Report of the Specifications and Tolerances Committee

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Reference
Key Number

300 INTRODUCTION

This is the final report of the Committee on Specifications and Tolerances (S&T) (hereinafter referred to as the "Committee") for the 93rd Annual Meeting of the National Conference on Weights and Measures (NCWM). The report is based on the Interim Report offered in the NCWM Publication 16, "Committee Reports," testimony at public hearings, comments received from the regional weights and measures associations and other parties, the addendum sheets issued at the Annual Meeting, and actions taken by the membership at the voting session of the Annual Meeting.

Table A identifies the agenda items in the report by Reference Key Number, Item Title, and Page Number. The item numbers are those assigned in the Interim Meeting agenda. Voting items are indicated with a "**V**," or if the item was part of the Voting Consent calendar by the suffix "**VC**" after the item number. Items marked with an "**I**" after the reference key numbers are Information items. Items marked with a "**D**" after the key numbers are Developing items. The Developing designation indicates that an item, while it has merit, may not be adequately developed for action at the national level. Items marked "**W**" have been withdrawn from consideration. Items marked with a "**W**" will generally be referred to the regional weights and measures associations because they either need additional development, analysis, and input or did not have sufficient Committee support to bring them before NCWM. Table B lists the appendices to the report, Table C identifies the acronyms for organizations and technical terms used throughout the report, and Table D provides a summary of the results of the voting on the Committee's items and the report in entirety.

This report contains recommendations to amend National Institute of Standards and Technology (NIST) Handbook 44, 2008 Edition, "Specifications, Tolerances, and Other Technical Requirements for Weighing and Measuring Devices." Proposed revisions to the handbook are shown in **bold face print** by ~~**striking out**~~ information to be deleted and **underlining** information to be added. New items proposed for the handbook are designated as such and shown in **bold face print**.

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.

Table D
Voting Results

Reference Key Number	House of State Representatives		House of Delegates		Results
	Yeas	Nays	Yeas	Nays	
300 (Consent Calendar)	38	0	33	0	Passed
310-4	24	13	19	15	Returned to Committee
320-5	37	1	27	1	Passed
300 (Report in its Entirety Voice Vote)	All Yeas	No Nays	All Yeas	No Nays	Passed

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

310 GENERAL CODE

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

Source: Southern Weights and Measures Association (SWMA)

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**)

Add new General Code paragraphs G-S.8.1. and G-S.8.3., and renumber previous G-S.8.1. to G-S.8.2. as follows:

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.~~1~~2.,** any appropriate audit trail requirements in an applicable specific device code also apply. Examples of identification 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 time frame.

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 believed 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 Iinformational 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 in the calibration mode provide indications to the operator. This would encompass mechanical and electronic, and devices that use category 1 physical seals. Additionally, WMD believes that a device does not need an indication that is 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) had been inadvertently changed, and that it could be interpreted to mean that the physical seal itself disabled access to the adjustment mechanisms instead of simply 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. – A 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 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.

(Nonretroactive as of January 1, 2009)

(Added 200X)

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

Source: Carryover Item from 2008. This item originated from the NTETC Software Sector and first appeared on the Committee's 2007 Agenda as Developing Item Part 1, Item 2 and was placed on the Committee's Interim Agenda as Item 320-2 and was then returned back to Item 360-2 Developing Items in the Committee's Interim Report to the NCWM.

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.

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.

310-3 V G-A.1. and Appendix D – Definition of Equipment

(This item was adopted.)

Source: Carryover Item 310-1B. (This item originated from the 2007 Committee during discussion on agenda Item 310-1A General Code, paragraph G-S.2. Facilitation of Fraud.)

Recommendation: Modify G-A.1.(a) and add a new definition to Appendix D in HB 44 for "equipment" as follows:

G-A.1. Commercial and Law-Enforcement Equipment. – These specifications, tolerances, and other technical requirements apply as follows:

(a) To commercial weighing and measuring equipment; that is, to weights and measures and weighing and measuring devices commercially used or employed in establishing the size, quantity, extent, area, **composition (limited to meat and poultry), constituent value (limited to grain),** or measurement of quantities, things, produce, or articles for distribution or consumption, purchased, offered, or submitted for sale, hire, or award, or in computing any basic charge or payment for services rendered on the basis of weight or measure.

(Amended 2008)

Appendix D

equipment, commercial. Weights, measures, and weighing and measuring devices, instruments, elements, and systems or portion thereof, used or employed in establishing the measurement or in computing any basic charge or payment for services rendered on the basis of weight or measure. As used in this definition, measurement includes the determination of size, quantity, value, extent, area, composition (limited to meat and poultry), constituent value (limited to grain), or measurement of quantities, things, produce, or articles for distribution or consumption, purchased, offered, or submitted for sale, hire, or award. [1.10, 2.20, 2.21, 2.22, 2.24, 3.30, 3.31, 3.32, 3.33, 3.34, 3.35, 3.38, 4.40, 5.51, 5.56.(a), 5.56.(b), 5.57, 5.58, 5.59]

commercial equipment, See equipment

Background/Discussion: During the Committee's 2007 discussion of agenda Item 310-1 Facilitation of Fraud, the Committee agreed there was a need to define the term "equipment." The Committee believed the proposed definition will help prevent misinterpretation of the term as used in paragraph G-S.2. and several other HB 44 codes. The proposed definition is intended to clarify which parts or portions of a device or system must comply with applicable specifications, tolerances, and other technical requirements in HB 44. The Committee recommended the proposed definition be carried over to allow sufficient time for a review of the proposed definition.

For additional background information, refer to the Committee's 2007 Interim and Annual Reports.

At its 2007 Annual Meeting, the WWMA supported the intent of the proposal. The WWMA recommended the proposed language be split into two sentences and recommended the proposal move forward as a Voting item on the NCWM S&T Committee Agenda.

The CWMA and NEWMA supported the intent of the proposal, agreed with the changes to the proposed definition recommended by the WWMA, and recommend the proposal move forward as a Voting item on the NCWM S&T Committee Agenda.

At the 2008 Interim Meeting, the Committee heard no opposition to the item. The Committee received a recommendation to modify G-A.1. to: (1) add the words "composition, constituent value" to include the

measurements provided by Near-Infrared Grain Analyzers and Electronic Livestock, Meat, and Poultry Evaluation Systems and/or Devices, and (2) to modify the definition of "equipment" to include law enforcement and statistical information collection devices. The Committee modified the proposal as shown above and agreed to present it for a vote at the NCWM Annual Meeting.

At the 2008 Annual Meeting, the Committee agreed with the reports of the CWMA and NEWMA 2008 spring meetings that stated that the words "composition" and "constituent" need better definitions to make sure that the additional words do not broaden the scope of HB 44. The Committee also agreed with a suggestion from the Grain Inspection, Packers, and Stockyards Administration (GIPSA) to include the words "meat and poultry" to limit the scope of "composition." The Committee believed that the word "grain" should also be added to limit the scope of "constituent value" and amended the proposal to read as shown in the Committee's recommendation.

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

(This item did not pass or fail; therefore, it returns to the Committee.)

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 of this report. Note, however, that the Committee retained Item 310-4 and presented that item as a Voting item at the Annual Meeting.

Source: Central Weights and Measures Association (CWMA)

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 2008)

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 reqirements 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 2008)

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 times 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 references to the term "tolerance" by changing the reference to the term "tolerances" to the words "accuracy requirements."

The Committee heard comments during the open hearing that specific hand-held test measure user 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 Iinformation item on the agenda.

320 SCALES

320-1 V S.1.1.1.(b) Digital Indicating Elements

(This item was adopted.)

Source: Carryover Item 320-2. (This item originated from the NTETC WS and first appeared on the Committee's 2007 agenda.)

Recommendation: Amend S.1.1.1.(b) Digital Indicating Elements as follows:

S.1.1.1. Digital Indicating Elements.

(a) A digital zero indication shall represent a balance condition that is within ± ½ the value of the scale division.

(b) A digital indicating device shall either automatically maintain a "center-of-zero" condition to ± ¼ scale division or less, or have an auxiliary or supplemental "center-of-zero" indicator that defines a zero balance condition to ± ¼ of a scale division or less. ***A "center-of-zero" indication may operate when zero is indicated for gross or net mode(s).***
[Nonretroactive as of January 1, 1993]

(Amended 1992 **and 2008**)

Background/Discussion: This proposal was originally intended to clarify that the center-of-zero indicator may be operable when a zero condition exists in the net weight mode. At the 2007 NCWM Annual Meeting, the Committee heard testimony from the CWMA**,** NEWMA, and SMA stating that this item in the 2007 Interim Agenda had changed from the original intent (to verify that center-of-zero could be operable in the net mode) to include additional language which significantly altered the requirement. For example, using "and" instead of "or" at the end of paragraph S.1.1.1.(a), makes both requirements mandatory in both (a) and (b) of S.1.1.1. If "or" is used instead of "and," then this proposal lowered the current requirement of ½ e to ¼ e. The SMA further stated the proposal was not consistent with Canadian and OIML requirements because proposed paragraph (a) added a dual requirement for the "center-of-zero" indication. Therefore, the CWMA, NEWMA, and SMA recommended the status of the proposal be changed to Informational to allow time for further consideration.

At its 2007 Annual Meeting, the WS reviewed this item and agreed to support the WMD language as recommended in the 2007 NCWM S&T Committee Final Report on Agenda Item 320-2.

At their fall 2007 meetings, the CWMA and WWMA S&T Committees heard unanimous support for this proposal and agreed with the alternative language written by WMD. The CWMA and WWMA recommended the proposal incorporating the WMD alternate language as shown above move forward as a Voting item on the NCWM S&T Committee Agenda.

NEWMA believes the scale should not indicate a "center-of-zero" indication if the scale is displaying a negative weight when the tare object is removed from the load-receiving element after tare has been taken. Therefore, at its 2007 Interim Meeting, NEWMA supported the intent of this proposal but submitted an alternate note for paragraph S.1.1.1. as follows:

> **Note: The "center-of-zero" indication may also work when zero is indicated in either the gross or net mode.**

During the 2008 NCWM Interim Meeting, the Committee heard support for the intent of the proposal and for the NEWMA recommendation to clarify that the center-of-zero indication is only applicable when there is an indication of zero (gross load zero or net load zero with an object on the scale). NIST WMD agreed with NEWMA since the NEWMA recommendation is consistent with the language in the 2007 Edition of NCWM Publication 14 Digital Electronic Scales Section 41. Zero Indication and OIML R 76-1 Metrological and Technical requirements for Nonautomatic Weighing Instruments clause 4.5.5. WMD suggested that the proposed sentence be added to the end of paragraph S.1.1. since a "stand-alone" note is not justified.

The Committee agreed with comments during the open hearing and the recommendations from NEWMA and WMD and made this item a Voting item in its Interim Report. The Committee received no opposition to the item prior to or at the 2008 Annual Meeting.

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

320-2 V S.1.2.1. Weight Units, S.2.3. Tare, and T.N.2.1. General

(This item was adopted.)

