# Specifications and Tolerances Committee
# Interim Agenda

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Weights and Measures

Reference
Key Number

## 300 INTRODUCTION

The Specifications and Tolerances (S&T) Committee ("Committee") will address the following items at its Interim Meeting. All items are listed below in Table A by Reference Key Number. The headings and subjects apply to NIST Handbook 44, "Specifications, Tolerances, and Other Technical Requirements for Weighing and Measuring Devices." The Appendices to the Report are listed in Table B. The acronyms for organizations and technical terms used throughout the agenda are identified in a glossary in Table C. In some cases background information will be provided for an item. The fact that an item appears on the agenda does not mean that the item will be presented to the Conference for a vote. The Committee will review its agenda at the Interim Meeting and may withdraw some items, present some items for information meant for additional study, issue interpretations, or make specific recommendations for change to NIST Handbook 44 which will be presented for a vote at the Annual Meeting.

The recommendations are statements of proposals and are not necessarily those of the Committee. Suggested revisions to the handbook 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 |
| BCS | Belt-Conveyor Scales | NIST | National Institute of Standards and Technology |
| CC | Certificate of Conformance | NTEP | National Type Evaluation Program |
| CWMA | Central Weights and Measures Association | NTETC | National Type Evaluation Technical Committee |
| EPO | Examination Procedure Outline | NW&SA | National Weighing and Sampling Association |
| GS | Grain Analyzer Sector | OEM | Original Equipment Manufacturer |
| GMM | Grain Moisture Meters | Pub 14 | NCWM Publication 14 |
| GPMA | Gasoline Pump Manufacturers Association | RMFD | Retail Motor-Fuel Dispenser |
| HB 44 | NIST Handbook 44 | SI | International System of Units |
| HB 130 | NIST Handbook 130 | SMA | Scale Manufacturers Association |
| LMD | Liquid-Measuring Device | SWMA | Southern Weights and Measures Association |
| LPG | Liquefied Petroleum Gas | WG | Work Group |
| MDMD | Multiple Dimension Measuring Devices | WMD | NIST Weights and Measures Division |
| MFM | Mass Flow Meter | WS | NTETC Weighing Sector |
| MMA | Meter Manufacturers Association | WWMA | Western Weights and Measures Association |
| MS | NTETC Measuring Sector | USNWG | NIST/OIML U.S. National Working Group |
| NCWM | National Conference on Weights and Measures, Inc. | VTM | Vehicle-tank Meters |

"Handbook 44" (HB 44) means the 2008 Edition of NIST Handbook 44 "Specifications, Tolerances, and Other Technical Requirements for Weighing and Measuring Devices"

"Handbook 130" (HB 130) means the 2008 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 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. as follows:

***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.*
*[Nonretroactive as of January 1, 1990]*

~~**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 **2008**)

***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 automatically disables the access, including external and remote access, to the calibration and configuration mode, or***

***(b) The calibration and configuration adjustments, including external and remote access, are protected by an approved audit trail, and in addition:***

***- 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, 2009)***

***(Added* 200X)**

***G-S.8.~~1~~2. Multiple Weighing or Measuring Elements that Share a Common Provision for Sealing. – A change to any metrological parameter (calibration or configuration) of any weighing or measuring element shall be individually identified.***
***[Nonretroactive as of January 1, 2010]***

***Note: For devices that utilize an electronic form of sealing, in addition to the requirements in G-S.8.12., any appropriate audit trail requirements in an applicable specific device code also apply. Examples of iden***tification of a change to the metrological parameters of a weighing or measuring element include, but are not limited to**:**

(1) a broken, missing, or replaced physical seal on an individual weighing, measuring, or indicating element or active junction box;

(2) a change in a calibration factor or configuration setting for each weighing or measuring element;

(3) a display of the date of calibration or configuration event for each weighing or measuring element; or

(4) counters indicating the number of calibration and/or configuration events for each weighing or measuring element.

(Added 2007)

**G-S.8.3. Automatic or Semi-automatic Calibration Mechanism. – 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 1993)**

**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. The SWMA heard comments that manufacturers can incorporate into a device ways to indicate a device is in the calibration mode other than having an enunciator or other indication. Manufacturers also believe any changes to the requirements need to be nonretroactive. The SWMA S&T Committee agreed and modified the original proposal as shown above. The SWMA agreed to forward the modified

proposal to the NCWM S&T Committee with a recommendation that it be a Voting item on the Committee's agenda.

At the 2008 Interim Meeting, the Committee and the Meter Manufacturers Association (MMA) supported the proposal as presented. The Scale Manufacturers Association (SMA) recommended that, "The device shall provide an indication that it is in the setup mode." The Committee received a comment that as written the requirement that the device automatically exit the configuration mode after 60 minutes would not allow for a shorter timeframe.

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 make 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.

The Committee did not include the proposed time limits for devices to remain in the calibration/configuration mode because suitable times are different for different types of devices. For example, a 15 kg scale is likely to need less time to adjust than a vehicle scale or wholesale meter. The Committee is also aware of NTEP evaluation procedures that require indications and recorded representations (while in the adjustment mode) be either clearly identified as being in the calibration or configuration adjustment mode by means of words, symbols, codes, or that metrological indications cannot be interpreted as valid measurements. The Committee decided to present the amended proposal as shown in the recommendation for a vote at the Annual Meeting.

The Committee received the report of the SMA's 2008 spring meeting. The SMA supported the need for clarification of G-S.8. and stated that paragraph G-S.8.1. part (a) in the above recommendation changed the original intent of the physical security seal and the wording of part (b) could be accomplished by changing the following wording to replace the current recommendation:

> ***G-S.8.1 Access To Calibration and Configuration Adjustments. – A device shall be so designed that access to calibration and configuration mode shall be protected by an approved category 1,2, or 3 method of sealing, and shall clearly indicate to the operator when in this mode.***

The Committee agreed with comments from the CWMA, NEWMA, and the NTEP participating laboratories 2008 spring meeting reports to delete the words "category 1, 2, or 3," and add language that the device shall clearly and continuously indicate and print, if equipped with a printer, that the calibration and configuration adjustment mode is enabled or that the device shall not operate while in this mode or shall not display a usable quantity value. NEWMA

recommended that this item be made "Informational" to allow more time for the NCWM and other interested parties to review and analyze the alternate proposals from the CWMA and SMA.

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. as shown in the recommendations 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 believes 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 will submit 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, 200X)***

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 Information 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 proposal as shown in the recommendation.

At its 2008 Annual Meeting, the SWMA heard no specific recommendations for change to the proposal during its open hearings. The 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 NCWM S&T Committee may wish to consider at least incorporating interpretations and guidelines for the existing language in its reports. The Committee believes that additional work is needed before the item is ready for a vote. Consequently, the Committee is maintaining this as an Information item on its agenda.

**310-2 Appendix D – Definition of Electronic Devices, Software-Based**

**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:** Add a new definition and cross-reference term to Appendix D in HB 44 for "Electronic devices, software-based" as follows:

**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:** During the NTETC Software Sector discussion on marking requirements and G-S.1.1. Location of Identification Information, 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.

During the NTETC Software Sector discussion on marking requirements and G-S.1.1. Location of Identification Information, 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 Developmental section of the agenda and at least make it an Information item on the Committee's agenda to facilitate discussion and comment on the proposed language.

The Software Sector has indicated that it has completed its work on the item and noted that sufficient information (including specific proposed language) was included in the submission to enable action by the Committee; consequently, the Committee agreed to change the status of the item from Developmental to Informational and will forward the item to the regional weights and measures associations.

At its 2008 Annual Technical Conference, the WWMA heard comments supporting the items as Informational until other interested parties had the opportunity to provide comments. The WWMA agrees that this item move forward as an Information item.

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 Information 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.

**310-3 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/or G-S.1.1. to include the following:

| 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.

**Background/Discussion:** In 2005 the Board of Directors established a NTETC Software Sector. The tasks of the Sector are to:

- Develop a clear understanding of the use of software in today's weighing and measuring instruments.
- Develop NIST HB 44 specifications and requirements, as needed, for software incorporated into weighing and measuring devices. This may include tools for field verification, security requirements, identification, etc.
- Develop NCWM Publication 14 checklist criteria, as needed, for the evaluation of software incorporated into weighing and measuring devices, including marking, security, metrologically significant functions, etc.
- Assist in the development of training guidelines for W&M officials in verifying software as compliant to applicable requirements and traceable to an NTEP Certificate. Training aids to educate manufacturers, designers, service technicians and end users may also be considered.

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.

The Sector recommended that the recommendation to amend G-S.1. and/or G-S.1.1. be given Developmental status since additional work is needed to develop the appropriate language to amend paragraphs G-S.1. and G-S.1.1. The Sector is also interested in receiving input from the weights and measures community about this item. Working with input from the weights and measures community, the Sector plans to introduce proposed modifications to current requirements through the regional weights and measures associations and other technical committees. In the meantime, the Sector welcomes opportunities to discuss this item at regional weights and measures associations to ensure the item is adequately addressed.

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. He requested that the Committee consider moving the item from the Developmental section of the agenda and at least make it an Information item on the Committee's agenda to facilitate discussion and comment on the proposed language.

The Sector indicated that it has completed its work on the item and noted that sufficient information (including specific proposed language) was included in the submission to enable action by the Committee; 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.

WMD has reviewed that Software Sector proposal and agrees 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. As a result of the study and analysis, WMD suggests the following changes to the General Code language on Identification be considered in the further review of this item. In brief, it divides the identification and marking location requirements for all devices and separable elements manufactured prior to, and after a date adopted by the Conference. Note that WMD developed two versions of proposed Table G-S.1.a. with the only difference being that the rows and columns are reversed. If the Conference agrees with the WMD-suggested incorporation of the Sector proposal, WMD suggests that the Conference indicate a preference to the formatting of Table G-S.1.a.

**G-S.1. Identification. – <u>For 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, 200X, shall be clearly marked as specified in Table G-S.1.a. Identification and explained in the accompanying notes in Table G-S.1.b. Notes for Table G-S.1. Identification for the purposes of identification:</u>**

**For a~~A~~**ll equipment, except weights and separate parts necessary to the measurement process but not having any metrological effect **<u>and manufactured prior to January 1, 200X</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 not-built-for-purpose, software-based devices;*
*[Nonretroactive as of January 1, 1968]*

(Amended 2003)

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

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

*(d) the current software version or revision identifier for not-built-for-purpose, software- based devices;*
*[Nonretroactive as of January 1, 2004]*

(Added 2003)

*(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)

***G-S.1.1. Location of Marking Information for Not-Built-For-Purpose, Software-Based Devices. –*** *For not-built-for-purpose, software-based devices* ***manufactured prior to January 1, 200X*** *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)

**Table G-S.1.a. Identification**
**for Devices Manufactured on or after January 1, 200X**
(For applicable notes, see Table G-S.1.b.)

| 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 (5) |
| 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 (5) |
| 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. | | | |

Alternate Table G-S.1.a. with rows and columns reversed.

