Specifications and Tolerances Committee
Interim Agenda

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Reference
Key Number

300 INTRODUCTION

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

The recommendations are statements of proposals and are not necessarily those of the Committee. Suggested revisions to the handbook are shown in **bold face print** by ~~**striking out**~~ information to be deleted and **underlining** information to be added. Requirements that are proposed to be nonretroactive are printed in **bold-faced *italics.***

Note: The policy of NIST is to use metric units of measurement in all of its publications; however, recommendations received by the NCWM technical committees have been printed in this publication as they were submitted and may, therefore, 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	NW&SA	National Weighing and Sampling Association
CC	Certificate of Conformance	NCWM	National Conference on Weights and Measures, Inc.
CWMA	Central Weights and Measures Association	NEWMA	Northeastern Weights and Measures Association
EPO	Examination Procedure Outline	NIST	National Institute of Standards and Technology
GS	Grain Analyzer Sector	NTEP	National Type Evaluation Program
GMM	Grain Moisture Meters	NTETC	National Type Evaluation Technical Committee
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
OEM	Original Equipment Manufacturer	VTM	Vehicle-tank Meters
"Handbook 44" (HB 44) means the 2008 Edition of NIST Handbook 44 "Specifications, Tolerances, and Other Technical Requirements for Weighing and Measuring Devices"			
"Handbook 130" (HB 130) means the 2008 Edition of NIST Handbook 130 "Uniform Laws and Regulations in the Areas of Legal Metrology and Fuel Quality"			
Note: NIST does not imply that these acronyms are used solely to identify these organizations or technical topics.			

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

310 GENERAL CODE

310-1 G-S.8. Provision for Sealing Electronic Adjustable Components

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 1993)
>
> – ***The application of the physical security seal shall ensure that the access to the set-up mode is disabled, or***

– ***The device shall clearly indicate that it is in the configuration mode and record such message if capable of printing in this mode, or shall not operate while in this mode, or shall automatically exit the configuration mode after 60 minutes.***

[*Nonretroactive as of January 1, 200X]

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.

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

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 base on the revision of OIML R 76 Non-automatic weighing instruments sub-sections 5.5.1. (Type P) and 5.5.2. (Type U).

310-3 Appendix D – Definition of Equipment

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: Add a new definition to Appendix D in HB 44 for "equipment" as follows:

equipment. Weights, measures, and weighing and measuring devices, instruments, elements, and systems or portion thereof, used or employed in establishing the size, quantity, value, extent, area, composition, constituent value, 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. [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]

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 as shown below and recommended the proposal move forward as a voting item on the NCWM S&T Committee Agenda.

equipment. 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, constituent value, 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]

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.

320 SCALES

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

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

Recommendation: At the 2007 Annual Meeting, the Committee modified the proposed language developed after the 2007 Interim Meeting. The recommendation (as modified by the Committee) currently under consideration by the Committee is to amend S.1.1.1. 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.
[Nonretroactive as of January 1, 1993]

Note: The "center-of-zero" indication may also work when zero is indicated for gross load zero or after a tare operation.

(Amended 1992 **and 200X**)

Background/Discussion: 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 zero tracking could be operable in the net mode) to include additional language which alters the requirement

even more. For example in paragraph S.1.1.1.(a), stating "and" instead of "or" makes both requirements mandatory. 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.

WMD agreed with the CWMA, NEWMA, and SMA and recommended deleting the changes added to the proposal (changing "or" to "and," and requiring all electronic indicators maintain zero within ¼ e). WMD suggested the Committee consider amending the proposal as shown in the recommendation to be more consistent with the original intent of the NTETC WS. In case the Committee had chosen to recommend Agenda Item 320-1 for a vote, WMD provided the Committee with a second proposal to consider at a later date to define the zero condition of a scale with a center-of-zero annunciator while the scale was in a "sleep mode."

The Committee agreed with comments heard that the language in its 2007 Interim report significantly changed the original intent of the proposal. Additionally, the changes to the "center-of-zero" indication requirements were in conflict with OIML recommendations and Canadian requirements.

The Committee agreed the status of the item should be changed to Informational and that the first alternate proposal from the WMD should become a carryover item for the 2008 Committee agenda since that text was consistent with the intent of the original proposal from the WS.

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.**

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

320-2 S.1.2.1. Weight Units and T.N.2.1. General

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 paragraph 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.*
> *[Nonretroactive as of January 1, 1989]*
>
> **Note: The requirement that the value of the scale division be expressed only as 1, 2, or 5, or a decimal multiple or submultiples 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 scale indicating a tare weight of 2 kg in the lower range or segment and a gross weight of 5 kg in the higher range or segment may indicate a net weight of 3 kg, or a scale indicating a tare weight of 20 lb in the lower range or segment and a gross weight of 50 lb in the higher range or segment may indicate a net weight of 30 lb.
(Added 1987) **(Amended 200X)**

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 range)**, 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.**
(Amended 1985)

*[**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 200X)

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 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., and
- to clarify that the SWMA proposed modification to the language in S.2.3. 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 also 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 that the NIST technical advisor forward the amended proposal to the Tare WG and WS for their consideration and comment.

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

At its 2007 Annual Meeting, the WS reviewed this item 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 than 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:

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.*
[Nonretroactive as of January 1, 1989]

Note: The requirement that the value of the scale division be expressed only as 1, 2, or 5, or a decimal multiple or submultiples 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 scale where the first weighing range (WR1) has a division size of 2 kg and the second weighing range (WR2) has a division size of 5 kg that indicates a tare weight of 4 kg in the lower range or segment and a gross weight of 55 kg in the higher range or segment may indicate a net weight of 51 kg, or 0.06 lb tare weight in a weighing range or segment with 0.02 lb intervals and with 0.05 lb intervals in the higher weighing range may have a net weight in the higher weighing range with 0.01 lb division size as follows:

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

(Amended 200X)

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 range)****, 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.**
(Amended 1985)

*[**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 200X)

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)

The CWMA and NEWMA agreed with the Fall 2007 WS and WWMA recommendation.

The CWMA and WWMA recommend that this proposal move forward as a voting item on the NCWM S&T Committee Agenda.

