2.

Please feel free to contact me for any additional information at 724-430-4059 or at Cell Phone 412-576-7338.

Thank you.

Regards,

Scott Swanson
Manager, Customer Quality & Engineering Support
Sensus Metering Systems

Appendix D

Jeff Humphrey's Letter and Comments on 2008 Developing Item Part 4, Item 1 Water Meters

September 2, 2008

TO: Steven Cook, NIST, Technical Advisor
Specifications and Tolerances Committee
National Conference on Weights and Measures

FROM: Jeff Humphreys
Deputy Director – Weights and Measures Bureau

SUBJECT: S&T Committee 2008 Report, Specifically Item 360-2, Part 5, Item 3: Water Meters

This letter is intended to clarify comments made concerning water meter tolerances during the NCWM 2008 meeting open hearing regarding a proposal to amend HB 44 Section 3.36. T.1. Appendix A, Part 5, Item 3, in the S&T Committee report describes a Developing Item proposal to either eliminate HB 44 repeatability requirements, or amend HB 44 Section 3.36., Tables N.4.1. and N.4.2. by increasing test draft sizes. We believe that the results of numerous water meter tolerance tests conducted on this Department's test bench at our South Gate facility will show that the proposed increases in test draft sizes are unnecessary, and could result in substantial increases in costs to jurisdictions performing these tests.

In the "Background/Discussion" section, the proponents argue that due to uncertainties associated with reading individual graduations, additional water volume is required to be run through the meters in order to obtain a fair test of their accuracy. In order to determine the truth to this claim, especially to the tests conducted at the minimum flow rate, the Department conducted tests at both the 5 gallon test draft size, and at the 10 gallon draft size for those 5/8" meters that failed to meet tolerance at 5 gallons. The accompanying chart summarizing our tests show that substantial numbers of multi-jet water meters that failed their 5 gallon slow-flow tests continued to fail the 3 % tolerance requirement when tested again at 10 gallons.

The enclosed information also shows that very few positive displacement meters fail tolerance tests at any of the current HB 44 flow rates. The claim has been made that the tests as currently being conducted have seriously impacted meter sales for several water meter manufacturers. Our tests show that manufacturers of positive displacement meters should not be negatively impacted by being tested at the current established flow rates.

The Department has received a large number of 5/8" meters for testing over the last several years. The proposed requirement to increase test draft sizes would substantially increase the amount of time necessary to test these meters at the three flow rates (from approx. 30 minutes to approx. 90 minutes). If evidence supported the necessity to conduct these tests, the Department would certainly adopt these larger draft sizes. We believe however, that the evidence shows that larger draft sizes are unnecessary. Such tests would increase costs to the Department, and these increased costs would ultimately have to be borne by all owners of water sub-meters.

The proposal appears to be advanced by a manufacturer of multi-jet meters. Our suggestion to that manufacturer of these meters would be to look to improve the quality of their product.

KEF:RKI:JNH:jh
Enclosure

Water Meter Test Results

January 2008 - June 2008

Minimum Flow Rate (¼ GPM) – 5 Gallon vs. 10 Gallon

5/8 in Positive Displacement Meters

Minimum Rate Tolerances: 1.5 % Overregistration, 5 % Underregistration

Failure Percentages		
	5 Gallon	**10 Gallon**
Meter #1	–13.0 %	–13.0 %
Meter #2	–6.6 %	–7.1 %
Meter #3	–83.6 %	–87.7 %

("–" indicates underregistration, "+" indicates overregistration)

*All three meters failed by underregistration on both 5 gallon and 10 gallon tests.

Water Meter Test Results

January 2008 - July 2008

Minimum Flow Rate (¼ GPM) – 5 Gallon vs. 10 Gallon

5/8 in Multi-Jet Meters

Minimum Flow Rate Tolerances: 3 % Overregistration, 3 % Underregistration

*Meters #3, #9, #10, #19, #21, #22, #23, #26, and #27 failed on the 5 gallon test and passed on the 10 gallon test.

The rest of the meters failed both 5 gallon and 10 gallon tests. All meters except two (#21 and #27) were underregistering.