**Table G-S.1.a. Identification**
*(Note: same as above table with columns and rows reversed)*
**for Devices Manufactured on or after January 1, 200X**
(For applicable notes, see Table G-S.1.b.)

| **Device Type** | **Name, Initials, or Trademark of the Manufacturer or CC Holder, and Model Identification Information that Positively Identifies the Pattern or Design of the Device (1)** | **Non-repetitive Serial Number (2)** | **Software Version or Revision (3)** | **Certificate of Conformance Number or Corresponding CC Addendum (4)** |
|---|---|---|---|---|
| Type P electronic devices and separable elements | Hard Marked or Continuously Displayed | Hard Marked or Continuously Displayed | Hard Marked (5), Continuously Displayed, or by Command (operator action) (6) | Hard Marked or Continuously Displayed |
| Type U electronic devices and separable elements | Hard Marked, Continuously Displayed, or Via Menu (display) or Print Option (5) | Not Acceptable | Continuously Displayed, or Via Menu (display) or Print Option (8) | Hard Marked (7) or Continuously Displayed |
| Full mechanical devices and separable mechanical elements | Hard Marked | Hard Marked | Not Applicable | Hard Marked |
| 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. | | | | |

**Table G-S.1.b. Identification**
**Notes for Table G-S.1.a. Devices Manufactured on or after January 1, 200X**

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) 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 only dedicated for 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) Only 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.

At their September 2008 meetings the WWMA and CWMA reviewed the WMD suggested 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.

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

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, MD, 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 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 Committee is interested in comments from other organizations, including SMA on this issue. Consequently, the SWMA made this an Information item on its agenda.

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

Note: 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 "Information" 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.

**Source:** 2008 Carryover S&T Item 310-4. This item arose as a result of a proposal submitted by the CWMA. See note above.

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

**G-N.3. Verification (Testing) Standards. – Field standards used in verifying weighing and measuring devices shall comply with the most current requirements of NIST Handbook 105 Series 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).**

**(Added 200X)**

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 presented as Item 330-2 on the Committee's 2008 Interim agenda. The item was moved to Item 310-4. The Committee considered the following proposal from the CWMA to add a new paragraph N.4.6.:

**N.4.6. 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- to 15-degree angle from vertical.**

**(Added 200X)**

The CWMA noted that HB 44 does not address pour or drain times for 5 gal 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 (5 gal) 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. Service agents, as a result, 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 as follows:

**N.4.6. Verification (Testing) Standards. – Field standard provers and test measures used in verifying measuring devices shall comply with requirements of, and used in accordance with, NIST Handbook 105-3 standards (or other suitable and designated standards) and the tolerances expressed in Fundamental Considerations, paragraph 3.2. (i.e., one-third of the smallest tolerance applied).**

**(Added 200X)**

The Committee noted that the NIST 105 series handbooks are already referenced in Appendix A – Fundamental Considerations of HB 44. The Committee also noted that pour and drain times are referenced in NIST HB 112 EPOs and are referenced in NIST training materials and training presented by NIST. The Committee questioned whether a lack of uniformity in the application of Handbook 105-3 criteria is sufficient technical justification for including requirements in HB 44. However, the Committee acknowledged the concerns raised by some jurisdictions regarding the need for service companies to apply proper drain time and discussed alternative approaches to assist those jurisdictions and to emphasize the need to follow Handbook 105 series criteria.

In its review of the issue, the Committee noted that several of the weighing devices codes in HB 44 already include similar paragraphs referencing requirements for test standards. Since the application of Handbook 105 criteria is universal to all devices covered by HB 44, as referenced in the Fundamental Considerations, the Committee believes that including a paragraph in the Notes section of the General Code to reference the Handbook 105 series is more efficient than including references in each specific code. Consequently, the Committee developed a proposal to add a new paragraph G-N.3. Verification (Testing) Standards to the General Code and delete corresponding Notes paragraphs currently in the Scales Code, Automatic Bulk-Weighing Systems Code, and the Automatic Weighing Systems Code as outlined in the recommendation above. The Committee agreed to present this item for a vote.

In its spring 2008 report, the CWMA S&T Committee indicated that it heard comments that field inspectors may not carry the NIST HB 105 series. Comments were also heard that the proposed item be code specific to eliminate any confusion. The CWMA S&T Committee recommended that the item be included only in specific LMD code and not in the General Code.

In their spring 2008 report, NEWMA stated that some of the 105 series are out of date and that before this item is adopted, the series should be brought up to date. An example was made of 105-1 where OIML class F1/F2 is not recognized even though weights of that class are commonly used to test class II scales in the United States. NEWMA further stated that this should remain a Developing item while the 105 series is being updated by NIST.

The SMA stated that it supported this item at its 2008 spring meeting.

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 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 also amended the proposal to address the concerns about the term "tolerances" by changing the term to "accuracy requirements" as shown below.

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 Information 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 addition of paragraph G-N.3. will not ensure that service agents will following 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 as stated in Item 330-2.

At its 2008 Interim Meeting, the CWMA 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 words *"or other suitable and designated standards"* be removed from the current proposal. The CWMA recommends the item move forward for a vote with the following changes.

**G-N.3. Verification (Testing) Standards. – Field standards used in verifying weighing and measuring devices shall comply with the most current requirements of NIST Handbook 105 Series standards ~~(or other suitable and designated standards)~~ or the accuracy requirements expressed in Appendix A – Fundamental Considerations, Section 3. Testing Apparatus.**

**(Added 200X)**

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 Committee believes this language is necessary since there are not 105 Handbooks for every type of test standard. The Committee 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 Committee supports the item as written and recommends that it be forwarded to the NCWM S&T Committee as a Voting item.

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.

### 310-5 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 200X)**

(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 commercially used 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 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.

## 320 SCALES

### 320-1 S.2.1.6. Combined Zero-Tare ("0/T") Key, S.2.3. Value of Tare Indication and Recorded Representations, S.2.4. Preset Tare Mechanism, Appendix D – Definitions for Tare Mechanism, Gross Weight Value, Net Weight, Net Weight Value, 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:** (NOTE: This item will be considered jointly with Item 324-2.) This recommendation clarifies 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:

1. 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.
2. Modifying 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 the following definition for "tare mechanism:"

**tare mechanism.** A **tare-balancing and tare-weighing** mechanism (including a tare bar) designed for determining 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 200X)**

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 200X)**

**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 200X)**

**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 200X)**

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

**(Added 200X)**

**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 with a typical 10-key keyboard with values 0 through 9, by the pushing of a key numbered 5, the value 5 is entered as a tare value. For example, pressing the 0 then 5 key enters 0.05 as the tare value on a scale where d = 0.01.**

- **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 between 2 and 4 kg, etc.). A proportional tare is, therefore, not limited to being a percentage tare.**

**[2.20, 2.24]**

**(Added 200X)**

**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 200X)**

**tare-balancing mechanism. A tare mechanism with an indication that tare has been taken either semi-automatically 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 200X)**

**tare-weighing mechanism. A tare-balancing mechanism that stores the 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 200X)**

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

**(Added 200X)**

Delete paragraph S.2.1.6. as follows (See proposed paragraph S.2.3.6.):

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

**~~(Added 1998)~~**

Amend paragraph S.2.3. and S.2.3.1. as follows:

**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 200X**)

*[**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 200X)**

**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)

**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 200X)**

**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 200X)**

Add new paragraphs S.2.3.2. through S.2.3.8. as follows:

**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:**

**± 0.25 d for electronic weighing devices and any weighing device with an analog indication, and**

**± 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 200X)**

**S.2.3.3. 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 200X)**

**S.2.3.4. 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 200X)**

**S.2.3.5. 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 200X)**

**S.2.3.6. Combined Zero-setting and Tare-balancing Mechanisms (0/T Key). – Scales not intended to be used in direct sales to the public may be equipped with a combined zero and tare function key, provided the device is clearly marked as to how the key functions. 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.**

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

- **the indication is at zero, or at a negative net value equivalent to gross zero, and**
- **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 200X)**

**S.2.3.7. 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 200X)**

**S.2.3.8. 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 "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.**

**(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 200X)**

Add new paragraphs S.2.4., and S.2.4.1. 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.2.3.7. Consecutive Tare Operations, and**

**(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 200X)**

**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.2.3.8. Indication and Printing of Weighing Results, 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 instrument 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 200X)**

**Background/Discussion:** This 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 Tare WG recommendations to the weights and measures regional association and the NCWM S&T Committees.

At that meeting, the WS stated that the Tare WG had completed its work. The Sector agreed that most of the proposed language is currently verified in Publication 14 with G-S.2. Facilitation of Fraud, S.2.1.6. Combined Zero/Tare (0/T) Key, and S.2.3. Tare, listed as the HB 44 code references. The WG did not change any existing HB 44 tare requirements but recommended an amended definition for "tare mechanism." The Sector agreed with the WG that the proposed items for calculated weights and the identification of preset tare weights go beyond what is currently evaluated by NTEP and recommended these items be split into separate proposals on the NCWM S&T agenda.

At their fall 2007 meetings, the WWMA and SWMA heard support from the NTETC WS and SMA to put forth the new NTETC WS version of the proposal. The WWMA agreed that the additional definitions would clarify tare-related terms. It also agreed that the Tare WG's suggested changes would further harmonize NIST HB 44 with the

latest version of R 76. Therefore, the WWMA and SWMA recommended the proposal, with the additions from the Tare WG, move forward as a Voting item on the NCWM S&T Committee agenda.

At its 2007 Interim Meeting, the CWMA agreed that tare needs to be further defined in HB 44. The CWMA recommended the proposal be broken up into several parts in order to provide better clarification. The CWMA and NEWMA recommended this proposal be moved to Developmental until it can be divided into more manageable sections.

During the 2008 NCWM Interim Meeting, the Committee heard support for the intent of this item. In response to questions from the audience, the Committee clarified the term "additive tare" by providing an example of a mechanical scale with an ungraduated tare bar that does not reduce the net capacity of the scale. Additionally, the NIST Technical Advisor stated that the Tare WG did not believe that a definition for "additive tare" was needed since both subtractive tare and additive tare are described within the proposal to amend the definition of "tare mechanism." The Committee considered the recommendations from the CWMA and NEWMA to split this item into more manageable sections. However, the Committee could not find a way to effectively split the proposal since the requirements in the proposal are interrelated.

During the 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.2.3.7. 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 were 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 2.3.8.(e) includes 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).

Based on the clarifications, the Committee amended proposed paragraphs S.2.3.7. and S.2.3.8.(e) in this item. The Committee also moved the language from the originally proposed paragraph S.2.3. in its Interim agenda to paragraph S.2.3.1. to group together the language referring to scale intervals. The Committee also deleted the originally proposed subparagraphs S.2.3.9.(f) and (g). (Note: S.3.9. was renumbered to S.2.3.8. in the above proposal.) Since the language for "calculated net weights" was not fully developed or understood by the Committee, the Committee recommended that the subject of calculated net weights be submitted as a separate proposal for future consideration. Additionally, the Committee amended the proposed paragraph S.2.4.2. to remove requirements already stated in paragraph S.2.3.8. and deleted the "Note" since it addresses scales with a "0/T key" that are already marked with the statement "Not for Direct Sales" in the current HB 44 and the above proposed paragraph S.2.3.6.

At their 2008 spring meetings, the SMA, the CWMA and NEWMA, opposed this as a Voting item and recommended that the item be made Informational to allow for further development and evaluation. The rationale for this position was that the proposal was significantly amended from the language in the recommendation appearing in the 2008 Interim agenda and that there were some questions regarding with some of the definitions and how they are intended to be applied.

The CWMA also recommended that this should be split into two sections and that the Weighing Sector should consider doing a practical review of the language using one or more devices.

NEWMA also recommended that this item be posted on the NCWM website and appropriate list servers along with a summary of how this item would appear in HB 44 if adopted.

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

For additional background information, refer to the Committee's 2007 Annual Report.

At its 2008 Annual Technical Conference, the WWMA considered a request from the SMA asking the WWMA to keep this an Information 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.

The CWMA is looking forward to the presentation to be given by NIST advisors in the near future. The CWMA recommends this item remain Informational.