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

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, 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.

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

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.

(b) **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.

(c) ***Indicating element not permanently attached to weighing and load-receiving elements covered on a separate CC. The maximum Initial Zero-Setting Mechanism range of electronic indicators must be limited to 20 % of the configured capacity.***
[Nonretroactive as of January 1, 200X]
(Added 200X)

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 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 separable weighing/load-receiving elements from small capacity scales to railroad-track scale load-receiving elements 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 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.

320-5 S.2.4. Level-Indicating Means

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 moved from a level position and rebalanced in a position that is out of level **on a slope or grade (rise over run) up to and including ~~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 in 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 placed out of level **on a slope or grade (rise over run)** up to and including 5 % ~~(approximately three degrees).~~]
(Amended 1991 **and 200X**)

S.2.4.1. Vehicle On-Board Weighing Systems. – A vehicle on-board weighing system shall operate within tolerance when the weighing system is out of level up to three degrees or 5 **% slope or grade (rise over run)**. 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 200X)**

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 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 added that 5 % without a "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 above 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 state as such. 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.

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 moved from a level position and rebalanced in a position that is out of level **on a slope or grade (rise over run) up to and including** in any upright direction by 5 % (approximately three degrees). The level-indicating means shall be readable without removing any scale parts requiring a tool.

[Note: Portable wheel-load weighers and portable axle-load scales shall be accurate when placed out of level **on a slope or grade (rise over run)** up to and including 5 % (approximately three degrees).]

S.2.4.1. Vehicle On-Board Weighing Systems. – A vehicle on-board weighing system shall operate within tolerance when the weighing system is out of level up to three degrees or 5 % **slope or grade (rise over run)**. 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 200X)

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. as shown below and recommended that the item move forward as a voting item on NCWM S&T Committee Agenda.

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 moved from a level position and rebalanced in a position that is out of level in any upright direction by **a** 5 % **slope/grade (~~approximately~~ slightly less than** 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 placed out of level up to and including **a** 5 % **slope/grade (~~approximately~~ slightly less than** three degrees).]
(Amended 1991 **and 200X**)

S.2.4.1. Vehicle On-Board Weighing Systems. – A vehicle on-board weighing system shall operate within tolerance when the weighing system is out of level up to three degrees or **a** 5 % **slope/grade**. 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 200X)

320-6 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: Modify the definition for "tare mechanism" and add new definitions for "gross weight value," "net weight," "net weight value," "tare," and "tare weight value" to Appendix D.

Amend the following definition for "tare mechanism:"

tare mechanism. A 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 indication to zero when the tare object is on the load-receiving element:**

1. **by reducing the weighing range for net loads (e.g., subtractive tare where Net Weight + Tare Weight ≤ Gross Weight Capacity), or**
2. **without altering the weighing range for net load on mechanical scales (e.g., additive tare mechanism such as a tare bar on a mechanical scale with a beam indicator).**

The tare mechanism may function as:

1. **a non-automatic mechanism (load balanced by an operator),**
2. **a semi-automatic mechanism (load balanced automatically following a single manual command),**
3. **an automatic mechanism where the load is balanced 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. The term "net mass" or "net weight" means 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)

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 weight value. The weight value of a load determined by a tare mechanism. [2.20, 2.24]
(Added 200X)

In September 2007, the Tare WG submitted the following additional definitions with the recommendation they be added to HB 44.

Calculated weight (gross or tare) value. Calculated sum or difference of more than one measured weight value and/or calculated net value.
(Added 200X)

Tare-balancing mechanism. A tare mechanism with an indication that tare has been taken 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.

(Added 200X)

Tare-weighing mechanism. A tare-balancing mechanism that stores the tare value and is capable of displaying (continuously or upon command) or printing the value whether or not the instrument is loaded.
(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; e.g., with a typical 10-key keyboard with values 0 through 9, by the pushing of a key numbered 5, the number 5 is entered as a tare value.**

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

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

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

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

- **Proportional Tare. A preset tare value, automatically calculated by the scale, proportional to the gross weight indicated by the scale. A proportional tare can be a percentage tare or a fixed tare value proportional to a range of gross weights (i.e., a 10 g tare for gross weights between 0 and 2 kg, a 20 g tare for gross weights between 2 and 4 kg, etc.). A proportional tare is, therefore, not limited to being a percentage tare.**

(Added 200X)

In September 2007, the Tare WG submitted the following proposal:

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

S.2.3. ~~Tare~~ Value of Tare Indication and Recorded Representations:

~~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 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)

*[**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. – The interval of a tare weighing mechanism shall be equal to the scale interval of the weighing device for any given load.

(a) *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 range****), the value of the tare division shall be equal to the value of the scale division.**
*[*Nonretroactive as of January 1, 1983]*

(b) ~~S.2.3.1.~~ 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)

(Renumbered 200X)

In September 2007, the Tare WG submitted the following proposal:

S.2.3.2. Accuracy. – A tare weighing or balancing mechanism shall permit setting the 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 d1 (division value of the first weighing segment).

S.2.3.3. Operating Range. – The tare mechanism shall be such that it cannot be used at or below its zero effect or above its maximum indicated effect.

On a single or multiple range scale, the maximum tare capacity cannot exceed the maximum capacity of the highest weighing range.

On a multi-interval scale, the maximum tare capacity cannot exceed the maximum capacity of the first weighing segment.

S.2.3.4. Visibility of Operation. – Operation of the tare mechanism shall be visibly indicated on the instrument. In the case of instruments with digital indications, this shall be done by marking the indicated net value with the word "NET" or the symbol "N."

"NET" may be displayed as "NET", "Net" or "net".

If a scale is equipped with an indicator that allows the gross value to be displayed temporarily while a tare mechanism is in operation, the "NET" symbol shall disappear while the gross value is displayed.

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

S.2.3.6. 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.**

S.2.3.7. 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:

1) **After zero/tare setting the effect of accuracy of the zero setting shall be not more than ± 0.25 d.**

2) **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.**

3) **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.**

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

S.2.3.8. Consecutive Tare Operations. – Repeated operation of a tare mechanism (including preset tare) is permitted. If more than one tare mechanism is operative at the same time, tare weight values shall be clearly designated (identified) when indicated or printed.