Failure Percentages			
"–" indicates underregistration, "+" indicates overregistration			
	Error 5 gal	**Error 10 gal**	**% Difference**
Meter #1	–3.78 %	–3.38 %	–0.40 %
Meter #2	–3.92 %	–3.30 %	–0.62 %
Meter #3	–3.06 %	–2.98 %	–0.08 %
Meter #4	–3.80 %	–3.71 %	–0.09 %
Meter #5	–3.44 %	–3.47 %	0.03 %
Meter #6	–4.28 %	–3.73 %	–0.55 %
Meter #7	–4.80 %	–4.28 %	–0.52 %
Meter #8	–5.20 %	–4.60 %	–0.60 %
Meter #9	–3.54 %	–3.00 %	–0.54 %
Meter #10	–3.30 %	–2.49 %	–0.81 %
Meter #11	–4.48 %	–3.49 %	–0.99 %
Meter #12	–3.88 %	–4.08 %	0.20 %
Meter #13	–3.32 %	–3.26 %	–0.06 %
Meter #14	–7.34 %	–5.87 %	–1.47 %
Meter #15	–4.10 %	–3.13 %	–0.97 %
Meter #16	–4.38 %	–3.61 %	–0.77 %
Meter #17	–6.34 %	–5.57 %	–0.77 %
Meter #18	–4.78 %	–4.05 %	–0.73 %
Meter #19	–3.50 %	–2.73 %	–0.77 %
Meter #20	–4.34 %	–3.65 %	–0.69 %
Meter #21	3.20 %	0.82 %	2.38 %
Meter #22	–17.40 %	–1.78 %	–15.62 %
Meter #23	–3.80 %	–2.20 %	–1.60 %
Meter #24	–10.20 %	–26.68 %	16.48 %
Meter #25	–3.68 %	–3.54 %	–0.14 %
Meter #26	–3.12 %	–0.92 %	–2.20 %
Meter #27	3.60 %	0.81 %	2.79 %
Meter #28	–7.68 %	–12.95 %	5.27 %
Average	***–4.45 %***	***–4.32 %***	***–0.14 %***
Std Dev	***0.036461744***	***0.049867807***	***0.0460693***

WATER METER TEST RESULTS: JANUARY ' 08 - JULY ' 08															
						Meters Failing Tolerances within Passed Lots					Meters Failing Tolerances within Failed Lots				
Make	**Model**	**Size**	**Lots**	**Meters Tested**	**Meters Passed**	**Min. Flow**	**Int. Flow**	**Max. Flow**	**Total Fails**	**Misc. Fails**	**Min. Flow**	**Int. Flow**	**Max. Flow**	**Total Fails**	**Misc Fails**
Arad		5/8 in	1	2	0								2	2	
Amco	C-700	5/8 in	16	183	174	9			9						
Amco	C-700	¾ in	3	22	22										
Amco	C-700	1 in	3	42	42										
Badger	RCDL 25	5/8 in	21	171	165	6			6						
Kent	C-700	5/8 in	1	2	1		1		1						
Neptune	T-10	5/8 in	65	749	655	26	9	1	42	6 mech fails		4		52	34 mech fails
Master Meter	USA 140 F	5/8 in USG HOT	51	875	765	5	4	8	19	2		11	37	91	7 NoS/N
Master Meter	MM3C	5/8 in	3	39	26									13	
Master Meter	MM4	¾ in	3	28	23				1					4	
Master Meter	MM5C	1 in USG COLD	12	337	262	5		6	53			1	21	22	
Master Meter	FAM	5/8 in USG COLD	29	575	466	3	15		21			17	1	88	
Master Meter	FAM	¾ in	1	14	3							11		11	
Performance	PPD	5/8 in	1	1	1										

PASSING RATES FOR METERS TESTED: JANUARY ' 08 - JULY ' 08														
	Arad	**Amco C-700 5/8 in**	**Amco C-700 ¾ in**	**Amco C-700 1 in**	**Badger RCDL25 5/8 in**	**Kent C-700 5/8 in**	**Neptune T-10 5/8 in**	**USA 140CF 5/8 in**	**Master Meter MM3C 5/8 in**	**Master Meter MM4 ¾ in**	**Master Meter MM5 C 1 in USG**	**Master Meter FAM 5/8 in USG**	**Master Meter FAM ¾ in**	**Perfor-mance PPD 5/8 in**
% passed of total tested for each model	0	95	100	100	96	50	87	87	67	82	78	81	21	100
Lots passed	0	13	3	3	21	1	59	27	0	2	7	14	0	1
Lots failed	1	3	0	0	0	0	6	24	3	1	5	15	1	0