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 Information 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.

### 320-2 T.N.4.6. Time Dependence (Creep) for Load Cells During Type Evaluation and T.N.4.7. Creep Recovery for Load Cells During Type Evaluation

**Source:** 2008 S&T Committee

**Recommendation:** The text of the proposal will be presented at the 2008 WWMA Annual Technical Conference and added to subsequent revision of the DRAFT Interim agenda.

**Discussion:** The Committee received a "priority" request to add a proposal as a Voting item to the Committee's agenda. 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 Information 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 expects 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 Information 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.

**320-3 S.1.7. Automatic Zero-Setting Mechanism**

**Source:** 2008 NTETC Weighing Sector

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

**Add the following new paragraph 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 200X)**

**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 200X)**

**Amend HB 44 Appendix D by adding a new definition for automatic zero-setting mechanism and move the current definition for initial zero-setting mechanism as a type of zero mechanism as follows:**

**zero-setting mechanism.** Means provided to attain a zero balance indication with no load on the load-receiving element. **Five** ~~**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 200X)**

**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]

**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. 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.

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 which may lead to inconsistent 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. . ."*) could be interpreted to allow the automatic zero-setting device as described in OIML R 76. That may not be a universal interpretation.

The Sector concluded that:

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

(b) 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.

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

(d) 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 the NCWM S&T Committee and make a recommendation 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), 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. Making 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, and if the time, stability, and capacity parameters can be adjusted beyond the limitations 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 and it can only operate if it complies with motion detection requirements and its effect is no larger than 4 % on the nominal scale capacity.

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" and 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 November 1, 2008, cutoff date for submitting new items to the Committee. Therefore, the group agreed to submit the proposal to the Committee and ballot the Sector members. (Note: The ballot will also ask the Sector if it agrees with submitting a recommendation to the NTEP Committee that an existing CC may be amended upon a successful review on an application and documentation to amend an existing CC.) The results of the ballot and all comments will be summarized and forwarded to the Committee prior to the 2009 NCWM Interim Meeting.

## 321 BELT-CONVEYOR SCALE SYSTEMS

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

**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 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 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. (Amended 200X)**

**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.**

- **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.**

**(Added 200X)**

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 200X**)

- 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 200X**)

- **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 200X**)

- **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 200X**)

**Discussion:** HB 44 gives limited guidance on what to do with zero-load test results. Belt loss is not the only factor which 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.

During the 2007 NCWM Annual Meeting, the Committee heard testimony that a WG of the National Weighing and Sampling Association was working on this item and would have a recommendation for the WWMA prior to its 2007 Annual Meeting.

Participants in the WG include:

| | |
|---|---|
| Phil Carpentier, PTC Consulting, LLC | ptcarpentier@att.net |
| Paul Chase, Chase Technology, Inc. | mjc@emily.net |
| Al Page, Montana Weight and Measures | awp88bb@gmail.com |
| Peter Sirrico, Thayer Scale | psirrico@thayerscale.com |
| Bill Ripka, Thermo Ramsey | bill.ripka@thermofisher.com |

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 that interval (longer interval if the scale is stable; shorter 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 heard comments from a BCS manufacturer that the NW&SA WG version was superior to current language. However, the manufacturer stated that this item needed additional development and subsequent review by the entire NW&SA. The WWMA believed this item was not sufficiently developed and did not have a consensus from the NW&SW WG 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 is 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 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.

### 321-2 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 200X)</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. The NIST technical advisor agreed the proposal needed additional work. Therefore, the WWMA recommended this proposal be a Developing item to allow the BCS WG additional time to make modifications.

During the 2008 NCWM Interim Meeting, the Committee was informed that the USNWG on Belt-Conveyor Scales is going 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 recommends that 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.

**321-3 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]**~~

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.

**321-4 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 200X)**

**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).

**321-5 N.2. Conditions of Tests and N.2.1. Initial Verification**

**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 200X)**

**N.2.1. Initial Verification.** – A belt-conveyor scale system shall be ~~tested~~**verified with pairs of test runs** at the normal use flow rate, 35 % of the maximum rated capacity, and 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 2 pairs of test runs may be conducted at only one flow rate provided it can be established that the belt-conveyor scale operates at a single flow rate (± 5 %).**

(Added 2004) **(Amended 200X)**

**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. Additionally, WMD has received requests to provide clarification in a particular test requirement impacts the complete official verification test or individual test runs that performed during the official test. 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 need 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 (See graphs 1 and 2 in the appendix to this document). 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. In addition the wording recommended as shown above in paragraph N.2.1. serves to clarify the required number of test runs which are to be conducted at various flow rates also bringing HB 44 towards aligning with OIML R 50 Section A.9.3.1.

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.

**321-6 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**~~ **a** 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 200X**)

**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 official with regulatory authority with guidance in determining the frequency for conducting zero-load tests between official tests.

**321-7 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.

Amend N.3.1.2. and 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. **If operable, the automatic zero-setting mechanism shall not obscure any change in zero for integrators manufactured on or after January 1, 200X.**

(Added 2002) (Amended 2004 **and 200X**)

**N.3.1.34. 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 200X)**

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 200X)**

**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.

## 322 AUTOMATIC BULK-WEIGHING SYSTEMS

### 322-1 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~~Automatic** zero-tracking **and automatic zero-setting** mechanism**s ~~is~~are** prohibited.

**(Amended 200X)**

**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), 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 is 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.

# 324 AUTOMATIC WEIGHING SYSTEMS

### 324-1 S.2.1.7. Automatic Zero-Setting Mechanism

**Source:** 2008 NTETC Weighing Sector

**Recommendation:** Amend HB 44 Section 2.24. Automatic Weighing Systems by adding new paragraph S.2.1.7. 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 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 200X)**

**Background/Discussion:** At it 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 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 included Scott Davidson (Mettler-Toledo), Scott Henry (NCR), Steve Cook (NIST Technical Advisor), and Stephen Patoray (Consultant) 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 the development of this proposal.

### 324-2 S.2.2. Value of Tare Indication and Recorded Representations and S.2.3. Preset Tare Mechanism

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

**Recommendation:** (NOTE: This item will be considered jointly with Item 320-6.) This recommendation clarifies the requirements for tare by modifying paragraph S.2.2. and adding new paragraphs S.2.2.1. through S.2.2.8. and S.2.3. through S.2.3.2. 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).

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.2.2.8. 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 200X)**

**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 200X)**

**S.2.2.3. 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 200X)**

**S.2.2.4. 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 200X)**

**S.2.2.5. 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:**

**(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 200X)**

**S.2.2.6. 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.**

**(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 200X)**

**S.2.2.7. 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 200X)**

**S.2.2.8. 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 200X)**

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.2.2.7. Consecutive Tare Operations., and**

**(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.2.2.8. 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 200X)**

**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 320-6, 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 320-6 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 320-6.

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 Information status. The NIST technical advisor will develop a 1 hour 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.

# 330 LIQUID-MEASURING DEVICES

## 330-1 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 as follows:

***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.1.6.~~8~~9. Lubricant Devices, Travel of Indicator.** – The indicator shall move at least 2.5 cm (1 in) in relation to the graduations, if provided, for a delivery of 0.5 L (1 pt).

***S.2.6. Temperature Determination – ~~Wholesale Devices~~.*** *– For test purposes, means shall be provided to determine the temperature of the liquid either:*

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

*(b) immediately adjacent to the meter in the meter inlet or discharge line.*
*[Nonretroactive as of January 1, 1985]*
(Added 1984) (Amended 1986 **and 200X**)

**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**.56** °C **for liters or ~~(~~**60 °F**~~)~~ for gallons.**

***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]***

***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]***

**S.2.7.~~2~~4. Provision for Deactivating.** – On a device **or system** equipped with an automatic temperature-compensating mechanism that will indicate or record only in terms of ~~gallons~~**liters** compensated to 15**.56** °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.
(Amended 1972 **and 200X**)

**S.2.7.~~3~~5. 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 200X)**

***S.2.7.5.1. 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, 200X]***

**S.2.7.4.6. 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**.56** °C **for liters or** ~~(~~60 °F~~)~~ **for gallons.**

**(Amended 200X)**

**S.4.~~3~~4. Wholesale Devices, Discharge Rates.** – A wholesale device shall be marked to show its designed maximum and minimum discharge rates. However, the minimum discharge rate shall not exceed 20 % of the maximum discharge rate.

***S.4.45. Retail Devices.***

***S.4.45.1. Discharge Rates.*** *– On a retail device with a designed maximum discharge rate of 115 L (30 gal) per minute or greater, the maximum and minimum discharge rates shall be marked in accordance with S.4.4.2. The marked minimum discharge rate shall not exceed 20 % of the marked maximum discharge rate.*
*[Nonretroactive as of January 1, 1985]*
(Added 1984) (Amended 2003)

Example: With a marked maximum discharge rate of 230 L/min (60 gal/min), the marked minimum discharge rate shall be 45 L/min (12 gal/min) or less (e.g., 40 L/min (10 gal/min) is acceptable). A marked minimum discharge rate greater than 45 L/min (12 gal/min) (e.g., 60 L/min (15 gal/min) is not acceptable.

***S.4.45.2. Location of Marking Information; Retail Motor-Fuel Dispensers.*** *– The marking information required in the General Code, paragraph G-S.1. Identification shall appear as follows:*

**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**.56** °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 200X**)

**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 200X**)

**UR.3.6. Temperature Compensation.**

**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 200X**)

**UR.3.6.1.2. 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**.56** °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 200X)**

**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)**

**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 15.56 °C or the U.S. gallon of 231 $in^3$ at 60 °F.**

**(Added 200X)**

**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 this proposal to provide design and 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 L&R-proposed language would permit the temperature-compensated sale of petroleum products at all levels of distribution.

At the 2007 Interim Meeting, the L&R Committee moved forward with a Method of Sale proposal containing permissive language for retail sales of petroleum products using automatic temperature compensation (see L&R Item 232-1). Although the Committee recognized this S&T item was still not fully developed, it felt it could resolve the remaining issues in time for the NCWM Annual Meeting in July 2007; therefore, the Committee unanimously voted to make this item a "priority" Voting item as described in Section H of the Introduction of HB 44. It did this because it felt strongly that, if the L&R item passed, it was very important for there to be a corresponding S&T item that provided HB 44 guidance as described above. Following the Committee vote, the Committee chairman went before the NCWM Board of Directors (BOD) for their input. The BOD instructed the Committee to make this an Information item. Irrespective of the concerns about the timing of adoption of language in HB 130, the Committee, after further deliberation, concurred with the BOD and added the proposal to its agenda as an Information item. The BOD further informed the Committee of its plan to form a steering committee to provide guidance and give support to both the S&T and L&R Committees on temperature compensation issues. The Committee noted that it looked forward to working with the steering committee on this important issue.

This item is still in development. Some of the items the Committee is currently working on are outlined below:

**Recorded Representations (S.1.6.7.):** What, if any, abbreviations are acceptable for devices equipped with ATC (e.g., gal at 60 ºF)?

**API Gravity:** How should the API gravity be entered in the device and what API gravity should the inspector use during a test? Should an average API gravity be used (national or state)? The Committee will work on gathering API data in order to resolve this issue.

**Difference between Net and Gross (T.4.):** Is the current tolerance of 0.1 % (electronic) appropriate for field-testing of retail devices with ATC? Will maintaining our current tolerances mean taking extra drafts to obtain a stable temperature? The Committee will work on gathering data concerning temperature measurement.

The Committee will continue work on this item and will seek input from the regions and other interested parties in the weights and measures community.