S.2.3.9. 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 "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.2.3.4.) 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, they shall be suitably identified.

f) When gross, net, and tare values are printed together, one of these values may be calculated from two actual determinations of mass. In the case of a multi-interval device, the weight gross or tare calculated value may be printed with a smaller scale interval.

g) The printout of a calculated gross or tare weight value shall be clearly identified. This should be done by the symbol "C" in addition to the symbols mentioned above, if applicable, or by the completer complete word "calculated."

Tare WG Comment: The requirements in f) and g) are from the revised version of R 76 and are beyond what is currently required by HB 44 and NTEP.

S.2.4. Preset Tare Mechanism.

S.2.4.1. Modes of Operation. – A preset tare mechanism may be operated together with one or more tare devices provided:

- **the preset tare mechanism complies with paragraph S.2.3.8. Consecutive Tare Operations., and**
- **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,**
- **the preset tare associated with a price look-up (PLU) shall be automatically cancelled at the same time a PLU is cancelled, and**
- **the preset tare values are designated by the symbol "PT"; however, it is permitted to replace the symbol "PT" with complete words.**

Tare WG Comment: The symbol "PT" is from the revised version of R 76 and is beyond what is currently required by HB 44 and NTEP. The Tare WG considered a class and capacity exception for lower capacity scales since they felt that the need for providing the additional type of tare information is greater for larger capacity scales and for vehicle scale applications where preset tares are not allowed by some jurisdictions. However, the WG decided to present the wording as recommended in R 76 since U.S. manufacturers that internationally market their devices may already be capable of complying with these requirements.

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.2.4.2. Indication of Operation. – Operation of the preset tare device 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 sign "NET", "Net" or "net". If an instrument is equipped with a device that allows the gross value to be displayed temporarily while a tare device is in operation, the "NET" symbol shall disappear while the gross value is displayed. It shall be possible to temporarily indicate the preset tare value.

Paragraph S.2.3.9. 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:

1. **a Class II or a Class III instrument with a maximum capacity not greater than 100 kg used in direct sales to the public,**

2. **price computing scales, and**
3. **nonautomatic weigh/price labeling scales.**

Note: Paragraph S.2.4.2. also applies to weighing devices with a combined semi-automatic zero-setting device and a semi-automatic tare-balancing device operated by the same key.

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 its 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.

The WS stated that the Tare WG had completed its work. The Sector agreed that the majority 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 and recommended an amended definition for "tare mechanism." The Sector agreed with the WG that the highlighted 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 Items 320-3B and 320-3C 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 with the Tare WG's suggested specifications changes that 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.

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

321 BELT-CONVEYOR SCALE SYSTEMS

321-1 N.2.3. Minimum Test Load

Source: Western Weights and Measures Association (WWMA)

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

N.2.3. Minimum Test Load. – The minimum test load shall not be less than the largest of the following values.

(a) 800 scale divisions,

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

(c) at least 10 minutes of operation **or for a normal weighment that is less than 10 minutes (i.e., belt-conveyor systems used exclusively to issue weights for individual vehicles, and railway track cars).**

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 200X)

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 paragraph 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 because 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 such operation of BCS systems used exclusively to issue weights for individual vehicles and railway track cars provided the systems comply with tolerance and repeatability requirements. It should be noted that the 10 minutes 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 who supported the proposal as shown above and recommended this proposal move forward as a voting item on the NCWM S&T Committee Agenda.

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

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. – <u>The belt shall be centered on the idlers in the weighing area and shall track in practically the same position whether empty or loaded.</u> The belt shall not extend beyond the edge of the idler roller in any area of the conveyor.
(Amended 1998 **<u>and 2007</u>**)

Background/Discussion: During the 2006 NCWM Interim Meeting, the Committee considered the recommendations from the NCWM review panel and the comments from industry. 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 added language in the original proposal above be withdrawn.

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

UR.2.2.(n) Belt Alignment. The belt shall not extend beyond the edge of **~~the idler~~ <u>any carry side (top)</u>** roller in any area of the conveyor. **<u>The belt shall not touch the conveyor structure on the return (bottom) side of the conveyor.</u>**

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.

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

324 AUTOMATIC WEIGHING SYSTEMS

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

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 requirements 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 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 scale indicating a tare weight of 2 kg in the lower range or segment and a gross weight of 5 kg in the higher range or segment may indicate a net weight of 3 kg, or a scale indicating a tare weight of 20 lb in the lower range or segment and a gross weight of 50 lb in the higher range or segment may indicate a net weight of 30 lb.
(Note Added 200X)

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),*** 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 **200X**)

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 200X)

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. as shown in the recommendation above.

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
- to 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.

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

At their fall 2007 meetings, the CWMA, NTETC WS, and the WWMA supported this item. See additional comments and recommendations from Agenda Item 320-2.

324-2 Appendix D; Definitions for Tare Mechanism, Gross Weight Value, Net Weight, Net Weight Value, Tare, and Tare Weight Value

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

Recommendation: For those definitions that apply to Section 2.24. Automatic Weighing Systems, modify the definition for "tare mechanism" and add new definitions for "gross weight value," "net weight," "net weight value," "tare," and "tare weight value" to Appendix D as shown in the "Recommendation" for Scales Code Item 320-6.

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. The Committee recommended that new S&T Item 324-2, along with a corresponding proposal to apply these definitions to devices that fall under the Scales Code S&T Item 320-6, be discussed and considered jointly during all deliberations and voting procedures. In the interest of brevity, the Committee placed all recommendations, discussion, and background information for this proposal in S&T Item 320-6 because the proposed definitions apply to both applications; this ensures both proposals are addressed collectively.

At their fall 2007 meetings, the CWMA, NTETC WS, and the WWMA supported this item. See additional comments and recommendations from Agenda Item 320-6.

330 LIQUID-MEASURING DEVICES

330-1 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 °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 °C **for liters or ~~(~~**60 °F**~~)~~ for gallons.**

S.2.7.2. Display of Net and Gross Quantity. – A device equipped with 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 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 °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 Seal 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 automatic temperature compensation, the primary indicating elements, recording elements, ~~**or**~~**and** recorded representation shall be clearly and conspicuously marked to show that the volume delivered has been adjusted to the volume at 15 °C **for liters or ~~(~~**60 °F**~~)~~ for gallons.**
(Amended 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.4.4~~5~~. Retail Devices.