(Manu A HB 44 data) 1/2/08 Summary

Accuracy and Repeatability tests

Qty 4 -- 5/8 x 3/4 PD meters (new), data from Manufacturer "A", re: HB 44, 3.36

Meter #	Draft size	Flow Rate		% Registr	% Registr	Repeatability	
1	5 gallons	1/4 gpm		99.2	99.8	0.6%	
2	5 gallons	1/4 gpm		101.4	101.0	0.6%	
3	5 gallons	1/4 gpm		101.4	98.0	3.4%	
4	5 gallons	1/4 gpm		98.4	102.8	4.4%	
			Average	100.1	100.4		**Ave**
			Std Dev	1.5	2.0	2.3%	**Repeat**

Meter #	Draft size						
1	10 gallons	1/4 gpm		99.7	100.4	0.7%	
2	10 gallons	1/4 gpm		100.8	101.0	0.2%	
3	10 gallons	1/4 gpm		99.7	100.0	0.3%	
4	10 gallons	1/4 gpm		100.4	100.2	0.2%	
			Average	100.2	100.4		**Ave**
			Std Dev	0.5	0.4	0.4%	**Repeat**

Meter #	Draft size						
1	10 gallons	2 gpm		100.5			
2	10 gallons	2 gpm		101.0			
3	10 gallons	2 gpm		100.8			
4	10 gallons	2 gpm		100.9			
			Average	100.8			
			Std Dev	0.2			

Meter #	Draft size						
1	10 gallons	10 gpm		100.5	100.6	0.10%	
2	10 gallons	10 gpm		101.0	100.7	0.30%	
3	10 gallons	10 gpm		100.8	100.6	0.20%	
4	10 gallons	10 gpm		100.9	100.5	0.40%	
			Average	100.8	100.6		**Ave**
			Std Dev	0.2	0.1	0.3%	**Repeat**

Test data results fail to meet the HB44 repeatability requirements
Test data results fail to meet the HB44 accuracy requirements
Test data results fail to meet manufacturer's internal controls for accuracy

Comments: -- a 5-gallon draft for the 1/4 gpm test results in 2-of-4 meters failing for repeatability
-- a 5-gallon draft for the 1/4 gpm test results in 1-of-8 individual tests failing for accuracy vs. HB 44 requirements (and 2 additional failures relative to manu internal controls)
-- moving to a 10-gallon draft for the 1/4 gpm test results in no such failures (but note that the repeatability range may increase if tests are done three times instead of twice)

19 Sep. '08 (0919 manu C HB 44 addition 2008)

Manufacturer "C" additional testing, new 5/8 x 7-1/2 PD meters, 0908 "68" test series
-- tested 18-19 September 2008
-- meters fitted with standard gallon registers (10-gallon test circle)
-- after purging all air, accuracy tested only at the minimum flow (low flow) rate of 1/4 gpm

Background: Water meter manufacturers contend that test drafts in Handbook 44, Section 3.36, when smaller than those in AWWA M6, are too small for standard accuracy tests. Manufacturers further contend that test drafts, even if harmonized with M6, are in some cases too small to be used in enforcing current Handbook 44 repeatability requirements of 0.6% at maximum and intermediate rates, and 1.3% at minimum rate.

-- individual test result fails to meet HB 44 accuracy tolerance limits
-- individual test result fails to meet manufacturer's internal control limits
-- range in accuracy results fails to meet HB 44 repeatability requirement

Meter Ident	Accy, 1/4 gpm x 5 gallons			3-run range	Accy, 1/4 gpm x 10 gallons			3-run range
	Run 1	Run 2	Run 3		Run 4	Run 5	Run 6	
68-a	99.80	97.42	100.23	2.81	100.00	99.89	99.56	0.44
68-b	101.01	101.26	100.59	0.67	99.60	99.79	99.76	0.19
68-c	100.41	99.26	99.79	1.15	99.40	99.29	99.56	0.27
68-d	99.62	99.79	102.20	2.58	99.80	99.79	99.56	0.24
68-e	101.39	102.77	99.82	2.95	99.40	99.99	100.06	0.66

Comments -- for the 5-gallon draft, 3-of-5 meters have repeatability ranges beyond HB 44 tolerances
-- for the 5-gallon draft, 2-of-15 individual accuracy test results fail to meet HB 44 tolerances (in addition, 4 of the remaining 13 individual tests fail to meet the manufacturer's internal control limits)
-- after switching to a 10-gallon draft, accuracy and repeatability failures were not seen