At its 2007 Annual Meeting, the WWMA did not receive any opposition or comments relating to the technical requirements in this proposal and, therefore, it supported the proposal as a Voting item. However, the WWMA recommended that the NCWM S&T Committee consider adopting the ATC Steering Committee recommendation to use the U.S. reference temperature of 60 °F and direct conversion to SI units (15.56 °C). The WWMA S&T Committee noted that the 15 °C SI equivalent was already used in NIST Handbook 44 and that the reference temperature should be used consistently throughout the HB 44 where appropriate.

At its 2007 Interim Meeting, the CWMA S&T Committee received comments concerning the availability of API tables for SI units. The CWMA recognized that 15.56 °C is the exact conversion for 60 °F. While, the CWMA agreed with the ATC Steering Committee that 60 °F should be the reference temperature in HB 44 for dispensers measuring in gallons, the CWMA believed that 15 °C should be the reference temperature for dispensers measuring in liters since it is the international standard and is referenced in other sections of HB 44.

The CWMA recommended this item remain Informational while further information becomes available from the ATC Steering Committee and L&R Committee.

At its 2007 Interim Meeting, NEWMA received a proposal from the State of New York to add proving equations to Handbook 44 based on equations found in OIML R 120 Section 4.7. Calculation of meter error and forwarded it to the NCWM S&T Committee for consideration.

At its 2007 Annual Meeting, the SWMA received a comment from an official that a dispenser should not print a statement that the volume of the product has been adjusted to the volume in liters at 15 ºC or the volume in gallons at 60 ºF when ATC is not activated. The official also believed the allowance for a record of action in proposed S.2.7.5. should be performed automatically by the device and recorded in the audit trail. A manufacturer stated that the print statement currently comes from information provided by the inside control console, not from the dispenser. The SWMA S&T Committee agreed to forward the comments to the NCWM S&T Committee for consideration.

At the 2008 Interim Meeting, the Committee received comments that the proposed paragraphs S.2.7.2., S.2.7.3., S.4.3., and UR.3.6.4. should be modified to apply only to devices with an active temperature compensation feature along with a recommendation that the word "should" in the last sentence in N.5. relating to the use of petroleum measurement tables be changed to "shall." The Committee also heard that based on the recommendation of the Automatic Temperature Compensation Steering Committee, the reference to 15 °C should be change to 15.56 °C where appropriate throughout the proposal. The Committee agreed with all the comments and modified the proposal as shown above.

The Committee further heard that Handbook 44 was not the appropriate place to add the proving equations based on OIML R 120 Section 4.7. as recommended in a proposal submitted by NEWMA. The statement of scope in OIML R 120 states that the document specifies the characteristics of standard capacity measures and describes the methods by which measuring systems for liquids other than water are tested in order to verify that they comply with the relevant metrological requirements in OIML R 117 Measuring systems for liquids other than water. The sections of R 120 relevant to characteristics of standard capacity measures are more similar to the requirements in NIST Handbook 105-3. The sections of R 120 relating to test methods more resemble the recommendations for various devices in NIST Handbook 112 Examination Procedure Outlines for Commercial Weighing and Measuring Devices. The Committee also agreed that Handbook 44 was not the place to include the proving equations noting that no other metering codes in the handbook had similar equations and they had not been seen as necessary in the past. The committee believes that a more appropriate place for proving equations would be in the appropriate Examination Procedure Outline (EPO) in NIST Handbook 112. If NEWMA believes that proving equations will substantially benefit weights and measures officials it will consider recommending that they be added as an example of one method for determining meter error in the appropriate EPOs. The Committee also heard a request from an official to move the item forward in order to provide a mechanism for evaluation of dispensers with ATC. The official believed that ATC dispensers will be installed in their jurisdiction in the near future.

The Committee acknowledged the need for uniform technical criteria for devices equipped with ATC, particularly in jurisdictions where this equipment is or soon will be installed. With the changes made by the Committee in the recommendation above, the Committee believes the proposal is substantially complete. Consequently, after considerable deliberations at the 2008 Interim Meeting the Committee agreed to designate 310-1 as a Voting item on its agenda for the 2008 Annual Meeting. A key factor in reaching this decision is the Conference policy that allows for an item listed as a Voting item on the agenda in Publication 16 to be changed to a lesser status of Informational, but does not allow an Information item to be moved up to voting status unless the Conference agrees that the item meets the criteria to be considered an emergency issue. The process would still allow minor changes to be made to the recommendation based on input received between the Interim and the Annual Meetings.

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 this 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 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 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 EPO's 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 asks 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 Laws and Regulations 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 Information.

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 CA 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 report 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 CA 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 developmental 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 developmental.

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.

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

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 Information 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. See Item 310-4 for the Committee's original recommendation and background information and the outcome of that discussion.

**Source:** 2008 Carryover Item 330-2. This item originated from the CWMA and first appeared on the Committee's 2008 agenda. See also Note above.

**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. Field Standards. – Field standards shall be certified to meet the accuracy requirements of NIST Handbook 105 Specifications and Tolerances for Reference Standards and Field Standard Weights and Measures, 3. Specifications and Tolerances for Graduated Neck Type Volumetric Field Standards.**

**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 200X)**

**Background/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. Therefore, the Committee agreed that language originally submitted by the CWMA be reinstated in the Committee's report as an Information item for the Liquid-Measuring Devices Code according to the General Conference Information, Item Categories in Publication 16 page Gen-2.

The Committee also heard comments during the 2008 Annual Meeting 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.6.6.1. 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.6.6.2. 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 EPO's. 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.

### 330-3 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 200X)**

***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 200X**)

***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**

**(Added 200X)**

(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**

**(Added 200X)**

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

**(Added 200X)**

(Amended 1972, 1983, 1987, 1989, 1992, ~~and~~ 1993**, and 200X**)

**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 200X)***

**UR.3.4. Printed Receipt. – Except for *purchases conducted under UR.3.3 (c) *see note below, ~~T~~t**he 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 200X**)

**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-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.

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.

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 Developmental 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.
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 further and that WG will meet during the 2008 Annual Meeting. 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 national work group has not yet met in 2008. 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, and 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 that group. Because of the ongoing efforts to develop this item, the SWMA agrees that this item should remain an Information item and encourages people to study the proposal that has been presented thus far.

**330-4 T.5. Predominance - Retail Motor-Fuel Devices**

**Source:** Central Weights and Measures Association (CWMA); This item appeared on the Committee's 2008 agenda as Developmental 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 Information 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 that 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 3.30. T.5. Predominance 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 the 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, the 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 (developmental) issue during its 2008 Annual Technical Conference open hearings. The WWMA made no changes to the proposal and recommends the item remain developmental.

## 331 VEHICLE-TANK METERS

### 331-1 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 200X)**

**Background/Discussion:** For more than 13 years, Alaska has been testing mechanical and electronic temperature-compensating vehicle-tank meters ranging in flow rates 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 this amount, there is a risk these problems will be missed.

The following example illustrates the point using:

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 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.

The WWMA recommends that this proposal move forward as a Voting item on the NCWM S&T Committee agenda.

At its 2007 Interim Meeting, the CWMA commented that tightening the tolerance was premature without additional input from other jurisdictions and manufacturers to see how or if this would affect devices currently in the field. Therefore, the CWMA requested that data to support or oppose this item be gathered from additional jurisdictions.

At the 2008 Interim Meeting, the 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 that more information is needed before moving the item forward and, consequently, made 331-2 an Information item on its 2008 agenda.

In their spring 2008 meeting reports, CWMA and NEWMA stated that there is not enough data to support the proposed changes in tolerance and recommended that the item remains an Information item. WMD submitted comments supporting the collection of additional data, and also 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 that 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 to 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. If no additional information is received before the Interim Meeting, the WWMA recommends this item be changed to voting by the NCWM Committee.

At its 2008 Interim Meeting, the CWMA recommended waiting for more information to be submitted before the NCWM Interim Meeting in January 2009. If no more information is received the CWMA recommends the item be moved forward as a Voting item.

At its 2008 Interim Meeting, NEWMA recommended making this item Informational while waiting for more information.

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 Information 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.

### 331-2 UR.2.5. Automatic Temperature Compensation for Refined Petroleum Products

**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.2.5.2.1. 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 shall be dispensed on the basis of temperature-compensated volume.**

**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.

These two proposals will help to eliminate the potential for facilitation of fraud with ATC. The proposals also will help to eliminate consumer confusion regarding why certain products are currently sold using ATC and others are not.

At its 2007 Annual Meeting, the SWMA received the proposal shown above and recommended it move forward as a Voting item on the NCWM S&T Committee agenda.

Based on comments received at the 2008 Interim Meeting, that the proposal should only apply to fuel products and to VTMs, the Committee modified the proposal and agreed to present it for a vote at the 2008 NCWM Annual Meeting.

In its spring 2008 meeting report, the CWMA S&T Committee stated that it heard comments that there may be problems with uniformity over buyer and seller agreements at the retail level. The CWMA S&T Committee recommended that the item be moved back to an Informational status for further clarification.

In its spring 2008 meeting report, NEWMA reported that it initially supported this item, but after hearing comments raised by the CWMA regarding written agreements; it re-considered its position and proposed that the item be moved back to an Information item. NEWMA members commented that unscrupulous companies could have customers unwittingly sign contracts agreeing to gross or net deliveries to their disadvantage. Some members suggested that maybe the written agreement language should be removed altogether. NEWMA did not have a solution to this problem but recognized how this could be misused.

NIST WMD noted that the numbering of the proposed paragraphs needs to be reviewed and the paragraphs reorganized within the code before proceeding with this item.

The Committee heard concerns regarding the proposed UR.2.5.2.1. from the CWMA and NEWMA and during its open hearings at the 2008 NCWM Annual Meeting. While an identical paragraph is presently included in the Liquid-Measuring Devices Code, its use has been limited to wholesale applications where the buyer and the seller are well educated regarding the use of temperature compensation. There are concerns that this paragraph is not appropriate for the Vehicle-Tank Meters Code since this applies to retail applications where the buyer may not fully understand or appreciate the significance of temperature compensated deliveries and may not notice references to the basis for the sale in any delivery contract or understand the significance of the references. There is particular concern that a seller could include a time period shorter than a 12-month period in a contract and that the timeframe could include a time period where the use of temperature compensation is most advantageous to the business. Comments suggested that the Committee delay proposing this item for a vote until the language can be more carefully studied.

Based on the comments received, the Committee decided to change the status of this item from Voting to Information.

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 National S&T Committee at the 2008 NCWM, 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 vehicle tank meters 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" be inserted after the words "offered for sale…" in UR.2.5.2.2. Condition of Use.

The CWMA recommends 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 Information item on its agenda.

## 336 WATER METERS

### 336-1 S.1.1.3. Value of Smallest Unit

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

**Proposal:** Harmonize HB 44 value of the smallest unit requirements and indicator specifications with 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**),

**(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.**

**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.

Utility-type water meters 1 in and smaller have 10 gal test circles with 100 graduations (i.e., 0.1 gal increments). Utility meters 1½ in through 3 in have 100 gal test circles with 100 graduations (i.e., 1 gal increments), and utility meters 4 in and larger have 1000 gal test circles with 100 graduations (i.e., 10 gal increments). See comparable registration details for 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 than 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 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 than 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 the Vapor Meter 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 developmental until additional support is heard.

**336-2 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<br>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<br>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 Developmental Item Part 4, Item 1, 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 Developmental 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 manufactures 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, this results in meter designs sharing common meter reading resolution. These designs are quite different than those used for batching-type meters.
>
> For utility-type meters 1 inch and smaller, meter registration test hands (proving indicators) have graduations with resolution down to 0.1 gallon or 0.01 cubic feet. For meters 1½ inch and 2 inch, test hands have graduations with resolution down to 1.0 gallon or 0.1 cubic feet. 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 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 Developmental item until additional input is provided.