S.4.4~~5~~.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 automatic temperature-compensating-systems, normal tests shall be conducted:

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

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

The first test shall be performed with the automatic temperature-compensating system operating in the "as found" condition. On devices that indicate or record both the compensated and uncompensated volume for each delivery, the tests in (a) and (b) may be performed as a single test.
(Amended 1987 **and 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 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**~~ automatic temperature ~~**compensator**~~ **compensation**, it shall be connected,

operable, and in use at all times. An electronic or mechanical automatic temperature-compensating system may not be removed, nor may a compensated device be replaced with an uncompensated device, without the written approval of the ~~**responsible**~~ weights and measures jurisdiction **with statutory authority over the device**.
[**Note**: This requirement does not specify the method of sale for product measured through a meter.]
(Amended 1989 **and 200X**)

UR.3.6.1.2. Recorded Representations (Invoices, Receipts, and Bills of Lading).

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

(b) The invoice issued from an electronic wholesale device equipped with an automatic temperature-compensating system shall also indicate: (1) the API gravity, specific gravity or coefficient of expansion for the product; (2) product temperature; and (3) gross reading.

(Amended 1987 **and 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 °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 HB 44 for type approval and field testing. The L&R-proposed language would permit the temperature-compensated sale of petroleum products at all levels of distribution.

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

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

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

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

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

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

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

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

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

At its 2007 Interim Meeting, NEWMA received the following proposal from the State of New York:

Proposal: To ensure uniformity in application of the ATC requirements being considered by the S&T Committee, New York proposed that test notes be added to HB 44 specifying acceptable proving equations. In addition, New York recommended using a procedure for RMFDs similar to that used in Canada to simplify the inspector's job by reducing the level of calculations necessary to verify ATC functions in a system.

The following equation is found in OIML R120 Section 4.7 Calculation of meter error.

The value of the meter error is determined using the following equations:

$E = E' + E_\alpha + E_\beta$

$E' = [(V_m - V_s) / V_s] \times 100$

$E_\alpha = \alpha\ (t_s - t_m) \times 100$

$E_\beta = \beta\ (t_r - t_s) \times 100$

Where:

- E is the meter error, in %
- E' is the uncorrected error, in %
- E_α is the temperature correction for the test liquid, in %
- E_β is the temperature correction for the standard capacity measure (%)
- V_m is the volume indicated by the meter, in L
- V_s is the volume measured in the standard capacity measure, in L
- t_s is the average liquid temperature in the standard capacity measure, in °C
- t_m is the average liquid temperature in the meter, in °C

- t_r is the reference temperature of the standard capacity measure, in °C
- α is the cubic expansion coefficient of the test liquid due to temperature, in $°C^{-1}$
- β is the cubic expansion coefficient of the standard capacity measure due to temperature, in $°C^{-1}$

The United States differs from OIML in several minor respects that require amendment of the OIML formulas for use in enforcing Handbook 44.

- First, the U.S. inspector often calculates the error in volume units rather than percent. This is driven by the custom in the United States of using provers with gages reading in 0 at nominal volume. In addition, the gage graduations on those provers often have units different than the device under test.
- Second, the U.S. inspector typically uses delivery error, which means the error would be calculated as (prover – meter) rather than (meter – prover) as in the OIML equations.
- Third, the U.S. system may use either the Celsius or the Fahrenheit temperature scale.
- Fourth, the U.S. system requires computation of errors for both net and gross deliveries, yet the OIML equation is written for gross indication only.

The U.S. proving equation for gross delivery error would be derived from the OIML equation by reversing a few terms to reflect error calculation as (prover – meter) and expressing errors in volume units by multiplying both sides of the OIML equation by $V_s / 100$. After these manipulations, a combination/reduction of common terms results in Equation (1) for gross delivery error. For net delivery error, the term $[1 + \alpha (t_s – t_m)]$ must be replaced with a factor for the predicted change in volume between the observed product temperature and the product reference temperature. For liquids with stable expansion properties this factor is given by $1 / [1 + \alpha (t_s – tref)]$ (where tref is the product reference temperature). This results in Equation (2) for net delivery.

(1) $E \text{ (gross delivery)} = V_s \times [1 + \alpha (T_s – T_m)] \times [1 + \beta (T_s – T_r)] – V_m \text{ (gross)}$

(2) $E \text{ (net delivery)} = V_s \times [1 / (1 + \alpha (T_s – Tref))] \times [1 + \beta (T_s – T_r)$

Where: (note: all volume units and all temperature units must be compatible)

- E is the delivery error, in volume units
- V_m (gross) is the gross volume indicated by the meter, in volume units
- V_m (net) is the net volume indicated by the meter, in volume units
- V_s is the volume measured in the standard capacity measure, in volume units
- T_s is the average liquid temperature in the standard capacity measure in °F or °C
- T_m is the average liquid temperature in the meter in °F or °C
- T_r is the reference temperature of the standard capacity measure in °F or °C
- Tref is the reference temperature of the product in °F or °C
- α is the cubic expansion coefficient of the test liquid due to temperature in $°F^{-1}$ or $°C^{-1}$
- β is the cubic expansion coefficient of the standard capacity measure due to temperature in $°F^{-1}$ or $°C^{-1}$

These equations work well for pure liquids with uniform expansion properties over the market temperature range. However, for complex mixtures of liquids (generalized products like gasoline and diesel fuel) with variable expansion properties, the use of a single coefficient of expansion will result in errors in calculations. For example the actual expansion coefficient for 62 API gasoline changes significantly from roughly 0.000705 @ 0 °F to 0.000682 @ 110 °F. With appropriate Volume Correction Factor (VCF) tables such as API Table 6b, the formulas can be amended to replace these terms with equivalent expressions using the available VCF's as in (1a) and (2a) to accurately correct for these variations.