Source: Carryover Item 320-3. (This item originated from the NTETC WS and first appeared on the Committee's 2007 agenda.)

Recommendation: Add a new note to paragraph S.1.2.1. and amend paragraphs S.2.3. and T.N.2.1. as follows:

> ***S.1.2.1. Weight Units.*** *– Except for postal scales, a digital-indicating scale shall indicate weight values using only a single unit of measure. Weight values shall be presented in a decimal format with the value of the scale division expressed as 1, 2, or 5, or a decimal multiple or sub-multiple of 1, 2, or 5.*
>
> ***Note: The requirement that the value of the scale division be expressed only as 1, 2, or 5, or a decimal multiple or submultiple of only 1, 2, or 5 does not apply to net weight indications and recorded***

representations that are calculated from gross and tare weight indications where the scale division of the gross weight is different from the scale division of the tare weight(s) on multi-interval or multiple range scales. For example, a multiple range or multi-interval scale may indicate and record tare weights in a lower weighing range (WR) or weighing segment (WS), gross weights in the higher weighing range or weighing segment, and net weights as follows:

55 kg	*Gross Weight*	*(WR2 d = 5 kg)*	*10.05 lb*	*Gross Weight*	*(WS2 d = 0.05 lb)*
– 4 kg	*Tare Weight*	*(WR1 d = 2 kg)*	*– 0.06 lb*	*Tare Weight*	*(WS1 d = 0.02 lb)*
= 51 kg	*Net Weight*	*(Mathematically Correct)*	*= 9.99 lb*	*Net Weight*	*(Mathematically Correct)*

(Note added 2008)
[Nonretroactive as of January 1, 1989]

(Added 1987) **(Amended 2008)**

S.2.3. Tare. – *On any scale (except a monorail scale equipped with digital indications* ***and multi-interval scales or multiple range scales when the value of tare is determined in a lower weighing range or weighing segment)****, the value of the tare division shall be equal to the value of the scale division.** The tare 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]**
*[*Nonretroactive as of January 1, 1983]*

(Amended 1985 **and 2008**)

T.N.2.1. General. – The tolerance values are positive (+) and negative (-) with the weighing device adjusted to zero at no load. When tare is in use, the tolerance values are applied from the tare zero reference **(zero net indication)**; the tolerance values apply to **the net weight indication for any possible tare load using** certified test loads~~only~~.

(Amended 200X)

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

This proposal, which was developed by the Tare WG and supported by the WS, adds a new note to paragraph S.1.2.1. The note recognizes display and printing of net weight values in divisions other than the scale division used in the display of gross weight, resulting in a more accurate net weight determination. The proposed changes to S.1.2.1. requires that paragraph S.2.3. Tare also be amended as shown in the above proposal to avoid a conflict with the changes to paragraph S.1.2.1. Additionally, the Tare WG recommended changes to paragraph T.N.2.1. to clarify that tolerances in Table 6 also apply to net weight indications.

The Tare WG developed a corresponding proposal for the Automatic Weighing Systems Code to clarify the appropriate scale division values and the application of tolerances to tare weights for those devices (see S&T Item 324-1).

During the 2007 NCWM Annual Meeting, the Committee heard comments from the CWMA and NEWMA supporting this item with recommendations to change the word "value" to "division" and incorporate the SWMA recommendation to modify paragraph S.2.3.

NEWMA pointed out that the proposed amendment to S.1.2.1. appeared to be permissive and not a requirement. NEWMA asked if the intent was to prohibit multi-interval and multiple range scales from rounding and indicating calculated net weights in scale divisions to only 1, 2, or 5 when appropriate or was rounding the scale divisions still

allowed. The WMD representative to the NCWM Tare WG stated that the intent was for the language to be permissive because there are a significant number of devices in the marketplace with an NTEP CC that round the tare values before calculating net weights.

The Committee made several modifications to the proposal to:

- clarify the examples in the proposed note to paragraph S.1.2.1.,
- change the words "scale value" to "scale division" to be consistent with the terminology currently used in HB 44, and
- clarify that the SWMA proposed modification to the language in S.2.3. for an exception for multi-interval and multiple range scales only applies to the requirement that the value of tare shall be equal to the value of the scale division.

At its 2007 Annual Meeting, the WS reviewed the amended proposal and stated that the examples in the language carried over from the 2007 NCWM Annual Meeting did not provide enough information, such as the capacities of the weighing ranges or segments and the values of "d" for each weighing range or segment. Additionally, it was agreed that the second example should have a net value that is different from the first example.

At its 2007 Annual Meeting, the WWMA S&T Committee heard from the NTETC WS and SMA which supported the intent of this item. The WWMA recommended that the example be amended by changing the second paragraph of the note and by adding sample equations.

The CWMA and NEWMA agreed with the fall 2007 WS and WWMA recommendation. Additionally, the CWMA and WWMA recommend that this proposal move forward as a Voting item on the NCWM S&T Committee Agenda.

During the 2008 NCWM Interim Meeting, Ross Andersen, New York, commented that the proposal is different from what is currently permitted in Publication 14 in that the tare values for multi-interval and multiple range scales are rounded, indicated, and recorded to the nearest value of the net weight division if the net weight is in a higher weighing range or segment. Additionally, he noted that the proposal is also inconsistent with OIML R 76 since the value of the net weight division is expressed only as 1, 2, or 5. The NIST technical advisor responded that the Tare WG considered the differences between Pub 14 and OIML R 76. The Tare WG believes that the current tare requirements in Pub 14 forces tare in a lower range or segment to round up or down to the nearest division. In some cases, tare will be rounded to zero. This proposal increases the accuracy of the net weight calculated by the difference in the actual gross and tare values without introducing errors due to rounding tare and net weights to a larger d value when the gross weight is in a higher range or segment.

It should be noted that OIML R 76 is different from what is permitted in this proposal. OIML R 76 requires that printed weighing results be rounded to the nearest scale division of the actual weighing range or segment of each gross, tare and net result and permits a 1 d error in the calculation of net due to rounding. R 76 clause 4.6.12 "Examples of indications of weighing results" footnote 4 states:

> [4)] The displayed and printed weighing results (gross, tare weighing, net) shall be rounded each to the actual e (d). The e can be different depending on the actual weighing range or the actual partial weighing range, so a deviation of 1 x e (d) may be possible between the gross weighing result and the calculation of net and tare values.

The Tare WG concluded that neither of the current requirements in Publication 14 and R 76 were acceptable and recommended that the most accurate method to determine net weights is to perform an accurate mathematical calculation between the actual gross and net weights and to not require the net weight to comply with the requirement that it be expressed only as 1, 2, or 5.

The Committee heard support from the SMA for the proposal. The Committee believes that the alternate language submitted by WMD more clearly states the original intent of the proposal by deleting the second paragraph in the note and amending the examples submitted by the WWMA as shown in the above proposal. Don Onwiler commented that the NTEP laboratories have been discussing this issue for quite some time. Some of the NTEP labs believe that the tare should always round up to the favor of the customer. But that argument does not take into

account applications where the customer is selling product to the scale owner, in which case rounding tare up is always against the customer. Don added that this proposal is a compromise that results in a more accurate net weight determination and that he is in support of the proposal and commends the work of the Tare WG to resolve this issue.

At the 2008 Annual Meeting, the Committee agreed with comments from the SMA, the CWMA, and NEWMA to include the word "segment" in paragraph S.2.3., and amended the proposal as shown in the above recommendation.

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

320-3 W S.1.7. Capacity Indication, Weight Ranges, and Units Weights

(This item was withdrawn.)

Source: National Type Evaluation Technical Committee Weighing Sector

Recommendation: Modify paragraph S.1.7. as follows:

S.1.7. Capacity Indication, Weight Ranges, and Unit Weights.

(a) Gross Capacity. An indicating or recording element shall not display nor record any values when the total platform 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.

(b) *Capacity Indication. Electronic computing scales (excluding postal scales and weight classifiers) shall neither display nor record a gross or net weight in excess of scale capacity plus 9 d. [Nonretroactive as of January 1, 1993]*

(c) Flashing weight values are not acceptable as an overload indication.

The total value of weight ranges and of unit weights in effect or in place at any time shall automatically be accounted for on the reading face and on any recorded representation.

This requirement does not apply to: (1) single-revolution dial scales, (2) multi-revolution dial scales not equipped with unit weights, (3) scales equipped with two or more weighbeams, nor (4) devices that indicate mathematically derived totalized values.

(Amended 1990, 1992, ~~and~~ 1995 **and 200X**)

Background/Discussion: During its review and discussion of the Tare WG recommendation, the WS reviewed a comment from the WG that paragraph S.1.7. should be amended to include a statement that flashing weight values are not an acceptable indication of over capacity. The Tare WG made this recommendation to the Sector while developing a new paragraph that limits tare operating range to the capacity of a scale. This language has been in NCWM Publication 14 as early as its 2nd Edition (1989) and was added when NTEP applicants submitted scales using flashing weight values to indicate an over-capacity condition since flashing weights could be written down and used for commercial weight determinations. The WS agreed with the Tare WG recommendation and requested that appropriate language, as shown above, be developed by the NIST technical advisor and submitted to the NCWM S&T Committee.

During the 2008 NCWM Interim Meeting, the SMA stated that they oppose this item and believe that the current wording in subparagraphs S.1.7. (a) and (b) sufficiently addresses the issue. The SMA added that the recommendation to add a new subparagraph (c) would lead to an open list of possible unacceptable designs (solutions). WMD agreed with the SMA and stated that the language in Publication 14 is an appropriate interpretation of S.1.7. (a) and (b). Additionally, Publication 14 could be clarified to state that the scale shall not display any measurement value when the capacity exceeds 105 % of the nominal capacity (9 d for computing scales).

The Committee agreed with the comments and noted that a flashing weight can be interpreted as a valid weight and, therefore, any indication of weight value shall not be displayed nor recorded when the total platform load is in excess of 105 % of scale capacity. Consequently, the Committee withdrew this proposal from the agenda in its Interim Report.

320-4 V S.2.1.5. Initial Zero-Setting Mechanism

(This item was adopted.)

Source: National Type Evaluation Technical Committee Weighing Sector

Recommendation: Amend NIST Handbook 44, Section 2.20. Scales Code, paragraph S.2.1.5. as follows:

S.2.1.5. Initial Zero-Setting Mechanism. – ~~(a)~~ Scales of accuracy Classes I, II, and III may be equipped with an initial zero-setting device.

(~~a~~**b**) For **weighing, load-receiving, and indicating elements in the same housing or covered on the same CC.** An initial zero-setting mechanism shall not zero a load in excess of 20 % of the maximum capacity of the scale unless tests show that the scale meets all applicable tolerances for any amount of initial load compensated by this device within the specified range.