See also Developing item Part 4, Item 1 Water Meters, N.3. Test Drafts and N.4. Testing Procedures.

# 360 OTHER ITEMS

### 360-1 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)<br>Contact List for International Activities | |
|---|---|
| **Contact Information** | **Responsibilities** |
| **Postal Mail and Fax for All Contacts:** | NIST WMD<br>100 Bureau Drive MS 2600<br>Gaithersburg, MD 20899-2600<br>Tel: (301) 975-4004 Fax: (301) 975-8091 |
| Mr. John Barton (LMDG)<br>(301) 975-4002 | •R 21 "Taximeters"<br>•R 50 "Continuous Totalizing Automatic Weighing Instruments (Belt Weighers)"<br>•R 106 "Automatic Rail-weighbridges" |
| Mr. Kenneth Butcher (LMG)<br>(301) 975-4859<br>kenneth.butcher@nist.gov | •D 1 "Elements for a Law on Metrology"<br>•TC 3 "Metrological Control"<br>•TC 3/SC 1 "Pattern Approval and Verification"<br>•TC 3/SC 2 "Metrological Supervision"<br>•TC 6 "Prepackaged Products" |
| Mr. Steven Cook (LMDG)<br>(301) 975-4003<br>steven.cook@nist.gov | •R 60 "Metrological Regulations for Load Cells"<br>•R 76 "Non-automatic Weighing Instruments" |
| Dr. Charles Ehrlich (ILMG)<br>(301) 975-4834<br>charles.ehrlich@nist.gov | •CIML Member<br>•B3 OIML Certificate System for Measuring Instruments<br>•B 10 "Framework for a Mutual Acceptance Arrangement (MAA) on OIML Type Evaluations"<br>•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," & "OIML Procedures for Review of Laboratories to Enable Mutual Acceptance of Test Results and OIML Certificates of Conformity"<br>•TC 3 "Metrological Control" |
| Mr. Richard Harshman (LMDG)<br>(301) 975-8107<br>Richard.harshman@nist.gov | •R 51 "Automatic Catchweighing Instruments"<br>•R 61 "Automatic Gravimetric Filling Instruments"<br>•R 107 "Discontinuous Totalizing Automatic Weighing Instruments" (totalizing hopper weighers)<br>•R 134 "Automatic Instruments for Weighing Road Vehicles In-Motion and Measuring Axle Loads" |
| Ms. Diane Lee (LMDG)<br>(301) 975-4405<br>diane.lee@nist.gov | •R 59 "Moisture Meters for Cereal Grains and Oilseeds"<br>•R 92 "Wood Moisture Meters - Verification Methods and Equipment"<br>•R 121 "The Scale of Relative Humidity of Air Certified Against Saturated Salt Solution"<br>•TC 17/SC 8 "Measuring Instruments for Protein Determination in Grains" |

| NIST Weights and Measures Division (WMD)<br>Contact List for International Activities | |
|---|---|
| **Contact Information** | **Responsibilities** |
| Mr. Ralph Richter (ILMG)<br>(301) 975-3997<br>ralph.richter@nist.gov | •R 35 "Material Measures of Length for General Use"<br>•R 49 "Water Meters" (Cold Potable Water & Hot Water Meters)<br>•R 71 "Fixed Storage Tanks"<br>•R 80 "Road and Rail Tankers"<br>•R 85 "Automatic Level Gauges for Measuring the Level of Liquid in Fixed Storage Tanks"<br>•R 105 & R 117 "Measuring Systems for Liquids Other Than Water" (all measuring technologies)<br>•R 118 "Testing Procedures and Test Report Format for Pattern Examination of Fuel Dispensers for Motor Vehicles"<br>•TC 3/SC 4 "Verification Period of Utility Meters Using Sampling Inspections"<br>•R 137 "Gas Meters" (Diaphragm, Rotary Piston, & Turbine Gas Meters)<br>•R 140 "Measuring Systems for Gaseous Fuel" (i.e., large pipelines) |
| Dr. Ambler Thompson<br>(ILMG)<br>(301) 975-2333<br>ambler@nist.gov | •D 16 "Principles of Assurance of Metrological Control"<br>•D 19 "Pattern Evaluation and Pattern Approval"<br>•D 20 "Initial and Subsequent Verification of Measuring Instruments and Processes"<br>•D 27 "Initial Verification of Measuring Instruments Using the Manufacturer's Quality Management System"<br>•R 34 "Accuracy Classes of Measuring Instruments"<br>•R 46 "Active Electrical Energy Meters for Direct Connection of Class 2"<br>•TC 5/SC 2 "General Requirements for Software Controlled Measuring Instruments" |
| Ms. Juana Williams<br>(LMDG)<br>(301) 975-3989<br>juana.williams@nist.gov | •R 81 "Dynamic Measuring Devices and Systems for Cryogenic Liquids"<br>•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 Information 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 it is recommended by 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

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# 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.

**Recommendation:** Add new paragraphs S.1.4.6., UR.2.10., and UR.2.11. to the Scales Code as follows:

**S.1.4. Indicators.**

***S.1.4.6. Height. – All primary indications shall be indicated clearly and simultaneously.***

***(a) On digital devices that display primary indications during direct sales to the customer, the numerical figures displayed to the customer shall be at least 9.5 mm (0.4 in) high.***

***(b) The units of mass and other descriptive markings or indications, such as lb, kg, gross, tare, net, etc., shall be clearly and easily read and shall be at least 2 mm (0.08 in) high.***

***[Nonretroactive as of January 1, 200X]***

***(Added 200X)***

**UR.2. Installation Requirements.**

**UR.2.10. Primary Indicating Elements Provided by the User. – Primary indicating elements that are not the same as the primary indicating elements provided by the original equipment manufacturer (e.g., video display monitors) shall comply with the following:**

**(a) On digital devices that display primary indications during direct sales to the customer, the numerical figures displayed to the customer shall be at least 9.5 mm (0.4 in) high.**

**(b) The units of mass and other descriptive information, such as gross, tare, net, etc., shall be displayed or marked on the device and shall be at least 2 mm (0.08 in) high.**

**(Added 200X)**

**UR.2.11. Minimum Reading Distance – On digital devices that display primary indications, the height of the numbers expressed in millimeters should be not less than three times the minimum reading distance expressed in meters, without being less than 2 mm (0.08 in). (Example: If the height of the primary indications is 10 mm, then the minimum reading distance should not be greater than 30 m).**

**(Added 200X)**

Add new definitions of "minimum reading distance" and "primary indications" to Appendix D as follows:

**minimum reading distance. The shortest distance that an observer is freely able to approach the indicating device to take a reading under normal conditions of use. This approach is considered to be free for the observer if there is a clear space of at least 0.8 m in front of the indicating device. However, if the minimum reading distance "S" in Figure X below is less than 0.8 m, then the minimum reading distance is "L" in Figure X. [2.20]**

**(Added 200X)**

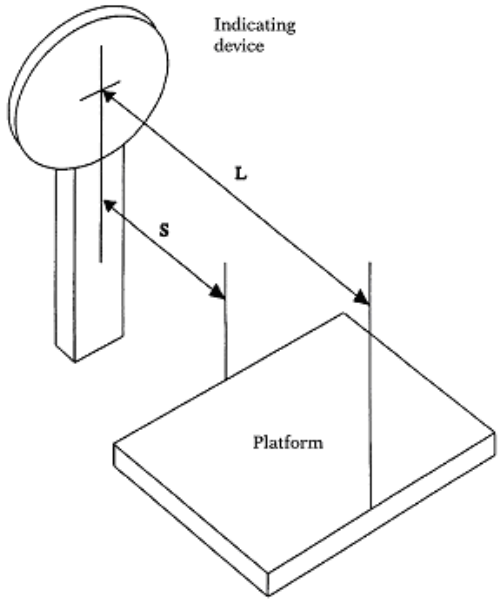



**Figure X**

**primary indications. Weight or other units of measurement values displayed by a primary indicating element. The primary indications are used as the determining factor in arriving at the sale representation when the device is used commercially. (Examples of primary indications include the measurement value, unit price or count, and total price on instruments capable of price computing. Primary indications do not include indications from auxiliary indicating devices such as totalizing registers and pre-determined stop mechanisms.) [1.10, 2.20]**

**(Added 200X)**

This proposal was developed to address a growing problem with the readability of weight indications and the values that define transaction information. Field and laboratory officials indicate both are becoming increasingly smaller, as demonstrated in the following example of a weight display where the actual size of the weight values are 23 mm in height, but the unit of measurement (g) is 4 mm in height.

The Committee agreed that although the clarity and readability of indications was a growing issue, the current proposal had only limited support from the public and private sectors. The Committee recognized the proposal required a significant amount of work before the language was clear, technically correct, and deemed applicable to the different types of installations and technologies in current use. The Committee had concerns about whether or not the proposed 2 mm height requirements for units of measurement and other markings were adequate. The Committee also questioned the clarity of the proposed user requirements for the minimum reading distance.

The Committee recommended the submitter consider several points in its review of the current proposal such as:

- Any specification and corresponding user requirement should provide laboratory and field officials with uniform guidelines:

  - determine if the required markings on a new equipment design from the manufacturer or a device recently modified by the owner or a service company were suitable for continued use in a particular application; and

  - remove all ambiguity or subjectivity when assessing if primary indications can be observed from a reasonable customer and operator position.

- A size requirement for figures and their corresponding descriptive symbols and characters specified as a percentage might be a good approach.

- Corresponding new language in HB 44 that is similar to that which exists in HB 130 for labels to specify, "all required markings shall be prominent, definite, plain, and conspicuous as to size and style of symbols, letters, and numbers and as to color that is in contrast to the background and presented so that there is adequate free area surrounding those markings."

- A recognized vision standard such as those used to determine visual acuity (eye exam charts, etc.) might be a good source for establishing specific distance limits.

- When the size of indications becomes a selectable configuration parameter, access to this feature must be sealed.

The NIST technical advisor to the NTETC WS amended the proposal to address the concerns and suggestions from the manufacturers, NTEP labs, and WMD and placed the item on the 2007 WS agenda. The NIST technical advisor did not develop any changes to the proposed definition of "Primary Indications," the proposed User Requirements, and the associated definition for "Minimum Reading Distance." The Sector was asked to review the proposed language in its agenda and provide a recommendation that can be forwarded to the regional weights and measures associations. The Sector agreed to submit the following revised language to the regional weights and measures associations and the NCWM S&T Committee. The Sector also recommends deleting the proposed amendment to the definition of primary indications. Additionally, the Sector did not discuss or make any recommendations on the proposed user requirements and definition for "minimum reading distance."