(1a) $E \text{ (gross delivery)} = V_s \times [VCF(T_s) / VCF(T_m)] \times [1 + \beta (T_s – T_r)] – V_m\text{(gross)}$

(2a) $E \text{ (net delivery)} = V_s \times VCF(T_s) \times [1 + \beta (T_s – T_r)] – V_m\text{(net)}$

Where:

VCF(T) is the volume correction factor from the appropriate table for the temperature at the meter or in the standard measure.

All other terms are equivalent to those in equations (1) and (2).

Performing the calculations will probably require either a computer application or lengthy hand calculations with manual table look-ups for the inspector. When doing wholesale meters or LP meters, there is downtime while product is returned to the storage tank at the end of each test run. This time will not be available for the solo inspector when testing RMFDs as he/she will be occupied with the manual return of product. Based on testing procedures developed by officials from Measurement Canada, there may be alternatives that can simplify the calculations and avoid loss of productivity for inspectors.

Under conditions of relative temperature stability, an inspector can use the net and gross readings from a test draft to derive an average VCF for the delivery. With a simple look-up table, the average temperature used by the dispenser can be derived from that VCF, and that temperature can be compared to the observed temperature at the thermometer well. Measurement Canada has established these should agree to within 1 °C (1.8 °F) if the ATC system is working correctly. This corresponds to approximate agreement of the gross and net indications to within 0.12 % for 62 API gasoline and 0.085 % for 36 API diesel fuel. The calculations are simple and can be done using only a hand calculator in just a few keystrokes. In addition, the calculations need not be run on every delivery but perhaps only on the last delivery to allow maximum opportunity for temperature stabilization. Thus the only limitation on the inspector is to run sufficient product to ensure the product delivery temperature remains constant perhaps within 1 °F during the delivery used to verify the ATC system. Where disputes arise, the full calculation methods would serve as the final official value.

NEWMA recommended that Item 330-1 remain as an Information item but move forward as further information becomes available from the ATC Steering Committee and L&R Committee.

NEWMA anticipates this method could be used for any ATC system where the system provides both net and gross from the same test draft and the test is performed under relatively stable temperature conditions. This was verified using existing data taken during tests of wholesale and LP meters. Of course, the gross/net agreement requirement would permit larger deviation for LP since it has a significantly larger coefficient of expansion and net/gross agreement is only required at 0.5 %. This equates to about 2.9 °F agreement for LP with a coefficient of expansion of around 0.0017 °F.

In further support of this concept, it is important to note that when the existing gross/net agreement requirement was added to the LMD and LPG Codes of HB 44, there was an alternative proposal to apply temperature accuracy requirements to temperature probes on devices with ATC. The agreement option was chosen over the temperature verification. The submitter believed this was primarily because the process to verify accuracy of thermometers was difficult even under lab conditions. Also the agreement requirement looked not only at the accuracy of the temperature sensor but what the system did with that information. The agreement is essentially a performance test that can be easily done in the field. In addition, this agreement method eliminates issues of accurately finding the temperature in the prover, which is significantly affected by the ambient air and other factors.

Thus, it seems clear that the NCWM should consider adopting separate proving equations for pure liquids and generalized products, and adopting the derived temperature method for use in testing ATC functions. NEWMA therefore recommended adding new Sections N.6. and N.7. to the LMD code as follows, and further suggested the S&T Committee add similar sections to other codes where ATC equipment is used.

N.6. Volume Proving Equations. – The equations/methods in N.6.1. through N.6.3. shall be used to calculate errors or otherwise determine device compliance with tolerances for initial and subsequent verification for both gross and net volume. The equations in N.6.1. or N.6.2. shall be used in type evaluation.

Definition of Terms Used in Volume Proving in N.6.1. and N.6.2.

- **E (gross) is the delivery error for gross volume, in volume units**
- **E (net) is the delivery error in net volume, in volume units**
- **Vm (gross) is the gross volume indicated by the meter in volume units**
- **Vm (net) is the net volume indicated by the meter in volume units**

- **V_s is the volume measured in the standard capacity measure in volume units**
- **Ts is the average liquid temperature in the standard capacity measure in °F or °C**
- **T_m is the average liquid temperature in the meter in °F or °C**
- **T_r is the reference temperature of the standard capacity measure in °F or °C**
- **Tref is the product reference temperature in °F**
- **α is the cubic expansion coefficient of the test liquid due to temperature in $°F^{-1}$ or $°C^{-1}$**
- **β is the cubic expansion coefficient of the standard measure due to temperature in $°F^{-1}$ or $°C^{-1}$**
- **$VCF(T_s)$ is the volume correction factor from the appropriate table at the liquid temperature in the standard measure**
- **$VCF(T_m)$ is the volume correction factor from the appropriate table at the average liquid temperature in the meter**

Note: All volume units used in these equations must be identical to the units displayed on the device. In addition, the temperature units and those of coefficients of expansion shall be consistent, e.g., all Celsius or all Fahrenheit.

N.6.1. Proving Equations for Liquids with Uniform Expansion Properties. – The formulas below shall be used to calculate device errors for any product having uniform expansion properties over the market range of temperature, i.e., for liquids with a uniform coefficient of expansion.

N.6.1.1. Gross Delivery Error.
$$E \text{ (gross delivery)} = V_s \times [1 + \alpha \times (T_s - T_m)] \times [1 + \beta \times (T_s - T_r)] - V_m \text{ (gross)}$$

N.6.1.2. Net Delivery Error.
$$E \text{ (net delivery)} = V_s \times [1 / (1 + \alpha \times (T_s - Tref))] \times [1 + \beta \times (T_s - T_r)] - V_m \text{ (net)}$$

N.6.2. Proving Equations for Liquids with Variable Expansion Properties. – The formulas below shall be used to calculate device errors for any product having non-uniform expansion properties over the market range of temperature, that is, liquids with a variable coefficient of expansion. The volume correction factors (VCF's) used in these equations shall come from appropriate tables as defined in regulation. These formulas may also be used in place of those in N.6.2., where a VCF table for the product has been derived using the established coefficient of expansion as in N.6.2.3.