(b) ***For indicating elements not permanently attached to weighing and load-receiving elements covered on a separate CC, the maximum initial zero-setting mechanism range of electronic indicators shall not exceed 20 % of the configured capacity.***
[Nonretroactive as of January 1, 2009]

(Added 2008)

(Added 1990) **(Amended 2008)**

Background/Discussion: This item first appeared on the NTETC WS agenda in 2004. The Sector noted that Scales Code paragraph S.2.1.5. was clear about the requirements for Initial Zero-Setting Mechanism (IZSM) for complete scales. However, it did not address the requirements for separable weighing and indicating elements. Electronic indicating elements have been submitted to NTEP with an IZSM of 100 % of the configured capacity of the indicator. NTEP can easily test to verify IZSM requirements on these elements. However, the problem occurred when the separable load-receiving element (with a CC) was not tested for IZSM and was interfaced with an indicating element that had been tested for IZSM.

If the IZSM on the indicating element was configured to zero off 100 % of the scale capacity and then interfaced with a load-receiving element that had not been tested for IZSM, the load-receiving element could be inadvertently loaded to 200 % of its designed capacity even though it indicated only 100 % capacity. This would likely result in inaccurate weight determinations and/or damage to the scale.

NTEP only evaluates load-receiving elements up to 105 % of the capacity requested by the applicant and marked on the device. All Class I, II, and III separable weighing/load-receiving elements with NTEP CC's have not been submitted or tested with an IZSM feature unless the submission was to be treated as a complete scale with a specific indicating element. Therefore, there is a possibility that many load-receiving elements consisting of only load-cell support structures may not comply with an indicating element configured with IZSM enabled.

The WS believes that weighing, load-receiving, and indicating elements that are type evaluated together and listed on a single CC can be tested with an IZSM up to 100 % to assure compatibility between the indicating and weighing/load-receiving elements. Separable weighing/load-receiving elements are typically not tested for IZSM since the IZSM is a feature of the indicating element. The Sector considered and agreed that the 20 % limitation was an appropriate value for IZSM in developing the proposal to amend HB 44 paragraph S.2.1.5. based on OIML R 76 [Technical requirements for a self- or semi-self-indicating instrument paragraph 4.5.1. Maximum Effect (of IZSM), WELMEC 2-1 Guide for Testing Indicators] and Canadian requirements (LG-15.04 IZSM Range-Maximum Range of Initial Zero-Setting Mechanism).

At its 2007 Annual Meeting, the WWMA S&T Committee heard comments questioning why Class III L scales are not included in this proposal. A comment was also received to amend the proposal in subparagraph (c) to state that the IZSM "shall not exceed" 20 %. The WWMA S&T Committee agreed with the second comment and recommended amending the proposal as follows:

S.2.1.5. Initial Zero-Setting Mechanism.

(c) ***For indicating elements not permanently attached to weighing and load-receiving elements covered on a separate CC, the maximum initial zero-setting mechanism range shall not exceed 20 % of the configured capacity.***

The WWMA agreed with the intent of the proposal and recommended this proposal, with modifications as shown above, become a Voting item, and that additional research be conducted before the Interim Meeting to determine why Class III L scales were omitted from the existing language in HB 44. (**Technical Advisor's Note:** The 1990 NCWM Annual Report of the S&T Committee Agenda Item 320-1 stated that the Committee believed IZSM was not appropriate or necessary on vehicle scales or other Class III L scales.)

At its 2007 Interim Meeting, the CWMA agreed with the WWMA comment and recommendation.

During the 2008 NCWM Interim Meeting, the Committee heard unanimous support of the item and agreed with the WWMA comments to change the proposed phrase "***must be limited to 20 %***" to "***shall not exceed 20 %***" as shown in the recommendation above. The Committee made the proposal a Voting item.

At the 2008 Annual Meeting, the Committee agreed with a suggestion to eliminate the reference to railway track scales in the third paragraph in the background/discussion section of this item since IZSM has never been applicable to Class III L scales. The Committee subsequently amended the referenced paragraph in its Interim Report for the Final Report. The Committee also agreed to recommend 2009 as the nonretroactive date.

320-5 V S.2.4. Level-Indicating Means and S.2.4.1. Vehicle On-Board Weighing Systems

(This item was adopted.)

Source: Western Weights and Measures Association

Recommendation: Amend paragraphs S.2.4. and S.2.4.1. as follows:

S.2.4. Level-Indicating Means. – Except for portable wheel-load weighers and portable axle-load scales, a portable scale shall be equipped with level-indicating means if its weighing performance is changed by an amount greater than the appropriate acceptance tolerance when it is **tilted up to and including 5 % rise over run in any direction from a level position and rebalanced.** ~~**moved from a level position and rebalanced in a position that is out of level in any upright direction by 5 % (approximately three degrees).**~~ The level-indicating means shall be readable without removing any scale parts requiring a tool.

[This requirement is nonretroactive as of January 1, 1986, for prescription, jewelers', and dairy-product-test scales, and scales marked I and II.]

[Note: Portable wheel-load weighers and portable axle-load scales shall be accurate when **tilted up to and including 5 % rise over run in any direction from a level position and rebalanced.** ~~**placed out of level up to and including 5 % (approximately three degrees).**~~]

(Amended 1991 **and 2008**)

S.2.4.1. Vehicle On-Board Weighing Systems. – A vehicle on-board weighing system shall operate within tolerance when the weighing system is **tilted up to and including 5 % rise over run in any direction from a level position and rebalanced.** ~~**out of level up to three degrees or 5 %.**~~ If the accuracy of the system is affected by out-of-level conditions normal to the use of the device, the system shall be

equipped with an out-of-level sensor that inhibits the weighing operation when the system is out of level to the extent that the accuracy limits are exceeded.

(Added 1992) **(Amended 2008)**

Background/Discussion: The WWMA received a proposal from a manufacturer to amend paragraph S.2.4. to clearly state that the 5 % is referring to slope or grade based on flat plane (180 degrees). The submitter stated that existing language in HB 44 paragraph S.2.4. was confusing and that several individuals in the weighing industry have said that 5 % refers to 5 % of 90 degrees, which would make the approved angle 4.5 degrees. As a result, these manufacturers market their devices as being NTEP certified for 4.5 degrees out-of-level.

During its 2007 open hearings, the WWMA S&T Committee heard comments from the NTETC WS and a weights and measures consultant stating that they believe there is not a problem with existing language. However, additional comments from device manufacturers indicate confusion about the difference between the 5 % requirements and the parenthetical "approximately 3 degrees." The NIST technical advisor noted the "degree" equivalent is used in international recommendations. One scale manufacturer, noting that the limits in HB 44 are not equivalent, stated that an NTEP CC had been issued stating the device complies with out-of level conditions at "5 %" or "3 degrees."

To more clearly state the specification in NIST HB 44, and because 5 % does not correspond exactly with 3 degrees, the WWMA agreed to forward the proposal to NCWM S&T Committee as a Voting item.

At its 2007 Interim Meeting, the CWMA agreed that the language for "Level Indicating Means" could be clarified in HB 44 and agreed that the 5 % inferred a grade or slope and that the existing language did not explicitly state this. Additionally, the CWMA recommended that the phrase in parentheses "(approximately three degrees)" remain in paragraph S.2.4. as shown below. The CWMA further recommended this proposal, as revised by the CWMA, move forward as a Voting item on the NCWM S&T Committee Agenda.

At its 2007 Annual Meeting the SWMA heard support from one manufacturer for the proposal as submitted. Another manufacturer recommended removing the word "approximately" from the parentheses in the fourth line of S.2.4. The SWMA modified S.2.4. accordingly and recommended that the item move forward as a Voting item on the NCWM S&T Committee Agenda.

During the 2008 NCWM Interim Meeting, the Committee heard support for the intent of this item and comments recommending that the reference to "in any upright direction" not be deleted from paragraph S.2.4. and added to paragraph S.2.4.1. WMD commented that the language in HB 44 does not need clarification and that the problem has adequately been addressed by the NTETC WS in their recommendation to clarify the requirements and test procedures in Publication 14. WMD added that if the Committee believes that clarification in the referenced paragraphs is needed, then the SMA recommendation to delete references to "approximately three degrees" would be a reasonable alternative since it does not change the current requirements and is consistent with OIML R 76. The Committee agreed with the justification to clarify the current language in HB 44 and the suggestions from the SMA. Therefore, the Committee decided to present the amended proposal as shown in their Interim Report for a vote at the Annual Meeting.

At their 2008 spring meetings, the CWMA and NEWMA supported the item as originally recommended in the Committee's Interim Report.

At the 2008 Annual Meeting, the Committee heard comments that the proposed language in Publication 16 was more confusing than the existing language in HB 44. The Committee reviewed a similar requirement from Measurement Canada during their deliberations on this item. Based on its review, the Committee amended the proposal as shown in the above recommendation and presented it for a vote.

320-6 I 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 320-9. (This item originated from the NTETC WS and first appeared on the Committee's 2007 agenda.)

Recommendation: (NOTE: This item was 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," "tare-balancing mechanism," "tare-weighing mechanism," "preset tare," "preset tare mechanism," and "tare weight value" to Appendix D.
2. Delete paragraph 2.1.6. and adding a new paragraph S.2.3.6.
3. Modifying paragraphs S.2.3. and S.2.3.1. and adding new paragraphs S.2.3.1.2. and S.2.3.1.3.; S.2.3.2. through S.2.3.8. and S.2.4. through S.2.4.1. 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 kg and 2 kg, a 20 g tare for gross weights between 2 kg 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 semiautomatically or automatically and without an indication of the tare value (weight) when the instrument is loaded. A negative net weight is assumed to be the tare value when the weighing instrument is unloaded. [2.20, 2.24]

(Added 200X)

tare-weighing mechanism. A tare-balancing mechanism that stores the tare value that has been taken either semiautomatically 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), 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 and multi-interval scales when the value of tare is determined in a lower weighing segment), 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 the 2008 Interim Meeting, the Committee did not receive any comments opposing this proposal and made this a Voting item in its Interim Report.

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 some of the definitions and how they are 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 recommend 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 Iinformation status. The Committee also recommends that the NIST technical advisor develop a 1-2 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.

320-7 I 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: SMA Load Cell Manufacturers

Background: 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.

321 BELT-CONVEYOR SCALE SYSTEMS

321-1 V N.2.3. Minimum Test Load

(This item was adopted.)

Source: Western Weights and Measures Association (WWMA)

Proposal: Amend NIST HB 44, Section 2.21. Belt Conveyor Scales (BCS) Systems Code, paragraph N.2.3. as follows:

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

(a) 800 scale divisions,

(b) the load obtained at maximum flow rate in one revolution of the belt, or

(c) at least 10 minutes of operation.

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

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

1. the smaller minimum totalized load is greater than the quantities specified in (a) and (b), and

2. consecutive official testing with the minimum totalized loads described in N.2.3. (a), (b), or (c) and the smaller minimum test load has been conducted that demonstrates the system complies with applicable tolerances for repeatability, acceptance, and maintenance.

(Added 2004) **(Amended 2008)**

Background/Discussion: In 2004 NIST HB 44 paragraph N.2. Conditions of Test. was amended, and the minimum totalized load (MTL) requirements were amended and renumbered to N.2.3. Since 10 minutes of operation in N.3.2.(c) typically results in a test load larger than (a) or (b), the 10 minutes MTL is used for most BCS installations. Additionally, the words "or a normal weighment" were deleted from MTL requirements; 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 deleting the words "or a normal weighment," it has been reported that the revised MTL requirements are 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 minutes MTL with the alternate test load of "2 % of the load totalized in 1 hour."