**S.1.4. Indicators.**

***S.1.4.6. Direct Sale Primary Indications - Size and Character. – Scales designed for direct sale applications with a capacity of 100 kg (200 lb) or less shall comply with the following:***

***a. All indications shall be indicated clearly and simultaneously.***

***b. All indications and associated descriptive markings (e.g., lb, kg, gross, tare, net, etc.) shall be presented in such a style of type or lettering as to be boldly, clearly, and conspicuously presented with respect to other type, lettering, or graphics and shall be at least 2 mm (3/32 in) high.***

***c. All indications and associated descriptive markings shall be in a color or shade that contrasts conspicuously with its background.***

***d. All primary numeric indications displayed to the customer shall be at least 9.5 mm (0.4 in) high.***

***e. All units and descriptors shall be at least 2 mm (3/32 in) high.***

***[Nonretroactive as of January 1, 200X]***

***(Added 200X)***

**primary indications. Weight or other units of measurement values displayed by a primary indicating element. The primary indications are used as the determining factor in arriving at the sale representation when the device is used commercially. (Examples of primary indications include the measurement value, unit price or count, and total price on instruments capable of price computing. Primary indications do not include indications from auxiliary indicating devices such as totalizing registers and pre-determined stop mechanisms.) [1.10, 2.20]**

**(Added 200X)**

At its 2007 Annual Meeting, the WWMA heard from one scale manufacturer that his company's devices will pass the 9.5 mm and 2 mm requirements, but not the 21 %.

The WWMA recommended this item remain a Developing item on the NCWM S&T Committee agenda.

At its 2007 Interim Meeting, the CWMA commented that although a specification in HB 44 has merit, the proposed language in Scales Code paragraph S.1.4.6. is not necessary since other requirements already present in HB 44 General Code G-UR.3.3. Position of Equipment states that a device shall be positioned so that its indications may be accurately read from some reasonable "customer" and "operator" position. Additionally, the new language for installation requirements in proposed paragraphs UR.2.10. and UR.2.11. are also addressed in paragraph G-UR.3.3. and, therefore, is not necessary.

The CWMA recommended this item remain a Developing item on the NCWM S&T Committee agenda.

At its 2007 Interim Meeting, NEWMA recommended this item be Withdrawn as it was already covered in HB 44 General Code paragraph G-S.5.1.

At the 2007 SWMA Annual Meeting, a scale manufacturer stated it could support S.1.4. Indicators, but not UR.2. Installation Requirements. The SWMA agreed to forward the comment to the NCWM S&T Committee for consideration.

At its 2008 Annual Technical Conference, the WWMA received no comments during the open hearing. Without further information and discussion, the item cannot move forward. For this reason, the WWMA recommends the item be Withdrawn.

To comment on this proposal, contact Steven Cook, NIST Technical Advisor to the NTETC WS, by e-mail at steven.cook@nist.gov, by telephone at (301) 975-4003, by fax at (301) 975-8091, or by postal mail at NIST WMD, 100 Bureau Drive MS 2600, Gaithersburg, MD 20899-2600.

For more background information refer to the Committee's 2006 and 2007 Final Reports.

**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 is 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 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 is 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 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 s~~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)**~~<br>**114 LPM (30 GPM)** | ~~**1.70 L (104 in$^3$)[1]**~~<br>**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)**~~<br>**225 LPM (60 GPM)** | ~~**2.25 L (137 in$^3$)[1]**~~<br>**1.1 L (0.30 gal) (69.3 in$^3$)[1]** |
| ~~**75 mm (3 in) or larger**~~<br>**378 LPM (100 GPM)** | ~~**3.75 L (229 in$^3$)[1]**~~<br>**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 200X)**

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)**~~<br>**114 LPM (30 GPM)** | ~~**1.70 L (104 in$^3$)[1]**~~<br>**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)**~~<br>**225 LPM (60 GPM)** | ~~**2.25 L (137 in$^3$)[1]**~~<br>**1.1 L (0.36 gal) (83.2 in$^3$)[1]** |
| ~~**75 mm (3 in) or larger**~~<br>**378 LPM (100 GPM)** | ~~**3.75 L (229 in$^3$)[1]**~~<br>**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 200X)**

**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:

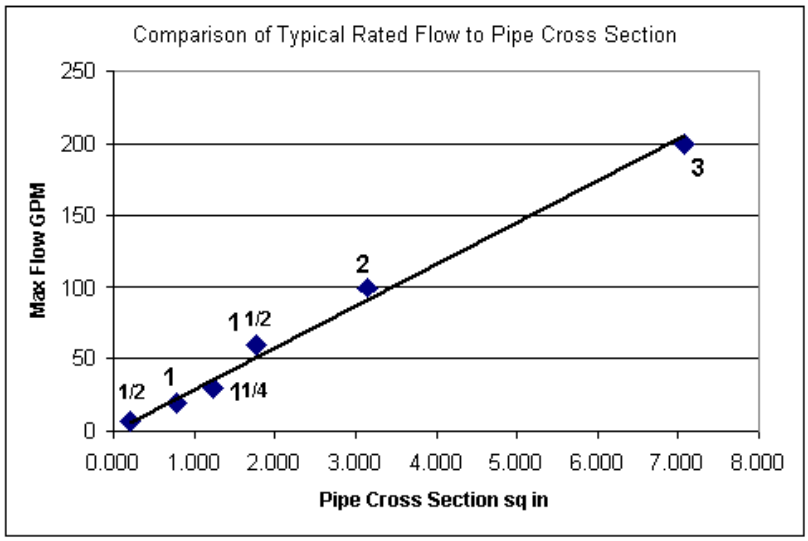
> The S&T Committee received a proposal to add new marking requirements to provide inspectors with a basis on which to assess tolerances since the meter size in inches is not currently marked on meters used in VTM systems. This solution would add a new marking requirement non-retroactively which will 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 VTM's 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 inch could be mounted on a vehicle and thus subject to these tolerances. Allowing the smallest current tolerance (104 in$^3$) on a ¼-inch 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-inch 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 in 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.

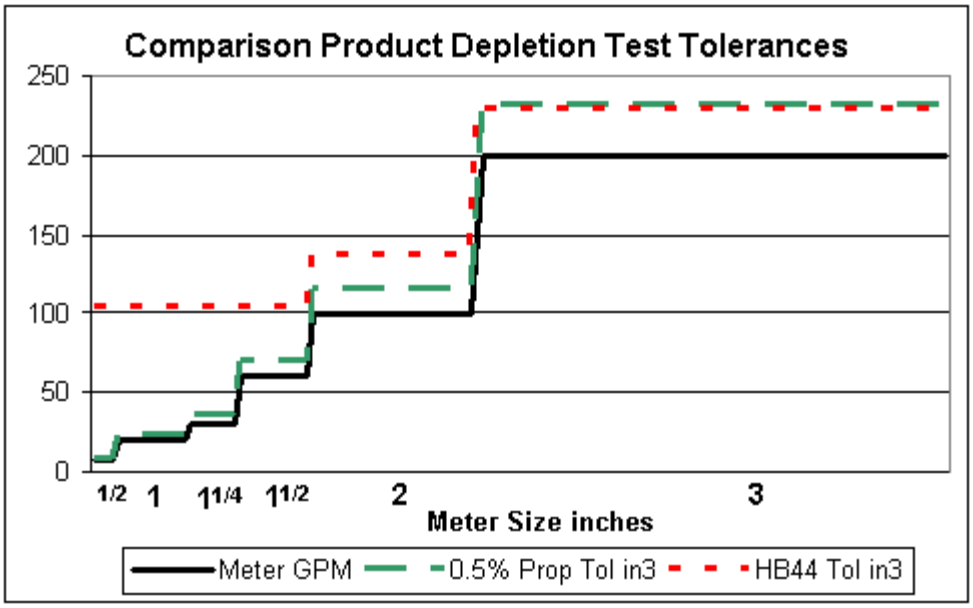
The submitter also noted the following:

We recognize that the tolerances proposed will reduce the tolerances for meter sizes 2 in 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 in (100 GPM) meter the tolerance would be 139 $in^3$, virtually identical to the existing tolerance.

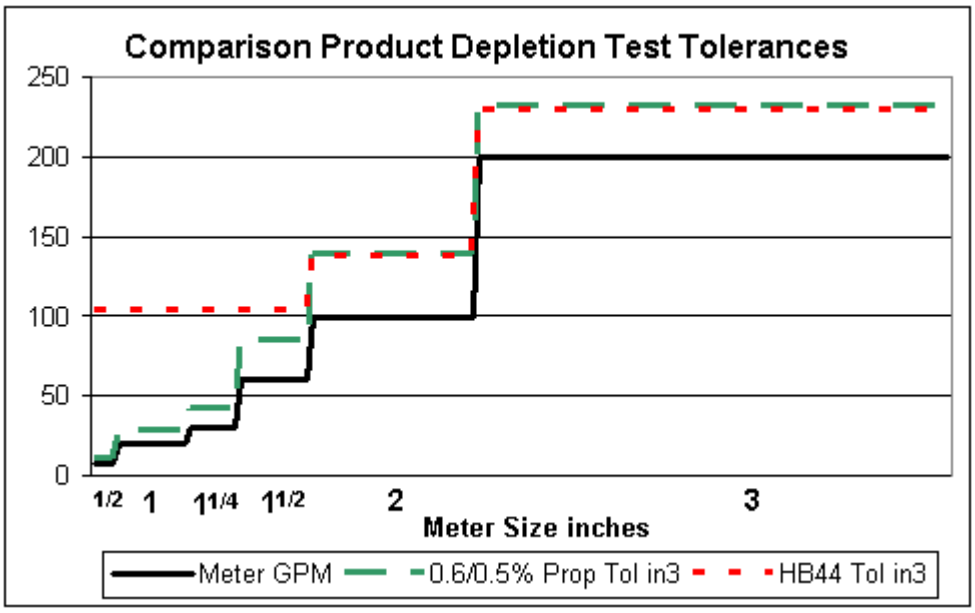
The submitter also provided the following supporting graphics:




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 Water Meters: N.3. Test Drafts and N.4. Testing Procedures**

**Source:** Southern and Western Weights and Measures Associations (SWMA and WWMA)

**Proposal:** 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<br>Normal Tests | | | |
|---|---|---|---|
| **Meter Size (inches)** | **Rate of Flow (gal/min)** | **Maximum Rate** | |
| | | **Meter Indication/Test Draft** | |
| | | **gal** | **ft³** |
| 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 | 1 000 | 100 |
| 6 | 700 | 1 000 | 100 |

(Table Added 2003) **(Amended 200X)**

| Table N.4.X. Flow Rate and Draft Size for Utility Type Water Meters<br>Normal Tests | | | |
|---|---|---|---|
| **Meter Size (inches)** | **Rate of Flow (gal/min)** | **Maximum Rate** | |
| | | **Meter Indication/Test Draft** | |
| | | **gal** | **ft³** |
| **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 200X)**

| Table N.4.2. Flow Rate and Draft Size for Non-Utility Type Water Meters<br>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** | **ft³** | | **gal** | **ft³** |
| 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 200X)**

| Table N.4.Y. Flow Rate and Draft Size for Utility Type Water Meters<br>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 200X)**

**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 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 paragraph N.4. Testing Procedures be amended (as outlined in the recommendation 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 title 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 a separate 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 manufactures 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 than 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 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 1 to Developing Items in this agenda. 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 gallons.

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 a 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-gallon draft size and a test draft of 20 gallons for 5/8 inch 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-gallon test draft was -4.45 %, and -4.32 % for the 10-gallon test draft. There was no data for repeatability in this series of data.

The WWMA S&T Committee also received two letters from water manufacturers supporting the items that were not in attendance at the WWMA.

The WWMA acknowledges that there is an increased potential for the 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 5/8 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 5/8 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 developmental 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. should remain developmental due to insufficient test data that justifies 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 a separate 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.

**Part 5, 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 200X)**

**Background/Discussion:** The CWMA received a proposal at its 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 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 type 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 at www.ncwm.net.

**Part 6, 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 Appendix 2 to Developing Items in this report) 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).

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.

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 developmental.