N.6.2.1. Gross Delivery Error.
$$E \text{ (gross delivery)} = V_s \times [VCF(T_s) / VCF(T_m)] \times [1 + \beta \times (T_s - T_r)] - V_m \text{ (gross)}$$

N.6.2.2. Net Delivery Error.
$$E \text{ (net delivery)} = V_s \times VCF(T_s) \times [1 + \beta \times (T_s - T_r)] - V_m \text{ (net)}$$

N.6.2.3. Derivation of Volume Correction Factors (VCF's) for a Liquid with Uniform Expansion Properties. – Volume correction factors may be calculated for a liquid with uniform expansion properties using the following formula.
$VCF(T) = [1 / (1 + \alpha \times (T - Tref))]$ **Where T is the temperature**

N.7. Verification for Electronic Automatic Compensating Systems using Volume Correction Factor Applied to the Transaction. – The following verification method may be used to verify conformance of net indications on electronic automatic temperature-compensating systems with the tolerances in paragraph T.4. during initial and subsequent verifications. This method may be used only if:

(a) the gross indications are within appropriate tolerances as per N.6.1.1. or N.6.2.1.;
(b) the device provides both net and gross indications for the same test draft; and
(c) the delivery temperature at the meter is uniform within 1 °F (0.5 °C) throughout the test draft.

If these conditions are not met, or in the case of dispute, determine compliance using the appropriate proving formulas in N.6.1.2. or N.6.2.2.

(a) During the delivery, monitor the temperature at the meter.
(b) If the temperature is stable within 1 °F (0.5 °C), calculate an average observed temperature for the delivery.
(c) Verify the gross indication is within tolerance using N.6.1.1. or N.6.2.1.
(d) Using the net and gross meter indications, compute the VCF applied to the transaction as (net indication/gross indication).
(e) Using the appropriate VCF table for the product, verify that the VCF applied to the transaction falls within the following limits:
(1) for Acceptance Tolerances the VCF applied to the transaction shall be not greater than the VCF corresponding to 0.9 °F or 0.5 °C less than the average observed temperature for the delivery nor less than the VCF corresponding to 0.9 °F or 0.5 °C more than the average observed temperature for the delivery.
(2) for Maintenance Tolerances the VCF applied to the transaction shall be not greater than the VCF corresponding to 1.8 °F or 1.0 °C less than the average observed temperature for the delivery nor less than the VCF corresponding to 1.8 °F or 1.0 °C more than the average observed temperature for the delivery.

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 for liters or the volume in gallons at 60 ºF for gallons 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.

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

Source: Central Weights and Measures Association (CWMA)

Proposal: Add a new paragraph as follows:

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.

Background/Discussion: 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 that 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.

The CWMA recommended the language in the above proposal move forward as a voting item on the NCWM S&T Committee agenda.

331 VEHICLE-TANK METERS

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

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, a meter shall be marked to show meter size. [Non-retroactive as of January 1, 200X)

Background/Discussion: Wisconsin Weights and Measures has 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 recommends that the language above move forward as a voting item on the NCWM S&T Committee Agenda.

331-2 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.

331-3 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 or non-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 measuring devices shall have active automatic temperature compensation and all 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 sold using ATC and others are not and will help to address consumers' questions such as, why the last delivery to a consumer's house applied ATC and today's delivery did 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.

336 WATER METERS

336-1 UR.2.1. Accessibility Customer Indication

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-UR2.1.1. 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. 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.

358 MULTIPLE DIMENSION MEASURING DEVICES

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

Source: Western Weights and Measures Association (WWMA)

Proposal: 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.1.1. A Multiple Dimension Measuring Device is generally used to measure regular hexahedron-shaped objects.

A.1.2. A Multiple Dimension Measuring Device may be used to measure irregularly shaped objects.

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, **minimum protrusion size,** or object orientations that are inappropriate for the device or those that are appropriate.

(Amended 200X)

Appendix D – Definitions.

hexahedron. A regular hexahedron shape is one where all faces of the object are square, i.e., a cube.

irregularly shaped object. Any object that is not a regular hexahedron shape.

This proposal clarifies the requirements by defining the type of objects measured by these types of devices and includes the definition of 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 irregular shaped objects. Examples of irregular 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 recognizes 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 recognizes that none of its members have experience in field testing or type evaluating these devices. Consequently, the WWMA recommends 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.

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

Source: Western Weights and Measures Association (WWMA)

Proposal: 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. as follows:

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 'x' (length) and 'y' (width) axis and may be different for the 'z' (height) axis.

Background/Discussion: Irregular 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.

358-3 N.1.2. Position Test

Source: Western Weights and Measures Association (WWMA)

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

N.1.2.1. Irregular 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.

358-4 N.1.4. Test Objects

Source: Western Weights and Measures Association (WWMA)

Proposal: 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. For irregular 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. If the device is marked with a minimum protrusion dimension to be measured, an irregular shaped test object with that size protrusion shall be used to verify the marked limitation.

Background/Discussion: The primary use of these devices is in the calculation of freight transportation charges based on the size of the package. Irregular 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.

360 OTHER ITEMS

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

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

NIST Weights and Measures Division (WMD) 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. 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"
Mr. Steven Cook (LMDG) (301) 975-4003 steven.cook@nist.gov	•R 50 "Continuous Totalizing Automatic Weighing Instruments (Belt Weighers)" •R 51 "Automatic Catchweighing Instruments" •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 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 106 "Automatic Rail-weighbridges" •R 107 "Discontinuous Totalizing Automatic Weighing Instruments" (totalizing hopper weighers) •R 134 "Automatic Instruments for Weighing Road Vehicles In-Motion and Measuring Axle Loads"
Ms. Diane Lee (LMDG) (301) 975-4405 diane.lee@nist.gov	•R 59 "Moisture Meters for Cereal Grains and Oilseeds" •R 92 "Wood Moisture Meters-Verification Methods and Equipment" •R 121 "The Scale of Relative Humidity of Air Certified Against Saturated Salt Solution" •TC 17/SC 8 "Measuring Instruments for Protein Determination in Grains"
Mr. Ralph Richter (ILMG) (301) 975-3997 ralph.richter@nist.gov	•R 35 "Material Measures of Length for General Use" •R 49 "Water Meters" (Cold Potable Water & Hot Water Meters) •R 71 "Fixed Storage Tanks" •R 80 "Road and Rail Tankers" •R 85 "Automatic Level Gauges for Measuring the Level of Liquid in Fixed Storage Tanks" •R 105 & R 117 "Measuring Systems for Liquids Other Than Water" (all measuring technologies) •R 118 "Testing Procedures and Test Report Format for Pattern Examination of Fuel Dispensers for Motor Vehicles" •TC 3/SC 4 "Verification Period of Utility Meters Using Sampling Inspections" •TC 8/SC 7 P1 "Measuring Systems for Gaseous Fuel" (i.e., large pipelines) •TC 8/SC 8 "Gas Meters" (Diaphragm, Rotary Piston, & Turbine Gas Meters)