21 Jan. '08 (0121 manu C HB 44 2008)

TESTING IN SUPPORT OF PROPOSED CHANGES TO HANDBOOK 44 DRAFT SIZES, FOR JANUARY 2008 DISCUSSIONS WITH NCWM S&T COMMITTEE

Manufacturer "C" testing, new 5/8 x 7-1/2 meters, "0108" test series
-- tested 14 and 15 January 2008, engineering lab,
-- meters fitted with standard gallon registers (10-gallon test circle)

Accy, 15 gpm x 50 gallons, three runs		
Meter Ident	Summary, results of individual runs	3-run range
a	All 3 meet tolerances	0.11
b	All 3 meet tolerances	0.27
c	All 3 meet tolerances	0.07
d	All 3 meet tolerances	0.18
e	All 3 meet tolerances	0.21
	average range :	0.17

Background: Water meter manufacturers contend that test drafts in Handbook 44, Section 3.36, when smaller than those in AWWA M6, are too small for standard accuracy tests. Manufacturers further contend that test drafts, even if harmonized with M6, are in some cases too small to be used in enforcing current Handbook 44 repeatability requirements of 0.6% at maximum and intermediate rates, and 1.3% at minimum rate.

Accy, 2 gpm x 10 gallons, three runs		
Meter Ident	Summary, results of individual runs	3-run range
a	All 3 meet tolerances	0.69
b	All 3 meet tolerances	0.61
c	All 3 meet tolerances	0.31
d	All 3 meet tolerances	0.62
e	All 3 meet tolerances	0.69
	average range :	0.58

-- range in accuracy results fails to meet repeatability requirement

-- note individual results fail to meet accuracy tolerance limits

Accy, 1/4 gpm x 5 gallons, three runs		
Meter Ident	Summary, results of individual runs	3-run range
a	2 of 3 meet tolerances	1.14
b	All 3 meet tolerances	0.58
c	2 of 3 meet tolerances	2.62
d	All 3 meet tolerances	0.33
e	2 of 3 meet tolerances	1.31
	average range :	1.20

Accy, 1/4 gpm x 10 gallons, three runs	
Summary, results of individual runs	3-run range
All 3 meet tolerances	0.61
All 3 meet tolerances	1.14
All 3 meet tolerances	0.37
All 3 meet tolerances	0.57
All 3 meet tolerances	0.25
average range :	0.59

Accy, 1/4 gpm x 20 gallons, three runs	
Summary, results of individual runs	3-run range
All 3 meet tolerances	0.16
All 3 meet tolerances	0.97
All 3 meet tolerances	0.95
All 3 meet tolerances	0.65
All 3 meet tolerances	0.84
average range :	0.71

Overview:

a- In fifteen individual accuracy tests at low flow into a 5-gallon draft (five different meters), three accuracy failures were seen. When the test draft was increased to 10 gallons, no accuracy failures were seen at low flow.

b- In testing five meters for repeatability at low flow into a 5-gallon draft, two of five failed for repeatability. When the test draft was increased, repeatability failures were eliminated, and the repeatability ranges were cut in half.

c- In testing five meters for repeatability at the intermediate flow into a 10-gallon draft, four of five failed for repeatability.

(Manu D HB 44 data) **RTR 20080109112916** 1/18/2008

Repeatability Test (tested **twice** for each rate/draft combination -- additional variation expected if meters had instead been tested **three** times at each rate as per HB 44)

Qty 4 - 5/8" x 3/4" PD meters (new), data from Manufacturer "D", re: HB 44, 3.36

Meter #	Volume	Flowrate	Run #1 % Registered	Run#2 % Registered	%Repeatability
1	5 Gallons	.25 gpm	97.90	99.90	2.00
2	5 Gallons	.25 gpm	101.70	99.90	1.80
3	5 Gallons	.25 gpm	99.10	100.50	1.40
4	5 Gallons	.25 gpm	96.30	100.70	4.4
		Average	**98.75**	**100.25**	**Average**
		Std. Dev.	**2.28**	**0.41**	**2.40 Repeatability**

Meter #	Volume	Flowrate	% Registered	% Registered	Repeatability
1	10 Gallons	.25 gpm	99.30	99.60	0.30
2	10 Gallons	.25 gpm	99.40	99.00	0.40
3	10 Gallons	.25 gpm	99.20	99.40	0.20
4	10 Gallons	.25 gpm	99.20	99.20	0.00
		Average	**99.28**	**99.30**	**Average**
		Std. Dev.	**0.10**	**0.26**	**0.23 Repeatability**