# Appendix 1 to Developing Items: Jeff Humphrey's Letter and Comments on 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 140C 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 |

Appendix 2 to Developing Items, Item Part 6, Item 1:
Draft Hydrogen Gas-Measuring Devices Code and Definitions

## Section 3.3X. Hydrogen Gas - Measuring Devices

**A.1. This code applies to devices that are designed to dynamically measure the mass of hydrogen gas in the vapor state used as a vehicle fuel.**

**A.2. This code does not apply to devices used solely for dispensing a product in connection with operations in which the amount dispensed does not affect customer charges.**

**A.3. Type Evaluation. – The National Type Evaluation Program will accept for type evaluation only those devices that comply with all requirements of this code.**

**A.4. In addition to the requirements of this code, hydrogen gas meters shall meet the requirements of Section 1.10. General Code.**

## S. Specifications

**S.1. Indicating and Recording Elements.**

**S.1.1. Indicating Elements. – A measuring assembly shall include an indicating element that continuously displays measurement results relative to quantity and total price. Indications shall be clear, definite, accurate, and easily read under normal conditions of operation of the instrument.**

**S.1.2. Vehicle Dispensers. – A hydrogen gas dispenser used to fuel vehicles shall be of the computing type and shall indicate the mass, the unit price, and the total price of each delivery.**

**S.1.3. Units.**

**S.1.3.1. Units of Measurement. – Deliveries shall be indicated and recorded in kilograms and decimal subdivisions thereof.**

**S.1.3.2. Numerical Value of Quantity-Value Divisions. – The value of a scale interval shall be equal to:**

- **1, 2, or 5, or**
- **a decimal multiple or submultiple of 1, 2, or 5.**

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

**S.1.3.3. Maximum Value of Quantity-Value Divisions. – The maximum value of the quantity-value division shall be not greater than 1.0 % of the minimum measured quantity.**

**S.1.3.4. Values Defined. – Indicated values shall be adequately defined by a sufficient number of figures, words, symbols, or combinations thereof. A display of "zero" shall be a zero digit for all displayed digits to the right of the decimal mark and at least one to the left.**

**S.2. Operating Requirements.**

**S.2.1. Return to Zero.**

(a) **One indicator and the primary recording elements, if the device is equipped to record, shall be provided with a means for readily returning the indication to zero either automatically or manually.**

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

**S.2.2. Indicator Reset Mechanism. – The reset mechanism for the indicating element shall not be operable during a delivery. Once the zeroing operation has begun, it shall not be possible to indicate a value other than the latest measurement, or "zeros" when the zeroing operation has been completed.**

**S.2.3. Nonresettable Indicator. – An instrument may also be equipped with a nonresettable indicator if the indicated values cannot be construed to be the indicated values of the resettable indicator for a delivered quantity.**

**S.2.4. Provisions for Power Loss.**

**S.2.4.1. Transaction Information. – In the event of a power loss, the information needed to complete any transaction in progress at the time of the power loss (such as the quantity and unit price, or sales price) shall be determinable for at least 15 minutes at the dispenser or at the console if the console is accessible to the customer.**

**S.2.4.2. User Information. – The device memory shall retain information on the quantity of fuel dispensed and the sales price totals during power loss.**

**S.2.5. Display of Unit Price and Product Identity.**

**S.2.5.1. Unit Price. – 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.**

**S.2.5.2. Product Identity. – A device shall be able to conspicuously display on each side the identity of the product being dispensed.**

**S.2.5.3. Selection of Unit Price. – When a product 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 a product.**

**S.2.5.4. Agreement Between Indications. – All quantity, unit price, and total price indications within a measuring system shall agree for each transaction.**

**S.2.6. Money-Value Computations. – A computing device shall compute the total sales price at any single-purchase unit price for which the product being measured is offered for sale at any delivery possible within either the measurement range of the device or the range of the computing elements, whichever is less.**

**S.2.6.1. Auxiliary Elements. – If a system is equipped with auxiliary indications, all indicated money value and quantity divisions of the auxiliary element shall be identical with those of the primary element.**

**S.2.6.2. Display of Quantity and Total Price. – When a delivery is completed, the total price and quantity for that transaction shall be displayed on the face of the dispenser for at least 5 minutes or until the next transaction is initiated by using controls on the device or other user-activated controls.**

**S.2.7. Recorded Representations, Point of Sale Systems. – A printed receipt shall be available through a built-in or separate recording element for transactions conducted with point-or-sale systems or devices activated by debit cards, credit cards, and/or cash. The printed receipt shall contain the following information for products delivered by the dispenser:**

**(a) the total mass of the delivery,**

**(b) the unit price,**

**(c) the total computed price, and**

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

**S.2.8. Indication of Delivery. – The device shall automatically show on its face the initial zero condition and the quantity delivered (up to the nominal capacity).**

**S.3. Design of Measuring Elements and Measuring Systems.**

**S.3.1. Maximum and Minimum Flow-Rates. – The ratio of the maximum to minimum flow-rates specified by the manufacturer for devices measuring gases shall be 10:1 or greater.**

**S.3.2. Adjustment Means. – An assembly shall be provided with means to change the ratio between the indicated quantity and the quantity of gas measured by the assembly. A bypass on the measuring assembly shall not be used for these means.**

**S.3.2.1. Discontinuous Adjusting Means. – When the adjusting means changes ratio between the indicated quantity and the quantity of measured gas in a discontinuous manner, the consecutive values of the ratio shall not differ by more than 0.1 %.**

**S.3.3. Provision for Sealing. – Adequate provision shall be made for an approved means of security (e.g., data change audit trail) or physically applying security seals in such a manner that no adjustment may be made of:**

**(a) each individual measurement element,**

**(b) any adjustable element for controlling delivery rate when such rate tends to affect the accuracy of deliveries,**

**(c) the zero adjustment mechanism, and**

**(d) any metrological parameter that detrimentally affects the metrological integrity of the device or system.**

**When applicable, the adjusting mechanism shall be readily accessible for purposes of affixing a security seal. Audit trails shall use the format set forth in Table S.3.3.**

| Table S.3.3. Categories of Device and Methods of Sealing | |
|---|---|
| **Categories of Device** | **Method of Sealing** |
| **Category 1: No remote configuration capability.** | **Seal by physical seal or two event counters: one for calibration parameters and one for configuration parameters.** |
| **Category 2: Remote configuration capability, but access is controlled by physical hardware.**<br><br>**The device shall clearly indicate that it is in the remote configuration mode and record such message if capable of printing in this mode or shall not operate while in this mode.** | **The hardware enabling access for remote communication must be on-site. The hardware must be sealed using a physical seal or an event counter for calibration parameters and an event counter for configuration parameters. The event counters may be located either at the individual measuring device or at the system controller; however, an adequate number of counters must be provided to monitor the calibration and configuration parameters of the individual devices at a location. If the counters are located in the system controller rather than at the individual device, means must be provided to generate a hard copy of the information through an on-site device.** |
| **Category 3: Remote configuration capability access may be unlimited or controlled through a software switch (e.g., password).**<br><br>**The device shall clearly indicate that it is in the remote configuration mode and record such message if capable of printing in this mode or shall not operate while in this mode.** | **An event logger is required in the device; it must include an event counter (000 to 999), the parameter ID, the date and time of the change, and the new value of the parameter. A printed copy of the information must be available through the device or through another on-site device. The event logger shall have a capacity to retain records equal to ten times the number of sealable parameters in the device, but not more than 1000 records are required. (Note: Does not require 1000 changes to be stored for each parameter.)** |

**S.3.4. Automatic Density Correction. – An automatic means to determine and correct for changes in product density shall be incorporated in any hydrogen gas metering system where measurements are affected by changes in the density (e.g., the effects of temperature, pressure, or variations in composition due to feedstock, processing, storage, or the environment) of the product being measured.**

**S.3.5. Pressurizing the Discharge Hose. – The discharge hose for hydrogen gas shall automatically pressurize to a pressure equal to or greater than the receiving vessel prior to the device beginning to register the delivery. Neither initial hose pressurization or purging/bleeding of the discharge hose shall not advance the indications.**

**S.3.6. Zero-Set-Back Interlock, Retail Vehicle Fuel Devices. – A device shall be constructed so that:**

**(a) when the device is shut-off at the end of a delivery an automatic interlock prevents a subsequent delivery until the indicating elements, and recording elements if the device is equipped and activated to record, have been returned to their zero positions;**

**(b) it shall not be possible to return the discharge nozzle to its start position unless the zero set-back interlock is engaged or becomes engaged and**

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

**S.4. Discharge Lines and Valves.**

~~**S.4.1. Diversion of Measured Product. – No means shall be provided by which any measured product can be diverted from the measuring instrument.**~~

**S.4.2. Directional Flow Valves. – If a reversal of flow could result in errors that exceed the tolerance for the minimum measured quantity, a valve or valves or other effective means, automatic in operation (and equipped with a pressure limiting device, if necessary) to prevent the reversal of flow shall be properly installed in the system. (See N.1.)**

**S.4.3. Other Valves. – Check valves and closing mechanisms that are not used to define the measured quantity shall have relief valves (if necessary) to dissipate any abnormally high pressure that may arise in the measuring assembly.**

**S.5. Markings. – A measuring system shall be conspicuously, legibly, and indelibly marked with the following information:**

**(a) pattern approval mark (i.e., type approval number);**

**(b) name and address of the manufacturer or his trademark and, if required by the weights and measures authority, the manufacturer's identification mark in addition to the trademark;**

**(c) model designation or product name selected by the manufacturer;**

**(d) nonrepetitive serial number;**

**(e) the accuracy class of the meter as specified by the manufacturer consistent with Table T.2.;**

**(f) maximum and minimum flow rates in kilograms per unit of time;**

**(g) maximum working pressure;**

**(h) applicable range of ambient temperature if other than -10 °C to +50 °C;**

**(i) minimum measured quantity; and**

**(j) product limitations, if applicable.**

**S.6. Printer. – When an assembly is equipped with means for printing the measured quantity, the printed information must agree with the indications on the dispenser for the transaction and the printed values shall be clearly defined.**

**S.6.1. Printed Receipt. – Any delivered, printed quantity shall include an identification number, the time and date, and the name of the seller. This information may be printed by the device or pre-printed on the ticket.**

**S.7. Totalizers for Retail Motor-Fuel Devices. – Retail motor-fuel dispensers shall be equipped with a nonresettable totalizer for the quantity delivered through each separate metering device.**

## N. Notes

**N.1. Minimum Measured Quantity. – The minimum measured quantity shall be specified by the manufacturer.**

**N.2. Test Medium. – The device shall be tested with hydrogen gas as defined by… (NOT YET PUBLISHED).**

**N.3. Test Drafts. – The minimum test shall be one test draft at the maximum flow rate of the installation and one test draft at the minimum flow rate. More tests may be performed at these or other flow rates. (See T.3.)**

**N.4. Tests.**

**N.4.1. Transfer Standard Test. – When comparing a meter with a calibrated transfer standard, the test draft shall be equal to at least the amount delivered by the device in two minutes at its maximum discharge rate.**

**N.4.2. Gravimetric Test. – The weight of the test drafts shall be equal to at least the amount delivered by the device in two minutes at its maximum discharge rate.**

**N.5. Minimum Measured Quantity. – The device shall be tested for a delivery equal to the declared minimum measured quantity when the device is likely to be used to make deliveries on the order of the declared minimum measured quantity. Any minimum measured quantity test shall be made at the minimum flow rate of the installation.**

**N.6. Motor Fuel Dispenser. – When a device is intended for use as a fuel dispenser, the type evaluation test shall include a test for accuracy using five starts and stops during a delivery to simulate the operation of the automatic shut-off nozzle. This test may be conducted as part of the normal inspection and test of the meter.**