NIST Weights and Measures Division (WMD) Contact List for International Activities	
Contact Information	**Responsibilities**
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 21 "Taximeters" •TC 8/SC 7 P2 "Compressed Gaseous Fuels Measuring Systems for Vehicles"

LIST OF ACRONYMS			
ILMG – International Legal Metrology Group	LMDG – Legal Metrology Devices Group LMG – Laws and Metrics Group	B – Basic Publication CIML – International Committee of Legal Metrology D – Document	P – Project R – Recommendation SC – Subcommittee 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, Colorado
Rick Fogal, Pennsylvania

Ted Kingsbury, Measurement Canada, Technical Advisor
Steven Cook, NIST, Technical Advisor
Richard Suiter, NIST, Technical Advisor

Specifications and Tolerances Committee

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Appendix A

Item 360-2: Developing Items

Part 1, Item 1 Scales: S.1.4.6. Height and Definition of Minimum Reading Distance, UR.2.10. Primary Indicating Elements Provided by the User, UR.2.11. Minimum Reading Distance and Definitions of Minimum Reading Distance and Primary Indications

Source: NTETC WS

Note: This proposal was Carryover Item 320-2 in the Committee's 2006 Agenda and appeared on the Committee's 2007 Agenda as Item 320-4. (This item originated from the 2005 NTETC WS and first appeared on the Committee's 2006 agenda.) 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: The Committee considered the WS's first attempt at a proposal that adds new paragraphs S.1.4.6., UR.2.10., and UR.2.11. to the Scales Code.

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)

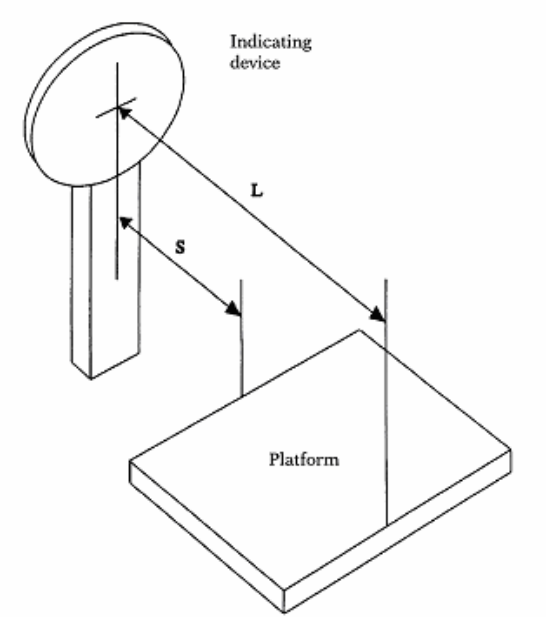

Figure X

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.

Field and laboratory officials need more specific requirements to consistently determine if indications are suitable for the environment in which the device is used. Currently only the Taximeters, Grain Moisture Meters, and Near-Infrared Grain Analyzers Codes include requirements that specify the minimum height of figures, words, and symbols. The size requirements for all three device technologies were developed primarily because of concerns about the visibility of indications from the customer's position. HB 44 and NCWM Publication 14 include no uniform size requirements or specific guidelines on how to evaluate display information for clarity and readability for equipment other than these three device types.

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:

- The proposed 2 mm height limits in the proposal may possibly be an error due to a miscommunication within the WS. The value was intended to be closer to that of the figure in the example display which was 4 mm.

- 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. This approach was explored by the 2006 WS in its review of the relationship of size requirements for taximeter indications. The legibility of primary indications is dependent upon or relative to not only the distance the reader is from the information, but also the total area (square footage) of the display panel where those markings are posted. For example, a 9.5 mm figure is not a suitable size for a primary indication on a typical vehicle scale scoreboard because of the distance of the scoreboard from the typical customer position.

- Corresponding new language in HB 44 that is similar to that which exists in HB 130 for labels might be needed. This language may be necessary to provide guidelines to ensure sufficient contrast between the color and illumination of all required markings and their background. For example, a requirement might 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." This language would be consistent with current General Code requirements or might be added to a specific code section of HB 44.

- 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.

For more background information refer to the Committee's 2006 Final Report.

During the 2007 Annual Meeting, The Committee was informed that the NTETC WS will continue to develop this item.

At its 2007 NTEP Participating Laboratory meeting, the weighing device labs discussed this item and reviewed the equivalent recommendations in OIML R 76. It was noted that the minimum height requirement for the weight display applied to scales used in direct sale applications with a capacity of 100 kg or less. Additionally, it was noted that R 76 was written to apply to weighing devices that indicated primarily in SI units and that U.S. scales are frequently configured with both SI and inch-pound units. The labs agreed with the suggestion that the proposed language for the minimum height of the weight display be limited to scales used in direct sales with a capacity of 200 kg or less. The minimum height of the "units" indication would only be applicable to devices with external lb/kg switching capability since there would be no chance of facilitating fraud using the lb/kg switching capability.

The NIST technical advisor contacted a manufacturer about the labs' recommendation to revise proposed S.1.4.6. The manufacturer believed most products could comply; however, he would not speak for other manufacturers. He also stated that this did not address questions about the minimum size of an annunciator that points to a unit legend silk-screened on the scale next to the annunciator.