Meter #	Volume	Flowrate	% Registered	% Registered	Repeatability
1	10 Gallons	2 gpm	101.50	100.70	0.8
2	10 Gallons	2 gpm	100.90	100.90	0.00
3	10 Gallons	2 gpm	100.70	101.20	0.50
4	10 Gallons	2 gpm	100.40	100.80	0.40
		Average	**100.88**	**100.90**	**Average**
		Std. Dev.	**0.46**	**0.22**	**0.42 Repeatability**

Meter #	Volume	Flowrate	% Registered	% Registered	Repeatability
1	40 Gallons	2 gpm	101.30	100.90	0.40
2	40 Gallons	2 gpm	101.20	100.80	0.40
3	40 Gallons	2 gpm	101.40	101.10	0.30
4	40 Gallons	2 gpm	101.30	100.70	0.60
		Average	**101.30**	**100.88**	**Average**
		Std. Dev.	**0.08**	**0.17**	**0.43 Repeatability**

Meter #	Volume	Flowrate	% Registered	% Registered	Repeatability
1	50 Gallon	15 gpm	100.10	100.00	0.10
2	50 Gallon	15 gpm	99.90	99.80	0.10
3	50 Gallon	15 gpm	99.80	99.70	0.10
4	50 Gallon	15 gpm	100.10	99.90	0.20
		Average	**99.98**	**99.85**	**Average**
		Std. Dev.	**0.15**	**0.13**	**0.12 Repeatability**

Meter #	Volume	Flowrate	% Registered	% Registered	Repeatability
1	100 Gallon	15 gpm	100.00	100.00	0.00
2	100 Gallon	15 gpm	99.80	99.80	0.00
3	100 Gallon	15 gpm	99.80	99.70	0.10
4	100 Gallon	15 gpm	100.00	99.90	0.10
		Average	**99.90**	**99.85**	**Average**
		Std. Dev.	**0.12**	**0.13**	**0.05 Repeatability**

-- range in accuracy results fails to meet HB 44 repeatability requirements
-- individual accurcy result fails to meet HB 44 accuracy requirements
-- individual accurcy result fails to meet manufacturer's internal controls for accuracy requirements

22 Jan. 2008 (Manu E HB 44 data)

Repeatability test data for quantity six 5/8x3/4 PD meters from Manufacturer "E"
(also, see note regarding accuracy test failures for some of the individual 5-gallon drafts at 0.25 gpm)
Meters fitted with US gallon registers
Each flow test repeated 3 times for each test draft volume.
Range calculated by subtracting the lowest accuracy from the highest accuracy for each meter

Flow rate (gpm)	15		2		0.25			
Volume (gal)	100	50	40	10	20	10	5	Meter
3-Run Range	0.05	0.08	0.37	0.75	0.20	0.90	1.30	1
	0.05	0.10	0.25	1.00	0.30	1.15	0.80	2
	0.02	0.02	0.40	1.30	0.40	1.05	1.10	3
	0.04	0.04	0.17	1.15	0.15	1.15	0.70	4
	0.04	0.04	0.52	1.35	0.30	0.90	2.70	5
	0.04	0.06	0.47	0.90	0.30	0.45	2.10	6
Average Range	0.04	0.06	0.37	1.07	0.28	0.93	1.45	

-- range in accuracy results fails to meet HB 44 repeatability requirement

-- range in accuracy results fails to meet HB 44 repeatability requirement
AND one of three individual accuracy test results fails to meet HB 44 accuracy tolerance limits

Comments:
-- for the 10-gallon draft at 2 gpm, 6-of-6 meters have repeatability ranges beyond HB 44 tolerances
-- when the 2 gpm test instead uses a 40-gallon draft, all meters comply with the HB 44 repeatability tolerances (and average repeatability range decreases by a factor of three)
-- for the 5-gallon draft at 0.25 gpm, 2-of-6 meters have repeatability ranges beyond HB 44 tolerances (and an additional meter has a repeatability range at the upper limit of HB 44 tolerances)
-- also for the 5-gallon draft at 0.25 gpm, 2-of-18 individual accuracy test results fail to meet HB 44 tolerances
-- when the 0.25 gpm test instead uses a 10-gallon draft, all individual accuracy test results meet HB 44 tolerances (and repeatability ranges decrease slightly, on average)
-- when the 0.25 gpm test instead uses a 20-gallon test draft, average repeatability ranges decrease by a factor of five, relative to 5-gallon test drafts (and by a factor of 3, relative to 10-gallon test drafts)