**N.7. Testing Procedures.**

**N.7.1. Normal Tests. – The normal test of a meter shall be made at the maximum discharge rate developed by the installation. Any additional tests conducted at flow rates down to and including the rated minimum discharge flow rate shall be considered normal tests.**

**N.7.1.1. Repeatability Tests. – Tests for repeatability should include a minimum of three consecutive test drafts of approximately the same size and be conducted under controlled conditions where variations in factors, such as, temperature, pressure, and flow rate are reduced to the extent that they will not affect the results obtained.**

**N.8. Density. – Temperature and pressure of metered hydrogen gas shall be measured during the test for the determination of density or volume correction factors when applicable. For the thermophysical properties of hydrogen the following publications shall apply: for density calculations at temperatures above 220 K and pressures up to 120 MPa, a simple relationship may be used that is given in the publication of Lemmon et al., J. Res. NIST, 2008. Calculations for a wider range of conditions and additional thermophysical properties of hydrogen are available free of charge online at the "NIST Chemistry WebBook" http://webbook.nist.gov/chemistry, or available for purchase from NIST as the computer program NIST Standard Reference Database 23 "NIST Reference Fluid Thermodynamic and Transport Properties Database (REFPROP): Version 8.0" http://www.nist.gov/srd/nist23.htm. These calculations are based on the reference Leachman, J.W., Jacobsen, R.T, Lemmon, E.W., and Penoncello, S.G. "Fundamental Equations of State for Parahydrogen, Normal Hydrogen, and Orthohydrogen" to be published in the Journal of Physical and Chemical Reference Data. More information may be obtained from NIST online at http://www.boulder.nist.gov/div838/Hydrogen/Index.htm.**

## T. Tolerances

**T.1. Tolerances, General.**

**(a) The tolerances apply equally to errors of underregistration and errors of overregistration.**

**(b) The tolerances apply to all products at all temperatures measured at any flow rate within the rated measuring range of the meter.**

**T.2. Tolerances. – The tolerances for hydrogen gas meters are listed in Table T.2.**

**Table T.2. Accuracy Classes for Hydrogen Gas Meter Applications**

| Accuracy Class | Application or Commodity Being Measured | Acceptance Tolerance | Maintenance Tolerance |
|---|---|---|---|
| 2.0 | Hydrogen gas as a motor fuel | 1.5 %<br><br>(STAY OPEN FOR DISCUSSION) | 2.0 % |

**T.3. Repeatability. – When multiple tests are conducted at approximately the same flow rate and draft size, the range of the test results for the flow rate shall not exceed 40 % of the absolute value of the maintenance tolerance and the results of each test shall be within the applicable tolerance. See also N.6.1.1.**

**T.4. Tolerance Application.**

**T.4.1. Type Evaluation Examinations for Devices. – For type evaluation examinations, the tolerance values shall apply under the following conditions:**

**(a) at any temperature and pressure within the operating range of the meter, and**

**(b) at all flow rates within the range of flow rates.**

**T.4.2. To the basic tolerance values that would otherwise be applied, there shall be added an amount equal to two times the standard deviation of the applicable transfer standard when compared to a basic reference standard.**

## UR. User Requirements

**UR.1. Selection Requirements.**

**UR.1.1. Computing-Type Device. – A hydrogen gas dispenser used to refuel vehicles shall be of the computing type and shall indicate the mass, the unit price, and the total price of each delivery.**

**UR.1.2. Discharge Hose-Length. – The length of the discharge hose on a retail motor-fuel device shall not exceed 4.6 m (15 ft) unless it can be demonstrated that a longer hose is essential to permit deliveries to be made to receiving vehicles or vessels.**

**UR.1.3. Minimum Measured Quantity.**

**(a) The minimum measured quantity shall be specified by the manufacturer.**

**(b) The minimum measured quantity appropriate for a transaction may be specified by the weights and measures authority. A device may have a declared minimum measured quantity smaller than that specified by the weights and measures authority; however, the device must perform within the performance requirements for the declared or specified minimum measured quantity up to deliveries at the maximum measurement range.**

**UR.2. Installation Requirements.**

**UR.2.1. Manufacturer's Instructions. – A device shall be installed in accordance with the manufacturer's instructions, and the installation shall be sufficiently secure and rigid to maintain this condition.**

**UR.2.2. Discharge Rate. – A device shall be installed so that after initial equalization the actual maximum discharge rate will not exceed the rated maximum discharge rate. Automatic means of flow regulation shall be incorporated in the installation if necessary.**

**UR.2.3. Low-Flow Cut-Off Valve. – If a metering system is equipped with a programmable or adjustable "low-flow cut-off" feature:**

**(a) the low-flow cut-off value shall not be set at flow rates lower than the minimum operating flow rate specified by the manufacturer on the meter; and**

**(b) the system shall be equipped with flow control valves which prevent the flow of product and stop the indicator from registering product flow whenever the product flow rate is less than the low-flow cut-off value.**

**UR.3. Use of Device.**

**UR.3.1. Unit Price and Product Identity for Retail Dispensers. – The unit price at which the dispenser is set to compute shall be conspicuously displayed or posted on the face of a retail dispenser used in direct sale.**

**UR.3.2. Ticket Printer; Customer Ticket. – Vehicle-mounted metering systems shall be equipped with a ticket printer which shall be used for all sales where product is delivered through the meter. A copy of the ticket issued by the device shall be left with the customer at the time of delivery or as otherwise specified by the customer.**

**UR.3.3. Printed Ticket. – The total price, the total quantity of the delivery, and the price per unit shall be printed on any ticket issued by a device of the computing type and containing any one of these values.**

**UR.3.4. Ticket in Printing Device. – A ticket shall not be inserted into a device equipped with a ticket printer until immediately before a delivery is begun, and in no case shall a ticket be in the device when the vehicle is in motion while on a public street, highway, or thoroughfare.**

**UR.3.5. Steps After Dispensing. – After delivery to a customer from a retail motor-fuel device:**

**(a) the device shall be shut-off at the end of a delivery, through an automatic interlock that prevents a subsequent delivery until the indicating elements and recording elements, if the device is equipped and activated to record, have been returned to their zero positions; and**

**(b) the discharge nozzle shall not be returned to its start position unless the zero set-back interlock is engaged or becomes engaged by act of returning the discharge nozzle.**

**UR.3.6. Return of Indicating and Recording Elements to Zero. – The primary indicating elements (visual), and the primary recording elements when these are returnable to zero, shall be returned to zero immediately before each delivery. Exceptions to this requirement are totalizers on key-lock-operated or other self-operated dispensers and the primary recording element if the device is equipped to record.**

**UR.3.7. Return of Product to Storage, Retail Hydrogen Gas Dispensers. – Provisions at the site shall be made for returning product to storage or disposing of the product in a safe and timely manner during or following testing operations. Such provisions may include return lines, or cylinders adequate in size and number to permit this procedure.**

**UR.3.8. Conversion Factors. – Established conversion values (see references in N.8.) shall be used whenever metered hydrogen gas is billed. All sales shall be based on kilograms.**

**Modify current NIST Handbook 44 definitions to apply and correspond with the proposed new code for hydrogen gas measuring devices.**

**Appendix D – Definitions**

**The specific code to which the definition applies is shown in [brackets] at the end of the definition. Definitions for the General Code [1.10] apply to all codes in Handbook 44.**

**A**

**audit trail.** An electronic count and/or information record of the changes to the values of the calibration or configuration parameters of a device. [1.10, 2.20, 2.21, 2.24, 3.30, 3.37, **3.3X**, 5.56(a)]

**automatic temperature or density compensation.** The use of integrated or ancillary equipment to obtain from the output of a volumetric meter an equivalent mass, or an equivalent liquid volume at the assigned reference temperature below and a pressure of 14.696 lb/in$^2$ absolute.

Cryogenic liquids – 21 °C (70 °F) [3.34,]
Hydrocarbon gas vapor – 15 °C (60 °F) [3.33]
Hydrogen gas – 21 °C (70 °F) [3.3X]
Liquid carbon dioxide – 21 °C (70 °F) [3.38]
Liquefied petroleum gas (LPG) and Anhydrous ammonia – 15 °C (60 °F) [3.32]
Petroleum liquid fuels and lubricants – 15 °C (60 °F) [3.30]

**C**

**calibration parameter.** Any adjustable parameter that can affect measurement or performance accuracy and, due to its nature, needs to be updated on an ongoing basis to maintain device accuracy, e.g., span adjustments, linearization factors, and coarse zero adjustments. [2.20, 2.21, 2.24, 3.30, 3.37, **3.3X**, 5.56(a)]

**D**

**discharge hose.** A flexible hose connected to the discharge outlet of a measuring device or its discharge line. [3.30, 3.31, 3.32, 3.34, 3.37, 3.38, **3.3X**]

**discharge line.** A rigid pipe connected to the outlet of a measuring device. [3.30, 3.31, 3.32, 3.34, 3.37, **3.3X**]

**E**

**event counter.** A nonresettable counter that increments once each time the mode that permits changes to sealable parameters is entered and one or more changes are made to sealable calibration or configuration parameters of a device. [2.20, 2.21, 3.30, 3.37, **3.3X**, 5.54, 5.56(a), 5.56(b), 5.57]

**event logger.** A form of audit trail containing a series of records where each record contains the number from the event counter corresponding to the change to a sealable parameter, the identification of the parameter that was

changed, the time and date when the parameter was changed, and the new value of the parameter. [2.20, 2.21, 3.30, 3.37, **3.3X**, 5.54, 5.56(a), 5.56(b), 5.57]

**I**

**indicating element.** An element incorporated in a weighing or measuring device by means of which its performance relative to quantity or money value is "read" from the device itself as, for example, an index-and-graduated-scale combination, a weighbeam-and-poise combination, a digital indicator, and the like. (Also see "primary indicating or recording element.") [1.10]

**M**

**minimum measured quantity (mmq). The smallest quantity delivered for which the measurement is accurate for that system . . . [3.37, 3.3X]**

**motor-fuel device** or **motor-fuel dispenser** or **retail motor-fuel device.** A device designed for the measurement and delivery of ~~**liquids**~~ **products** used as fuel for internal-combustion engines. The term "motor-fuel dispenser" means the same as "motor-fuel device"; the term "retail motor-fuel device" applies to a unique category of device (see definition of "retail device"). [3.30, 3.32, 3.37, **3.3X**]

**N**

**nonresettable totalizer. An element interfaced with the measuring or weighing element that indicates the cumulative registration of the measured quantity with no means to return to zero. [3.30, 3.37, 3.3X]**

**P**

**point-of-sale system.** An assembly of elements including a weighing or measuring element, an indicating element, and a recording element (and may also be equipped with a "scanner") used to complete a direct sales transaction. [2.20, 3.30, 3.32, 3.37, **3.3X**]

**R**

**remote configuration capability.** The ability to adjust a weighing or measuring device or change its sealable parameters from or through some other device that is not itself necessary to the operation of the weighing or measuring device or is not a permanent part of that device. [2.20, 2.21, 2.24, 3.30, 3.37, **3.3X**, 5.56(a)]

**retail device.** A measuring device primarily used to measure product for the purpose of sale to the end user. [3.30, 3.32, 3.37, **3.3X**]

**W**

**wet hose.** A discharge hose intended to be full of product at all times. (See "wet-hose type.") [3.30, 3.31, 3.38, **3.3X**]

**wet-hose type**. A type of device designed to be operated with the discharge hose full of product at all times. (See "wet hose.") [3.30, 3.32, 3.34, 3.37, 3.38, **3.3X**]

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