The restoration of the words "or a normal weighment" allows operation of such BCS systems used exclusively to issue net weights for material conveyed by individual vehicles and railway track cars, provided the systems comply with tolerance and repeatability requirements. It should be noted that the 10-minute test could still be used on installations that do not need to start and stop product flow to continuously fill and issue a totalized weight for several vehicles or railcars (unit trains).

At its 2007 Annual Meeting, the WWMA heard comments from a BCS manufacturer in support of the proposal and, consequently, recommended this proposal move forward as a Voting item on the NCWM S&T Committee Agenda.

During the 2008 Interim Meeting, the Committee heard comments from Bill Ripka, Thermo Fisher Scientific, supporting the proposal. The Committee agreed to present the proposal for a vote at the Annual Meeting.

At its February 2008 meeting, the NW&SA WG on BCS reviewed the proceedings from the Committee's 2008 Interim Report. This led to discussion regarding the comparison and alignment of the recommendation in the Interim Report to similar requirements in OIML R 50 – "Continuous totalizing automatic weighing instruments (belt weighers)" Section 2.5. Minimum Test Load. The WG believes the statement "at least 10 minutes of operation" should be removed and could be brought into alignment with OIML R 50 use of 2 % load in one hour at maximum

flow rate. Additionally, the test load listed in OIML R 50 must be understood as the minimum amount needed for a materials test and is based on the systems maximum flow rate. However, this recommendation was too large of a change to the proposal. Recognizing the urgency of the proposed language, the WG decided to submit their recommendation to align the MTL requirements with R 50 at a later time. The WG recommended changing the proposed language in paragraph N.2.3. to clarify that the minimum test load for applications when the normal weighment is less than 10 minutes still indicate at least 800 scale divisions or one belt revolution.

At its 2008 spring meeting, the CWMA S&T Committee supported the item as written in the Interim Report and recommended that the item move forward to a vote.

At the 2008 Annual Meeting, the Committee heard comments that the proposed language in the Interim Report appeared to indicate that BCS systems would issue weights for the individual vehicles or railway cars. The Committee agreed that the intent was for the belt-conveyor scale system to issue "net weights" for materials conveyed by vehicles and railway track cars. The Committee also agreed with the NW&SA WG recommendation to make the exception for applications for small normal weighments. Consequently, the Committee amended the proposal to read as shown in the recommendation above.

321-2 V UR.2.2.(n) Belt Alignment

(This item was adopted.)

Source: Carryover Item 321-1. (This item originated from the SWMA and first appeared on the Committee's 2007 agenda.)

Recommendation: Modify paragraph UR.2.2.(n) as follows:

UR.2.2. Conveyor Installation

(n) Belt Alignment. – The belt shall not extend beyond the edge of the **outermost roller of any carry side (top)** roller in any area of the conveyor **nor touch the conveyor structure on the return (bottom) side of the conveyor**.

(Amended 1998 **and 2008**)

Background/Discussion: During the 2006 NCWM Interim Meeting, the Committee considered the recommendations from the NCWM review panel and the comments from industry regarding this proposal. The review panel indicated the proposal should have included national data that demonstrated a need for modifying paragraph UR.2.2. and should be a Developing item until such data are provided. At that time, one representative from the belt-conveyor scale service industry indicated there are too many factors that influence belt tracking to ensure a belt is centered at all times. The service representative recommended that the belt should not extend beyond the edge of the idler roller in any area of the conveyor on the carrying side or touch holding brackets on the return side to reduce any detrimental effects on accuracy. Industry representatives indicated the design of idlers and scales are such that the belt is not intended to stay in the exact center. Industry also indicated there was no mechanism available to monitor the belt's tracking 24 hours a day, 7 days a week. Industry requested specifications for what constituted either "center" or an acceptable "range of center" for belt tracking. Although the 2005 SWMA reported the proposal was ready for national consideration, the Committee agreed it was more appropriate to make the proposal a Developing item until there was some clear indication that belt alignment could be tracked for maintenance and accuracy purposes.

During the 2007 NCWM Annual Meeting, the Committee heard testimony that a work group of the NW&SA was addressing this item. The NW&SA, in a letter dated July 31, 2007, submitted a recommendation to the Committee for consideration during the 2008 NCWM Interim Meeting.

In that letter, the NW&SA WG stated there was insufficient evidence of the effect of small lateral movement of the belt to establish a valid requirement narrower than the edge of the idler roller on belt-conveyor scale systems other than the short conveyors used by the original submitter. The WG added that no practical devices were available to measure such lateral alignment changes and recommended the language added to the original proposal above be

withdrawn. However, the WG made the recommendation to modify UR.2.2.(n) to include language to clarify that the belt shall not come into contact with any part of the conveyor structure.

At its 2007 Annual Meeting, the WWMA discussed the letter from the NW&SA and heard from a belt-conveyor scale manufacturer supporting the recommendation from the NW&SA WG because it provided guidance for the user to better maintain the zero condition of the scale and helped prevent damage to the belt. As a result, the WWMA recommended that the NW&SA WG version of UR.2.2. move forward as a Voting item on the NCWM S&T Committee Agenda.

At its 2007 Annual Meeting, the SWMA heard that Montana and the WWMA support the position and alternate proposal from the NW&SA. The SWMA recommended that the NCWM S&T Committee present the alternate proposal shown above and move forward as a Voting item on the NCWM S&T Committee Agenda.

During the 2008 NCWM Interim Meeting, the Committee heard from Bill Ripka, Thermo Fisher Scientific, who supported the intent of the July 31, 2008, alternate proposal, but noted that the language needed some additional refining. The NIST Technical Advisor reported on a letter submitted by the WG on October 19, 2007, that addressed Mr. Ripka's concerns that revised their proposal to clarify that the belt shall not extend beyond the edge of the outermost roller (i.e., wing roller) of the idler since idlers typically include more than one roller. The Committee agreed with the comments and the revised recommendation in that letter and agreed to present the amended proposal as shown in the recommendation for a vote at the Annual Meeting.

At the 2008 Annual Meeting, the Committee reviewed comments from the BSC WG and the CWMA supporting the amended proposal as a Voting item as shown in the Committee's recommendation.

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

324 AUTOMATIC WEIGHING SYSTEMS

324-1 V S.1.2. Value of Division Units and T.2.1. General

(This item was adopted.)

Source: Carryover Item 324-1 (This item originated from the NTETC WS and first appeared on the Committee's 2007 agenda.)

Recommendation: Add a new note to paragraph S.1.2. and amend paragraph T.2.1. as follows:

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

(a) 1, 2, or 5; or

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

Note: The requirement that the value of the scale division be expressed only as 1, 2, or 5, or a decimal multiple or submultiple of only 1, 2, or 5 does not apply to net weight indications and recorded representations that are calculated from gross and tare weight indications where the scale division of the gross weight is different from the scale division of the tare weight(s) on multi-interval or multiple range scales. For example, a multiple range or multi-interval scale may indicate and record tare weights in a lower weighing range (WR) or weighing segment (WS), gross weights in the higher weighing range or weighing segment, and net weights as follows:

55 kg	Gross Weight	(WR2 d = 5 kg)	10.05 lb	Gross Weight	(WSR2 d = 0.05 lb)
– 4 kg	Tare Weight	(WR1 d = 2 kg)	– 0.06 lb	Tare Weight	(WS1 d = 0.02 lb)
= 51 kg	Net Weight	(Mathematically Correct)	= 9.99 lb	Net Weight	(Mathematically Correct)

(Note Added 2008)

S.2.2. Tare. – On any automatic weighing system ***(except for multi-interval scales or multiple range scales when the value of tare is determined in a lower range or segment),*** the value of the tare division shall be equal to the value of the scale division. The tare mechanism shall operate only in a backward direction (i.e., in a direction of underregistration) with respect to the zero-load balance condition of the automatic weighing system. 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 automatic weighing system, 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 that a transaction or lot run be completed.

(Amended 2004 and **2008**)

T.2.1. General. – The tolerance values are positive (+) and negative (-) with the weighing device adjusted to zero at no load. When tare is in use, the tolerance values are applied from the tare zero reference **(zero net indication)**; the tolerance values apply to **the net weight indication for any possible tare load using** certified test loads~~only~~.

(Amended 2008)

Background/Discussion: During the 2007 NCWM Annual Meeting, the Committee heard comments from the CWMA and NEWMA supporting this item with recommendations to change the word "value" to "division" and incorporate the SWMA recommendation to modify paragraph S.2.2.

NEWMA pointed out that the proposed change to paragraph S.2.1. appeared to be permissive and not a requirement and asked if the intent was to prohibit multi-interval and multiple range scales from rounding and indicating calculated net weights in scale divisions to only 1, 2, or 5 or was rounding the scale divisions to only 1, 2, or 5 still allowed. The WMD representative to the NCWM Tare WG stated that the intent was for the language to be permissive because there are a significant number of devices with NTEP CCs in the marketplace that round the tare values before calculating net weights.

The Committee made several modifications to the proposal to:

- clarify the examples in the proposed note to paragraph S.1.2., and
- clarify that SWMA's proposed modification to the language in paragraph S.2.2. for an exception for multi-interval and multiple range scales only applied to the requirement that the value of tare shall be equal the value of the scale division.

The Committee agreed that the words "scale value" should be changed to "scale division" to be consistent with the terminology currently used in HB 44 and recommended the NIST technical advisor forward the amended proposal to the Tare WG and WS for their consideration and comment.

At their fall 2007 meetings, the CWMA, NTETC WS, and WWMA supported this item.

At the 2008 Interim Meeting, the Committee agreed to submit the proposal as amended by WMD for a vote at the Annual Meeting.

At the 2008 Annual Meeting, the Committee agreed with comments from the SMA, the CWMA, and NEWMA to include the word "segment" in paragraph S.2.3., and to submit the proposal as shown in the above recommendation for a vote.

See additional comments and recommendations from Agenda Item 320-2. For additional background information, refer to the Committee's 2007 Annual Report.

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

Source: 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.2.3.1. that provide new requirements for metrological tare (e.g., tare objects weighed or balanced off at the time of the transaction), tare accuracy, operating range, visibility, and preset tares (e.g., manually entered or stored tares for multiple transactions).

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 200X**)

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.

At the 2008 Interim Meeting, the Committee did not receive any comments opposing this proposal and made this a Voting item in their Interim Report.

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 there were some questions regarding 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 recommend 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.

See additional comments and recommendations from Agenda Item 320-6.

330 LIQUID-MEASURING DEVICES

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

Source: Carryover Item 330-4. (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 a**utomatic 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. The Committee did this because it felt strongly that, if the L&R item passed, it was very important to have 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 its 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.

The Committee acknowledged that the item was still in development and identified the following issues to be resolved:

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 indicated that it would continue work on this item and 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 changed 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.