The WMD adds that there has been little discussion on the clarity of the displays and annunciators and perhaps the proposal should include language similar to Handbook 130 Packaging and Labeling Regulation paragraphs:

- 8.1.2. Style of Type or Lettering that states that the "declaration or declarations of quantity shall be in such a style of type or lettering as to be boldly, clearly, and conspicuously presented with respect to other type, lettering, or graphic material on the package, except that . . . ," and

- 8.1.3. Color Contrast that states that the "declaration of quantity shall be in a color that contrasts conspicuously with its background . . ."

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.

At its 2007 Annual Meeting, the WS reviewed and discussed the amended proposal from the NTEP participating laboratories. Manufacturers stated they prefer the proposed paragraph be written so the requirements apply to new NTEP applications instead of all devices manufactured after the effective date. They state that the cost to modify the design of the scale displays is not justified considering they have not received comments from their customers stating consumers are complaining that the size of the displays are too small. Additionally, the majority of the Sector believed the current definition for "primary indications" in HB 44 is sufficient and that it be deleted from the proposal.

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 there may not be a necessity for such a requirement due to other requirements already present in HB 44. (G-UR.3.3). However, including a specification in HB 44 has merit. No additional user requirement would be 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.

Part 2, Item 1 Belt-Conveyor Scale Systems: UR.3.2.(c) Maintenance; Zero Load Tests

Source: 2005 Western Weights and Measures Association (WWMA)

Recommendation: Modify UR.3.2.(c) 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**~~**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.
(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)**~~

- 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~~simulated load tests~~, or material tests, and zero-load tests~~ shall be conducted at periodic intervals between official tests in order to provide reasonable assurance that the device is performing correctly. **The minimum 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 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.

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 2, Item 2 Belt-Conveyor Scale Systems: N.3.1.4. Check for Consistency of the Conveyor Belt Along Its Entire Length

Source: 2005 Western Weights and Measures Association (WWMA)

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

> **N.3.1.4. Check for Consistency of the Conveyor Belt Along Its Entire Length. – 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.** ~~**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 and 200X)**~~

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.

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 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)

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

Recently NIST conducted a national survey of retail motor-fuel dispenser testing, and the results pointed to a need to gain more uniformity in the application of tolerances. There is a wide variation in how different states handle the "predominance" question. Strides should be continually made to gain uniformity. Adoption of the proposed new paragraph G-UR.4.1.1. would be one step toward gaining greater uniformity. With more than 5 years of history using the proposed criteria, Wisconsin saw a relatively low number of devices rejected on the basis of "predominance," and most station owners and all service companies have a working understanding of predominance.

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

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

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

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

The WWMA believed that:

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

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

G-UR.4.1. Maintenance of Equipment. – All **weighing and measuring** equipment in service and all mechanisms and devices attached thereto or used in connection therewith shall be continuously maintained in proper operating condition throughout the period of such service. Equipment in service**, by group or entirety,** at a single place of business found to be in error predominantly in a direction favorable to the device **owner or** user shall not be considered "maintained in a proper operating condition."

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

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

The CWMA supported the following language as proposed.

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

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

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

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

G-UR.4.1. Maintenance of Equipment. – All **weighing and measuring** equipment in service and all mechanisms and devices attached thereto or used in connection therewith shall be continuously maintained in proper operating condition throughout the period of such service. Equipment in service**, by group or entirety,** at a single place of business found to be in error predominantly in a direction favorable to the device **owner ~~or user~~** shall not be considered "maintained in a proper operating condition."

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

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

Part 3, Item 2 Liquid-Measuring Devices: Price Posting and Computing Capability and Requirements for a Retail Motor-Fuel Dispenser (RMFD)

Source: WMD and all Regional Associations

Recommendation: Review and update NIST HB 44 requirements that address RMFD pricing and computing capability. This issue is under development and not ready for committee action.

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 and recent years have seen 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 NCWM S&T Committee and has also discussed a variety of pricing practices with individual state and local weights and measures jurisdictions.

NIST WMD is now in the process of reviewing the existing requirements and their application to current market practices. WMD has 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 is interested in receiving input from the weights and measures community about the various practices and pricing structures in use. Working with input from the weights and measures community, WMD plans to introduce proposed modifications to current requirements through the regional weights and measures associations and technical committees. In the meantime, WMD welcomes 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 encourages NIST in its efforts to tackle this ongoing issue. Therefore, the WWMA recommends this item be considered and move forward to the national level as a Developing item.

The CWMA recommends 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 is to be sent to:

James Truex, Chief
Division of Weights and Measures
8995 E. Main Street
Reynoldsburg, Ohio 43068

Phone: (614) 728-6290
Fax: (614) 728-6424
E-mail: truex@mail.agri.state.oh.us

NEWMA looks forward to further development of this item.

The SWMA recommends adding this item to the NCWM S&T Committee's 2007 agenda as a Developing item.

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, and recommended this item remain a Developing item.

At its 2007 Interim Meeting, the CWMA recommended this remain a Developing item on the NCWM S&T Committee agenda.

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.

To comment on this proposal, contact NIST technical advisors to the NCWM S&T Committee: Steve Cook at steven.cook@nist.gov, or by telephone at (301) 975-4003, or Richard Suiter at richard.suiter@nist.gov, or by telephone at (301) 975-4406, or either by fax at (301) 975-8091, or by mail at NIST WMD, 100 Bureau Drive MS 2600, Gaithersburg, MD 20899-2600.

Part 4, 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 4, 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.

Utlity 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 4, 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 5/8	8	**100**	**10**	2	**40**	**4**	¼	**20**	**2**
		~~**50**~~	~~**5**~~		~~**10**~~	~~**1**~~		~~**5**~~	~~**1**~~
5/8	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 rougly 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.

Part 5, 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[1]
TYPE P electronic devices shall meet at least one of the methods in each column:			
Hard-Marked	X	X	Not Acceptable
Continuously Displayed	X	X	X
By command or operator action	Not Acceptable	Not Acceptable	X[2]
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]

[1] If the manufacturer declares that the primary sensing element "software" is integral, has no end user interface and no print capability, the element may be considered exempt from the marking requirement for version/revision. 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.
[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 task of the Sector is 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 Steve Patoray spatoray@mgmtsol.com (e-mail), or by telephone at (828) 859-6178 or by mail at NCWM, Inc., 15245 Shady Grove Road. Suite 130, Rockville, MD 20850.

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