The Committee received input from WMD noting that there are jurisdictions who have reported they are being faced with regulating dispensers with ATC. The language in this proposal will provide those jurisdictions with uniform specifications, test notes, and user requirements.

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 item 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.

330-2 I 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.

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.

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

Source: 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

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

Provided that the dispenser complies with S.1.6.4.1. Display of Unit Price, it is not necessary that all the unit prices for all grades, brands, blends, or mixtures be simultaneously displayed or posted.

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

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

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

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

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

(Added 1989) (Amended 1992)

The following exceptions apply:

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

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

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

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

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

(Added 200X)

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

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

(Amended 2001 **and 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.

The CWMA recommended that the State Directors compile information regarding whether or not they are enforcing 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). If they are not enforcing the specific code requirement, it should be stated why not (for example, overriding state statute). Information was to be sent to James Truex, then Chief of the Ohio Division of Weights and Measures.

At the 2007 NCWM Interim Meeting, the Committee agreed to add this proposal to its agenda as a Developing item.

At its 2007 Annual Meeting, the WWMA urged all stakeholders to provide comments. NEWMA recommended this item remain a Developing item as did the CWMA at its 2007 Interim Meeting.

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 issue, the Committee decided to elevate the status of this item from a Developmental item to an Information item. 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 working group 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 work group 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 working group is being formed to develop this issue further and that working group will meet during the 2008 Annual Meeting. The Committee looks forward to receiving input and suggestions from the working group and encourages interested parties to participate in the working group and/or forward comments to the Committee.

Technical Advisor's Note: 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 work group to review the issue of price posting and computing capability for retail motor-fuel dispensers. The work group 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 working group to study this issue with the idea that the item 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 item 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 work group activities, including meeting agendas and summaries). Because there is no budget to support the cost of regular face-to-face meetings, the work group 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.

331 VEHICLE-TANK METERS

331-1 V S.5.7. Meter Size (Marking Requirements)

(This item was adopted.)

Source: Central Weights and Measures Association (CWMA)

Proposal: Amend S.5. by adding a new sub-paragraph S.5.7. as follows:

S.5.7. Meter Size. – Except for milk meters, if the meter model identifier does not provide a link to the meter size (in terms of pipe diameter) on an NTEP Certificate of Conformance, the meter shall be marked to show meter size.
[Non-retroactive as of January 1, 2009]

Background/Discussion: Wisconsin Weights and Measures reported that field inspectors may not be able to correctly determine the size of a VTM (in terms of pipe diameter) and, therefore, may have applied incorrect tolerances to product depletion tests. The requirement for marking the meter size would provide field inspectors with a positive method for applying the correct tolerance.

The CWMA recommended that the language above move forward as a Voting item on the NCWM S&T Committee Agenda.

At the 2008 Interim Meeting, the Meter Manufacturers' Association (MMA) opposed the proposal submitted by the CWMA in the Committee's Interim Agenda. The MMA stated that currently all NTEP CCs designate the meter size in terms of pipe diameter for each specific model identifier. The MMA also stated that adding an additional marking to the identification plate would add considerable additional cost and that the cost was not justified because the information is already readily available on the NTEP CC. The Committee acknowledged the need for the official to be able to readily determine meter size in order to properly apply the tolerances for the product depletion test. The Committee also acknowledged (as did some manufacturers) that this can sometimes be difficult to determine in a field application given the varying sizes of piping and flanges in a system. However, the Committee agreed with the MMA's concerns noted above and, consequently, modified the original proposal as shown above to allow for alternate approaches for providing the information for the official. The Committee agreed to present the item for a vote at the 2008 NCWM Annual Meeting.

In its spring 2008 meeting report, the CWMA S&T Committee recommended that the item move forward for a vote with a non-retroactive date of January 1, 2009.

At the 2008 NCWM Annual Meeting, the Committee heard comments supporting the compromise language in this item. Comments were also received from NEWMA and WMD that consideration should be given to develop tolerances for product depletion based on the meter flow rate. NEWMA stated in its spring 2008 meeting report that it was going to develop a new proposal where the tolerances will be based on meter flow rates and that the current proposal should be adopted pending the submission of a new agenda item.

331-2 I T.2.1. Automatic Temperature-Compensating Systems

Source: Western Weights and Measures Association (WWMA)

Proposal: 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.

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.

331-3 I UR.2.5. Automatic Temperature Compensation for Refined Petroleum Products

Source: Southern Weights and Measures Association (SWMA)

Proposal: 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.

336 WATER METERS

336-1 V UR.2. Accessibility Customer Indication

(This item was adopted.)

Source: Western Weights and Measures Association (WWMA)

Proposal: Add a new paragraph UR.2. to HB 44, Section 3.36. Water Meters, as follows:

> **UR.2. Accessibility of Customer Indication. – An unobstructed standing space of at least 30 in wide, 36 in deep, and 78 in high shall be maintained in front of an indication intended for use by the customer to allow for reading the indicator. The customer indication shall be readily observable to a person located within the standing space without necessity of a separate tool or device.**

Background/Discussion: At its 2006 Annual Meeting, the WWMA received an industry proposal intended to assist enforcement personnel in properly and uniformly enforcing the applicable regulations for obtaining meter readings. The proposed language is more appropriate than (1) trying to define inherently ambiguous and subjective terms like "reasonable" and "ordinary circumstances" or (2) defining specific height requirements that insure visibility for customers and/or officials. The industry proposal recommended that a new paragraph UR.2. Accessibility for Reading should be added to Section 3.36. Water Meters Code of HB 44 because of the need for language to describe acceptable and applicable provisions.

Industry members stated that existing language in General Code paragraphs G-UR.2.1.1. and G-UR.3.3. includes terms such as "reasonable" and "readily observable" which are subjective requirements; it is not possible to understand the installation requirements without relying on each local authority's interpretation of these terms, which varies even within the same jurisdiction.

In a vast majority of cases, water submetering locations are NOT chosen by the service agency or the property/meter owner, but are dictated by the engineers and architects who use both national and state building and plumbing codes as their primary guide.

The regulation which is most commonly cited on notices of violation for register visibility issues is paragraph G-UR.3.3. Position of Equipment. HB 44 defines direct sale as "*a sale in which both parties in the transaction are present when the quantity is being determined*…." Industry notes that paragraph G-UR.3.3. is being misapplied and should have no bearing on a water submeter application since both parties are **not** present when the quantity is determined. Furthermore, the antonym of a direct sale would be an indirect sale. NIST HB 130, Packaging and Labeling, Section 11. Exemptions, Subsection 11.1.1. Indirect Sale of Random Packages gives examples of indirect sales, several of which are exact examples of how water-submetering bills are paid. Examples of such indirect methods include on-line bill payments, phone bill payments, fax bill payments, and bill payments by mail.

Since water submetering is typically billed on a monthly cycle and since water submetering is not a direct sale where both parties are present at the time of the transaction, accessibility requirements for reading water meters should not

be the same as those enforced on direct sale devices where transactions take place frequently and with both parties present.

If the interpretation of the terms "reasonable and readily observable" continue to be enforced as they are currently, many meter owners will choose to abandon their systems for alternative billing methods such as "remote utility billing service" (RUBS) because re-plumbing existing water lines within walls is costly to building and coop/condo owners. This is especially true because there is no framework in place to know how to perform such a plumbing retrofit so that the work will be compliant with all interpretations of "reasonable" and "readily observable."

A detailed, 12-month sampling of call center complaints from California properties showed that not a single complaint about the difficulty in obtaining a water meter reading had been received.

HB 44, Water Meters Code paragraph S.1.1.1. General permits a remote display as long as it is "readily accessible to the customer."

The industry proposed language was no more definitive than the existing language. The industry proposal removed the requirement for providing a readily accessible customer indicator. The California Division of Measurement Standards (DMS) proposed alternative language that would remove the vagueness from the current requirement while providing flexibility to installers.

Property owners do not read the indicators on each meter or they would be placed in a more convenient reading location. With remote reading, however, many meters are now being placed in inaccessible locations. Hardware is being installed to permit remote readings for billing purposes, but may not be available for customers' use.

Complaints have been lodged where the remote billing did not match the meter readings and the WWMA believed that customers should be able to easily monitor their actual use without involving the property owner.

The industry in California has been advised that remote customer indications are permissible. However, industry has not submitted devices to California DMS for type evaluation. This problem can be resolved in a manner more consistent with other device applications through submitting for type evaluation remote customer indicators to be used in future meter installations.

The WWMA considered the proposal developed by industry and an alternate recommendation developed by California DMS. The industry proposal would have permitted access to indications either through a primary indicator or a remote indicator. Alternatively, operators would be required to provide customer access to meter indications within 24 hours of notification within a billing cycle. The California DMS proposal specified installation requirements that provide for a clear, unobstructed perimeter surrounding the device to ensure accessibility for viewing meter indications.

The WWMA acknowledged that utility submeters are commercial devices. However, the measurement operation takes place over an extended period of time and the customer is not able to observe the entire measurement operation. The customer then receives a bill on a periodic cycle based on meter indications taken at the start and at the end of the billing period. In some cases, the meter operator/owner may be offsite and does not observe primary meter indications. Consequently, no one General Code or Water Meters Code requirement appears to provide a complete and uniform set of guidelines that specifies all conditions for making meter indications available so the consumer can verify the measurement and allow the official to conduct an inspection. Some jurisdictions have developed policies to address this situation. In 2002 paragraph S.1.1.1. General was amended to ensure that when indications are remote they remain accessible to the customer.

In any case, requirements and jurisdiction policies should address the needs of the customer and the official for access to meter indications without placing an undue burden on the operator or customer, and they should not deter a customer from making a legitimate complaint. It is essential in the marketplace to have all components used in determining utility charges transparent; this includes meter indications that are available to all parties involved in the transaction.

The WWMA agreed that each proposal has some elements necessary to address meter accessibility and indicator accessibility. Therefore, the 2006 WWMA recommended the proposal become a Developing item to allow time to rework the text to provide uniform guidelines that fully address accessibility and include the following points: (1) Installation and location is such that there is no obstruction of the meter or indications, and (2) Indications are accessible for viewing by the customer and official without the use of tools separate from the device.

At its 2007 Annual Meeting, the WWMA heard comments from the California DMS stating that the dimensions listed in its alternate proposal are excerpted from utility meter requirements in the Pacific Gas & Electric Utility Company (Green Book) manual and California Weights and Measures Electric Meter regulations. The WWMA agreed with comments from DMS to add a new paragraph UR.2. to the Water Meters Code and believed it was sufficiently developed to be moved forward as a Voting item on the NCWM S&T Committee Agenda.

At the 2008 Interim Meeting, the Committee heard no opposition to the item and agreed to present it for a vote at the 2008 NCWM Annual Meeting.

In their spring 2008 meeting reports, the CWMA and NEWMA supported moving the item forward for a vote.

358 MULTIPLE DIMENSION MEASURING DEVICES

358-1 V A.1. General, Note 7 in Table S.4.1.b., and Appendix D. Definitions

(This item was adopted.)

Source: Western Weights and Measures Association (WWMA)

Recommendation: Add new paragraphs A.1.1. and A.1.2.; amend Note 7 in Table S.4.1.b.; and add new definitions to Appendix D. Definitions. as follows:

A.1. General. – This code applies to dimension and volume measuring devices used for determining the dimensions and/or volume of objects for the purpose of calculating freight, storage, or postal charges based on the dimensions and/or volume occupied by the object. A multiple dimension measuring device:

(a) is generally used to measure hexahedron-shaped objects, and
(Added 2008)

(b) may be used to measure irregularly-shaped objects.
(Added 2008)

Multiple Dimension Measuring Systems Table S.4.1.b. Notes for Table S.4.1.a.
7. Materials, shapes, structures, combination of object dimensions, speed, **spacing, minimum protrusion size,** or object orientations that are inappropriate for the device or those that are appropriate.

(Amended 2004 and 2008)

Appendix D – Definitions.

hexahedron. A geometric solid (i.e., box), with six rectangular or square plane surfaces. [5.58]
(Added 2008)

irregularly-shaped object. Any object that is not a hexahedron shape. [5.58]
(Added 2008)

Background/Discussion. This proposal clarifies the requirements for multiple dimension measuring devices by defining the type of objects measured by these devices and including the definitions for these objects. This proposal also clarifies a complex marking requirement currently included in this section by:

1. Providing a better description of the various objects measured using these devices. As the MDMD Irregular WG discussed "irregularly-shaped objects," it was determined that clarification was required as to the definition of irregularly-shaped objects. Examples of irregularly-shaped objects include, but are not limited to, pails, mufflers, tail pipes, palletized freight containing multiple hexahedron objects, and palletized freight containing large uncontainerized objects such as transmissions or engines.

2. Directing current marking requirements to the appropriate shapes. Current wording requires marking the unit for both appropriate and inappropriate shapes.

3. Defining the terms hexahedron and irregularly-shaped objects to clarify the application of various MDMD devices.

The submitters of this proposal state there are no additional cost impacts to the parties involved in the evaluation of these devices. This proposal will benefit both the NTEP evaluation process as well as the field evaluation process by clarifying the objects to be used during testing.

The WWMA recognized that clarification of the device application and marking requirements, along with the additional definitions, are integral to the understanding of this relatively new NIST Handbook 44 code. However, the WWMA recognized that none of its members have experience in field testing or type evaluating these devices. Consequently, the WWMA recommended that this proposal be an Information item so that others with more experience may provide comments.

At its 2007 Interim Meeting, the CWMA heard comments that the proposed language provided a better description of the various objects measured on multiple dimension measuring devices and supported the language as proposed.

At its 2007 Annual Meeting, the SWMA recommended the proposal move forward on the NCWM S&T Committee Agenda as a Voting item.

At the 2008 NCWM Interim Meeting, the Committee was informed that Measurement Canada believed that the proposal could be in conflict with some of their requirements. The Committee was aware that the MDMD work group was scheduled to meet immediately following the Interim Meeting. The Committee agreed to give the WG the opportunity to address Measurement Canada's concerns and modify the proposal as needed. The Committee further agreed to hold a conference call to discuss any proposed changes to the recommendation as a result of the WG meeting. The WG, with participation from Measurement Canada, modified the proposal and, thereby, resolved Measurement Canada's concerns. During the conference call the Committee agreed to accept the proposed changes from the MDMD work group and to present the item for a vote at the NCWM Annual Meeting.

At the 2008 NCWM Annual Meeting, the Committee heard support for the item from some of the device manufacturers present and received no comments in opposition to this item.

358-2 V S.1.5. Value of Dimension/Volume Division Value

(This item was adopted.)

Source: Western Weights and Measures Association (WWMA)

Recommendation: Add a new subparagraph S.1.5.2. Devices Capable of Measuring Irregularly-Shaped Objects to paragraph S.1.5. Value of Dimension/Volume Division Value, add a new paragraph UR.3.3. as follows, then renumber succeeding paragraphs.

S.1.5.2. Devices Capable of Measuring Irregularly-Shaped Objects. – For devices capable of measuring irregularly-shaped objects, the value of the division size (d) shall be the same for the length axis (x) and

the width axis (y) and may be different for the height axis (z), provided that electronic rotation of the object to determine the smallest hexahedron is calculated in only a two-dimension horizontal plane, retaining the stable side plane as the bottom of the hexahedron.

(Added 2008)

UR.3.3. Object Placement. – If the object being measured must be transported (e.g., shipped) on a stable side, that irregularly-shaped object must be measured while placed on that stable side. The electronic rotation of the object to determine the smallest hexahedron shall be calculated in a two-dimensional horizontal plane, retaining the stable side plane as the bottom of the hexahedron.

(Added 2008)

Background/Discussion: Irregularly-shaped objects are often electronically rotated in software on the "x" and "y" axis to determine the smallest regular hexahedron shape. The only accurate way to perform this function is if the "x" and "y" dimensions are measured with the same resolution, i.e., the same size "d."

The WWMA acknowledged that additional clarifying language may be needed to describe the specifications of devices in this relatively new handbook code. However, the WWMA recognized that none of its members had experience in field testing or type evaluating these devices. Consequently, the WWMA recommended this proposal be an Information item so that others with more experience may provide comments.

At its 2007 Interim Meeting, the CWMA heard comments that the proposed language provided a better description of the various objects measured on multiple dimension measuring devices and supported the language as proposed.

At its 2007 Annual Meeting, the SWMA recommended the proposal move forward on the NCWM S&T Committee Agenda as a Voting item.

At the 2008 NCWM Interim Meeting, the Committee was informed that Measurement Canada believed that the proposal could be in conflict with some of their requirements. The Committee was aware that the MDMD work group was scheduled to meet immediately following the Interim Meeting. The Committee agreed to give the WG the opportunity to address Measurement Canada's concerns and modify the proposal as needed. The Committee further agreed to hold a conference call to discuss any proposed changes to the recommendation as a result of the WG meeting. The WG, with participation from Measurement Canada, modified the proposal and, thereby, resolved Measurement Canada's concerns. During the conference call the Committee agreed to accept the proposed changes from the MDMD work group and to present the item for a vote at the NCWM Annual Meeting.

At the 2008 NCWM Annual Meeting, the Committee heard support for the item from some of the device manufacturers present and received no comments in opposition to this item.

358-3 V N.1.2. Position Test

(This item was adopted.)

Source: Western Weights and Measures Association (WWMA)

Recommendation: Add a new subparagraph N.1.2.1. to paragraph N.1.2. Position Test. as follows:

N.1.2.1. Irregularly-Shaped Test Object Placement. – Irregularly-shaped objects must be measured while placed on a stable side. The rotation of the object to determine the smallest hexahedron should be calculated in a two-dimension plane, retaining the stable side plane as the bottom of the hexahedron.

Background/Discussion: This issue is important to transportation companies which are the primary users of these devices. It is critical that goods are moved while in a stable position in order to ensure the safety of the employees as well as avoiding the damage of goods being transported. Examples are goods mounted to pallets, placement in transportation vehicles, and goods moving along a conveyor belt.

Three-dimension rotation would result in a measurement that typically leaves the measured object in an unacceptable position for transportation for these safety and damage concerns. In fact, it was noted by the MDMD WG that irregularly-shaped goods are frequently labeled with "This End Up," "Top Load," or "Do Not Stack" messages by shippers to enforce these concerns.

To address these concerns, this proposal maintains the "smallest hexahedron" concept while allowing the object to be placed on a stable plane.

The WWMA agreed that clarification and additional guidance was needed for proper field testing of irregularly-shaped items. However, the WWMA recognized that none of its members have experience in field testing or type evaluating these devices. Consequently, the WWMA recommended this proposal be an Information item so that others with more experience may provide comments.

At its 2007 Interim Meeting, the CWMA heard comments that the proposed language provided a better description of the various objects measured on multiple dimension measuring devices and supported the language as proposed.

At its 2007 Annual Meeting, the SWMA recommended the proposal move forward on the NCWM S&T Committee Agenda as a Voting item.

At the 2008 NCWM Interim Meeting, the Committee was informed that Measurement Canada believed that the proposal could be in conflict with some of their requirements. The Committee was aware that the MDMD work group was scheduled to meet immediately following the Interim Meeting. The Committee agreed to give the WG the opportunity to address Measurement Canada's concerns and modify the proposal as needed. The Committee further agreed to hold a conference call to discuss any proposed changes to the recommendation as a result of the WG meeting. The WG, with participation from Measurement Canada, modified the proposal and, thereby, resolved Measurement Canada's concerns. During the conference call the Committee agreed to accept the proposed changes from the MDMD work group and to present the item for a vote at the NCWM Annual Meeting.

At the 2008 NCWM Annual Meeting, the Committee heard support for the item from some of the device manufacturers present and received no comments in opposition to this item.

358-4 V N.1.4. Test Objects

(This item was adopted.)

Source: Western Weights and Measures Association (WWMA)

Recommendation: Add new subparagraphs N.1.4.2. and N.1.4.3. to paragraph N.1.4. Test Objects. as follows:

N.1.4.2. Irregularly-Shaped Test Objects. – For irregularly-shaped test objects, at least one angle shall be obtuse and the smallest dimension for an axis shall be equal to or greater than the minimum dimension for that axis.

N.1.4.3. Test Objects with Protrusions – If the device is marked with a minimum protrusion dimension to be measured, test objects with a protrusion shall be used to verify the marked limitation, during type evaluation.

Background/Discussion: The primary use of these devices is in the calculation of freight transportation charges based on the size of the package. Irregularly-shaped items are typically wrapped in plastic, not enclosed in a container or banded by straps. When these items are measured by humans, judgment can be used to exclude loose plastic wrapping, fly tag labels, strap ends and other protrusions from the dimensions used to determine the irregular object's shape.

When determining the size of irregular objects, these protrusions need to be excluded from the smallest regular hexahedron dimension or the resulting dimensions will generate excessive freight charges to the customer. Defining

the size limit of the protrusion is necessary to distinguish those protrusions that will be excluded from those that are included in an irregular object's shape.

The WWMA agreed that clarification and additional guidance was needed for proper field testing of irregularly-shaped items. However, the WWMA recognized that none of its members have experience in field testing or type evaluating these devices. Consequently, the WWMA recommended this proposal be an Information item so that others with more experience may provide comments.

At its 2007 Interim Meeting, the CWMA heard comments that the proposed language provided a better description of the various objects measured on multiple dimension measuring devices and supported the language as proposed.

At its 2007 Annual Meeting, the SWMA recommended the proposal move forward on the NCWM S&T Committee Agenda as a Voting item.

At the 2008 NCWM Interim Meeting, the Committee was informed that Measurement Canada believed that the proposal could be in conflict with some of their requirements. The Committee was aware that the MDMD work group was scheduled to meet immediately following the Interim Meeting. The Committee agreed to give the WG the opportunity to address Measurement Canada's concerns and modify the proposal as needed. The Committee further agreed to hold a conference call to discuss any proposed changes to the recommendation as a result of the WG meeting. The WG, with participation from Measurement Canada, modified the proposal and, thereby, resolved Measurement Canada's concerns. During the conference call the Committee agreed to accept the proposed changes from the MDMD work group and to present the item for a vote at the NCWM Annual Meeting.

At the 2008 NCWM Annual Meeting, the Committee heard support for the item from some of the device manufacturers present and received no comments in opposition to this item.

360 OTHER ITEMS

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

Many issues before the OIML, the Asian-Pacific Legal Metrology Forum (APLMF), and other international groups are within the purview of the Committee. Additional information on OIML activities will appear in the Board of Directors agenda and Interim and Final Reports and on the OIML website at http://www.oiml.org. NIST WMD staff will provide the latest updates on OIML activities during the open hearing sessions at NCWM meetings. For more information on specific OIML-related device activities, contact the WMD staff listed in the table below. The OIML projects listed below represent only currently active projects. For additional information on other OIML device activities that involve WMD staff, please contact WMD using the information listed below:

NIST Weights and Measures Division (WMD) Contact List for International Activities	
Contact Information	**Responsibilities**
Postal Mail and Fax for All Contacts:	NIST WMD 100 Bureau Drive MS 2600 Gaithersburg, MD 20899-2600 Tel: (301) 975-4004 Fax: (301) 975-8091
Mr. John Barton (LMDG) (301) 975-4002	•R 21 "Taximeters" •R 50 "Continuous Totalizing Automatic Weighing Instruments (Belt Weighers)" •R 106 "Automatic Rail-weighbridges"
Mr. Kenneth Butcher (LMG) (301) 975-4859 kenneth.butcher@nist.gov	•D 1 "Elements for a Law on Metrology" •TC 3 "Metrological Control" •TC 3/SC 1 "Pattern Approval and Verification" •TC 3/SC 2 "Metrological Supervision" •TC 6 "Prepackaged Products"

NIST Weights and Measures Division (WMD) Contact List for International Activities	
Contact Information	**Responsibilities**
Mr. Steven Cook (LMDG) (301) 975-4003 steven.cook@nist.gov	•R 60 "Metrological Regulations for Load Cells" •R 76 "Non-automatic Weighing Instruments"
Dr. Charles Ehrlich (ILMG) (301) 975-4834 charles.ehrlich@nist.gov	•CIML Member •B "OIML Certificate System for Measuring Instruments" •B 10 "Framework for a Mutual Acceptance Arrangement (MAA) on OIML Type Evaluations" •TC 3/SC 5 "Expression of Uncertainty in Measurement in Legal Metrology Applications," "Guidelines for the Application of ISO/IEC 17025 to the Assessment of Laboratories Performing Type Evaluation Tests," & "OIML Procedures for Review of Laboratories to Enable Mutual Acceptance of Test Results and OIML Certificates of Conformity" •TC 3 "Metrological Control"
Mr. Richard Harshman (LMDG) (301) 975-8107 Richard.harshman@nist.gov	•R 51 "Automatic Catchweighing Instruments" •R 107 "Discontinuous Totalizing Automatic Weighing Instruments" (totalizing hopper weighers) •R 134 "Automatic Instruments for Weighing Road Vehicles In-Motion and Measuring Axle Loads"
Ms. Diane Lee (LMDG) (301) 975-4405 diane.lee@nist.gov	•R 59 "Moisture Meters for Cereal Grains and Oilseeds" •R 61 "Automatic Gravimetric Filling Instruments" •R 92 "Wood Moisture Meters-Verification Methods and Equipment" •R 121 "The Scale of Relative Humidity of Air Certified Against Saturated Salt Solution" •TC 17/SC 8 "Measuring Instruments for Protein Determination in Grains"
Mr. Ralph Richter (ILMG) (301) 975-3997 ralph.richter@nist.gov	•R 35 "Material Measures of Length for General Use" •R 49 "Water Meters" (Cold Potable Water & Hot Water Meters) •R 71 "Fixed Storage Tanks" •R 80 "Road and Rail Tankers" •R 85 "Automatic Level Gauges for Measuring the Level of Liquid in Fixed Storage Tanks" •R 105 & R 117 "Measuring Systems for Liquids Other Than Water" (all measuring technologies) •R 118 "Testing Procedures and Test Report Format for Pattern Examination of Fuel Dispensers for Motor Vehicles" •R 137 "Gas Meters" (Diaphragm, Rotary Piston, & Turbine Gas Meters) •R 140 "Measuring Systems for Gaseous Fuel" (i.e., large pipelines) •TC 3/SC 4 "Verification Period of Utility Meters Using Sampling Inspections"
Dr. Ambler Thompson (ILMG) (301) 975-2333 ambler@nist.gov	•D 16 "Principles of Assurance of Metrological Control" •D 19 "Pattern Evaluation and Pattern Approval" •D 20 "Initial and Subsequent Verification of Measuring Instruments and Processes" •D 27 "Initial Verification of Measuring Instruments Using the Manufacturer's Quality Management System" •R 34 "Accuracy Classes of Measuring Instruments" •R 46 "Active Electrical Energy Meters for Direct Connection of Class 2" •TC 5/SC 2 "General Requirements for Software Controlled Measuring Instruments"
Ms. Juana Williams (LMDG) (301) 975-3989 juana.williams@nist.gov	•R 81 "Dynamic Measuring Devices and Systems for Cryogenic Liquids" •R 139 "Compressed Gaseous Fuels Measuring Systems for Vehicles"

NIST Weights and Measures Division (WMD) Contact List for International Activities			
Contact Information		**Responsibilities**	
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 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.

Carol P. Fulmer, South Carolina, Chairman

Todd R. Lucas, Ohio
Brett Saum, San Luis Obispo County, California
Kristin Macey, California
Steve Giguere, Maine

Ted Kingsbury, Measurement Canada, Technical Advisor
Steven Cook, NIST, Technical Advisor
Tina Butcher, NIST, Technical Advisor

Specifications and Tolerances Committee

Appendix A

Item 360-2: Developing Items

Part 1, Item 1 General Code: G-S.1. Identification – (Software)

Source: National Type Evaluation Technical Committee – Software Sector

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.

To comment on this proposal, contact Norm Ingram by e-mail at ningram@cdfa.ca.gov, or by telephone at (916) 229-3016 and Jim Pettinato by e-mail at jim.pettinato@fmcti.com, or by telephone at (814) 898-5250 or by mail at NCWM, Inc., 1135 M Street, Lincoln, NE 68508.

Part 1, Item 2 Appendix D – Definition of Electronic Devices, Software-Based

(This item first appeared on the 2008 S&T Committee Interim Agenda as Item 310-2)

Source: National Type Evaluation Technical Committee (NTETC) – Software Sector

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.

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. 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.

Part 2, 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)

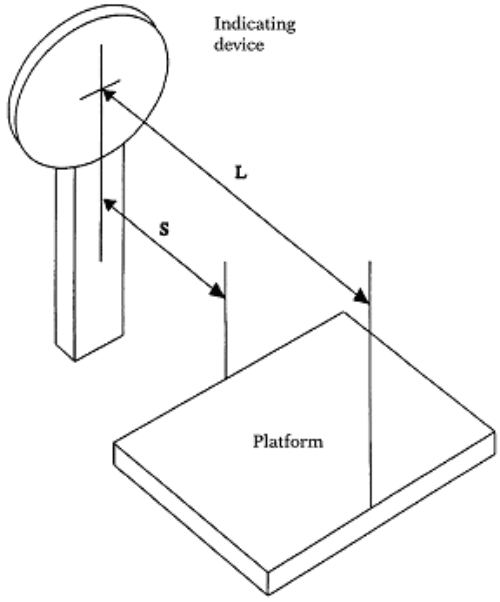

Figure X

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.

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 3, 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) 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.
(Amended 200X)

The action to be taken as a result of the zero-load tests is as follows:
(Added 200X)

- **if the change in zero is less than ± 0.1 %, make no adjustment, record results and proceed to simulated load tests; or**

- **if the change in zero is ± 0.1 % to ± 0.25 %, inspect the conveyor and weighing area for compliance with UR.2. Installation Requirements and retest.**
  (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 work group 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 work group 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 the following revised proposal to the NIST technical advisor to the S&T Committee.

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) **Simulated load tests or material tests and zero-load tests**~~**S**~~**s**~~imulated 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 test interval 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:

(Added 200X)

- **If the zero error is less than 0.25 %, adjustment to zero.**

- **If the zero error is at least 0.25 % but not more than 0.5 %, inspect the belt-conveyor scale system for installation and maintenance items (e.g., clearance, material adhering to the belt, alignment, etc.), make required corrections, adjust the zero, and repeat the zero-load test.**

- **If the zero error is greater than 0.5 %, inspect the belt-conveyor scale system, make required corrections to installation and maintenance items (e.g., clearance, material adhering to the belt, alignment, etc.), adjust the zero, and reduce the interval between zero tests.**

(Added 200X)

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

(Amended 2002)

- 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 **0.5**~~**6**~~ **%, the span shall be adjusted by an authorized service agent and** ~~**adjustment may be made if**~~ the official with statutory authority is notified**;**

  (Amended 1991 **and 200X**)

- If the error is greater than **0.5**~~**6**~~ **%**~~**but does not exceed 0.75 %, adjustments shall be made only by a competent**~~ **an authorized service** ~~**person**~~ **agent** ~~**and the official with statutory authority shall be notified. After such an adjustment, if the results of a subsequent test require adjustment in the same direction, an official tests shall be conducted**~~**shall adjust the span, perform maintenance on the belt-conveyor scale system, and schedule an official test with statutory authority**.

  (Amended 1991 **and 200X**)

- ~~**If the error is greater than 0.75 %, an official test is required.**~~
  (Amended 1987)

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.

To comment on this proposal, contact Steven Cook, NIST Technical Advisor to the NTETC Belt-Conveyor Scales Sector, 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.

Part 3, 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. 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.

To comment on this proposal, contact Steven Cook, NIST Technical Advisor to the NTETC Belt-Conveyor Scales Sector, 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.

Part 4, Item 1 Liquid-Measuring Devices: T.5. Predominance – Retail Motor-Fuel Devices

Source: Central Weights and Measures Association (CWMA)

Recommendation: The CWMA recommends withdrawing its earlier proposal (to add a new paragraph G-UR.4.1.1. to the General Code) and replacing it with 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 and later refined a policy that defined "predominance" to assist field officials in consistently applying the criteria. In 2005 the CWMA agreed to submit a modified proposal to the NCWM S&T Committee with a recommendation that it be placed on the Committee's agenda as a Developing item.

See the 2007 Final Report of the NCWM S&T Committee for additional background information on this item.

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 forwarded these and other comments to the submitter along with a recommendation that the specific proposal being considered be Withdrawn and replaced with an alternate proposal and the new item be made developmental.

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. Consequently, the CWMA developed an alternate proposal for consideration.

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

At its 2008 Annual Meeting, the CWMA recommended the item be Withdrawn.

Part 4, Item 2 Liquid-Measuring Devices: Price Posting and Computing Capability and Requirements for a Retail Motor-Fuel Dispenser (RMFD)

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 a Developmental item to an Information item. See Item 330-3 for details.

Part 5, Item 1 Water Meters: UR.2. Accessibility for Reading (See 336-1)

Recommendation: The WWMA believes that this item is sufficiently developed and recommends that the alternative proposal provided by the DMS as shown in the Committee's Agenda Item 336-1 be placed on the NCWM S&T Committee Agenda as a Voting item.

Part 5, Item 2 Water Meters: S.1.1. 3. Value of the Smallest Unit

Source: Southern Weights and Measures Association (SWMA)

Proposal: Clarify S.1.1.3 of Handbook 44, Section 3.36., for the "value of the smallest unit" of indicated delivery.

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.

Part 5, Item 3 Water Meters: N.4.1.1. Repeatability Tests and T.1. Tolerance Values

Source: Southern Weights and Measures Association (SWMA)

Proposal: Amend repeatability requirements in Section 3.36., Water Meters as follows:

A) Alternative A: Eliminate the repeatability requirements of HB 44, Section 3.36. (N.4.1.1. and T.1.1.) for utility type meters; or

B) Change the test draft quantities of Tables N.4.1. and N.4.2. of HB 44, Section 3.36., as shown in the table below, in order to meet the repeatability requirements as given in N.4.1.1. and T.1.1. for utility type meters.

Changes in test drafts, HB 44, Section 3.36., **if** current repeatability criteria is to be enforced for utility meters (see Tables N.4.1., and N.4.2)

	Maximum Rate			Intermediate Rate			Minimum Rate		
Meter Size (inches)	**Rate of Flow (gpm)**	**Test Draft (gal)**	**Test Draft (ft^3)**	**Rate of Flow (gpm)**	**Test Draft (gal)**	**Test Draft (ft^3)**	**Rate of Flow (gpm)**	**Test Draft (gal)**	**Test Draft (ft^3)**
less than ⅝	8	**100**	**10**	2	**40**	**4**	¼	**20**	**2**
		~~**50**~~	~~**5**~~		~~**10**~~	~~**1**~~		~~**5**~~	~~**1**~~
⅝	15	**100**	**10**	2	**40**	**4**	¼	**20**	**2**
		~~**50**~~	~~**5**~~		~~**10**~~	~~**1**~~		~~**5**~~	~~**1**~~
¾	25	**100**	**10**	3	**40**	**4**	½	**20**	**2**
		~~**50**~~	~~**5**~~		~~**10**~~	~~**1**~~		~~5~~	~~**1**~~
1	40	**100**	**10**	4	**40**	**4**	¾	**20**	**2**
		~~**100**~~	~~**10**~~		~~**10**~~	~~**1**~~		~~**5**~~	~~**1**~~
1½	80	**500**	**50**	8	**400**	**40**	1½	**200**	**20**
		~~**300**~~	~~**40**~~		~~**50**~~	~~**5**~~		~~**10**~~	~~**1**~~
2	120	**500**	**50**	15	**400**	**40**	2	**200**	**20**
		~~**500**~~	~~**40**~~		~~**50**~~	~~**5**~~		~~**10**~~	~~**1**~~
3	250			20	**400**	**40**	4	**200**	**20**
		500	50		~~**50**~~	~~**5**~~		~~**10**~~	~~**1**~~
4	350	**5000**	**500**	40	**4000**	**400**	7	**2000**	**200**
		~~**1000**~~	~~**100**~~		~~**100**~~	~~**10**~~		~~**50**~~	~~**5**~~
6	700	**5000**	**500**	60	**4000**	**400**	12	**2000**	**200**
		~~**1000**~~	~~**100**~~		~~**100**~~	~~**10**~~		~~**50**~~	~~**5**~~

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 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 uncertainly 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. The proposed changes to this item as submitted by Mr. Swanson are included in Appendix B to this report.

During the Committee's open hearings, Jeff Humphreys, Los Angeles County, provided some additional data to consider in conjunction with this item. A letter submitted by Mr. Humphreys that includes the data and that outlines his jurisdiction's comments on the proposal is included in Appendix C to the Committee's report.

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.

Appendix B

Water Meter Manufacturers' Proposed Changes to Developing Item Part 5, Item 3 Water Meters

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The National Conference on Weights and Measures
Attn: Ms Cardin – NCWM Chair and Mr. Fulmer – S&T Committee Chairman
15245 Shady Grove Road
Suite 130
Rockville, MD 20850

July 10, 2008

Subject: Proposed changes to Handbook 44 section 3.36 Water Meters

Dear Ms Cardin and Mr. Fulmer,

Attached are three separate proposals for change to section 3.36 Water Meters of Handbook 44. The specific sections are N.3 Test Drafts and N.4 Testing Procedures, T1.1 Repeatability, S1.1.3 Value of Smallest Unit and S1.1.6 Proving Indicator. I have also included a version of 3.36 as it would read if all of the proposals were accepted.

These proposals are supported by five water meter manufacturers. The manufactures involved are; Badger Meter Inc., Elster Metering, Master Meter, Neptune and Sensus Metering.

We are not asking for any immediate action at the July conference, but would like the committee to review the proposals if time permits. I unfortunately will not be able to attend the conference, but we have been working with Ms Kristin Macey of Division of Measurement Standards California Department of Food & Agriculture, and I'm sure she could provide some additional insight if needed.

We will be submitting these proposals to the regional conferences this fall in order to gain their support.

If you have any questions, please do not hesitate to contact me.

Thank you for your time and consideration.

Regards,

Scott Swanson
Manager, Customer Quality & Engineering Support
Sensus Metering Systems

PROPOSAL

COMMITTEE: S&T Standing Committee

Priority Level: 1		***Date:***	July 10, 2008
Contact Person:	Scott Swanson	***Telephone:***	(724) 430-4059
		Fax:	(724) 439-7861
		Email:	scott.swanson@sensus.com
Jurisdiction:	All NCWM Sections and derivative standards.		
Proposal:	Amend Section T.1. in Handbook 44, Sec. 3.36.		

We propose that Section T.1. be amended to address repeatability for utility type water meters.

We propose that Section T.1.1. Repeatability read as follows. The tables mentioned below can be found on the following page.

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 performing repeatability tests on utility type water meters, test draft sizes shall comply with Tables T.1.1. and T.1.2. Repeatability Testing for Utility Type Water Meters is to be applied only during type evaluation testing.

Justification:	Harmonize with utility type water meter designs derived from AWWA standards

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" and smaller, meter registration test hands (proving indicators) have graduations with resolution down to 0.1 gallons or 0.01 cubic feet. For meters 1½ inch and 2 inch, test hands have graduations with resolution down to 1.0 gallons 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.

Reasons for:	
Additional Considerations:	

PROPOSAL

COMMITTEE: S&T Standing Committee

Priority Level: 1		***Date:***	July 10, 2008
Contact Person:	Scott Swanson	***Telephone:***	(724) 430-4059
		Fax:	(724) 439-7861
		Email:	scott.swanson@sensus.com
Jurisdiction:	All NCWM Sections and derivative standards.		
Proposal:	Amend Section N.3. and N.4. in Handbook 44, Sec. 3.36.		

We propose that Section N.4. Testing Procedures be changed 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 proposal is to amend paragraph N.3. to read as follows.

N.3. Test Drafts.

(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).

2. The second 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 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. The two proposed tables are attached.

Justification:	Harmonize with AWWA standards and water meter manufacturers.

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 1inch and smaller, meter registration test hands (proving indicators) have graduations with resolution down to 0.1 gallons or 0.01 cubic feet. For meters 1½ inch and 2 inch, test hands have graduations with resolution down to 1.0 gallons 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).

(N.3. and N.4. arguments) 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.

Reasons for:	
Additional Considerations:	

PROPOSAL

COMMITTEE: S&T Standing Committee

Priority Level: 3		***Date:***	July 10, 2008
Contact Person:	Scott Swanson	***Telephone:***	(724) 430-4059
		Fax:	(724) 439-7861
		Email:	scott.swanson@sensus.com
Jurisdiction:	All NCWM Sections and derivative standards.		
Proposal:	Amend Section S.1.1.3. in Handbook 44, Sec. 3.36.		

We propose that subsection (a) be amended and an additional subsection be added to S.1.1.3. Value of Smallest Unit.

We propose that Section S.1.1.3. read 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 inch and smaller, or
(b) 500 L (100 gal, 10 ft^3) on utility type meters, sizes 1.5 inch and 2 inch, or
(c) 0.2 L (1/10 gal, 1/100 ft^3) on batching meters delivering less than 375 L/min (100 gal/min, 13 ft^3/min), or
(d) 5 L (1 gal, $^1/_{10}$ ft^3) on batching meters delivering 375 L/min (100 gal/min, 13 ft^3/min) or more.

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.

Justification:	Harmonize with AWWA standards and water meter manufacturers.

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 1inch and smaller, meter registration test hands (proving indicators) have graduations with resolution down to 0.1 gallons or 0.01 cubic feet. For meters 1½ inch and 2 inch, test hands have graduations with resolution down to 1.0 gallons or 0.1 cubic feet. The smallest unit of indicated deliver is then given by one full revolution of the test hand (amounting to 100 graduations).

Reasons for:	
Additional Considerations:	

Appendix C

Jeff Humphrey's Letter and Comments on Developing Item Part 5, Item 3 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" 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: JAN. '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"	1	2	0								2	2	
Amco	C-700	5/8"	16	183	174	9			9						
Amco	C-700	3/4"	3	22	22										
Amco	C-700	1"	3	42	42										
Badger	RCDL 25	5/8"	21	171	165	6			6						
Kent	C-700	5/8"	1	2	1		1		1						
Neptune	T-10	5/8"	65	749	655	26	9	1	42	6 mech fails		4		52	34mech fails
Master Meter	USA 140C F	5/8" USG HOT	51	875	765	5	4	8	19	2		11	37	91	7 NoS/N
Master Meter	MM3C	5/8"	3	39	26									13	
Master Meter	MM4	3/4"	3	28	23				1					4	
Master Meter	MM5C	1" USG COLD	12	337	262	5		6	53			1	21	22	
Master Meter	FAM	5/8" USG COLD	29	575	466	3	15		21			17	1	88	
Master Meter	FAM	3/4"	1	14	3							11		11	
Perfor-mance	PPD	5/8"	1	1	1										

PASSING RATES FOR METERS TESTED - JAN. '08 - JUL. '08

	Arad	**AmcoC 700 5/8"**	**AmcoC 700 3/4"**	**AmcoC -700 1"**	**Badger RCDL25 5/8"**	**Kent C-700 5/8"**	**Neptune T-10 5/8"**	**USA140CF 5/8"**	**Master Meter MM3C 5/8"**	**Master Meter MM4 3/4"**	**Master Meter MM5 C1" USG**	**Master Meter FAM 5/8" USG**	**Master Meter FAM 3/4"**	**Performance PPD 5/8"**
% 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

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