

Report of the Specifications and Tolerances Committee

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Reference
Key Number

300 INTRODUCTION

This is the final report of the Committee on Specifications and Tolerances (S&T) (hereinafter referred to as the “Committee”) for the 92nd Annual Meeting of the National Conference on Weights and Measures (NCWM). The report is based on the Interim Report offered in the NCWM Publication 16, “Committee Reports,” testimony at public hearings, comments received from the regional weights and measures associations and other parties, the addendum sheets issued at the Annual Meeting, and actions taken by the membership at the voting session of the Annual Meeting.

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 Items marked “W” have been withdrawn from consideration.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

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

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

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Table C
Glossary of Acronyms

AWS	Automatic Weighing Systems	NCWM	National Conference on Weights and Measures, Inc.
CC	Certificate of Conformance	NEWMA	Northeastern Weights and Measures Association
CWMA	Central Weights and Measures Association	NIST	National Institute of Standards and Technology
EPO	Examination Procedure Outline	NTEP	National Type Evaluation Program
GS	Grain Analyzer Sector	NTETC	National Type Evaluation Technical Committee
GMM	Grain Moisture Meters	RMFD	Retail Motor-Fuel Dispenser
GPMA	Gasoline Pump Manufacturers Association	SI	International System of Units
HB 44	NIST Handbook 44	SMA	Scale Manufacturers Association
HB 130	NIST Handbook 130	SWMA	Southern Weights and Measures Association
LMD	Liquid-Measuring Device	WMD	NIST Weights and Measures Division
LPG	Liquefied Petroleum Gas	WS	Weighing Sector
MDMD	Multiple Dimension Measuring Devices	WWMA	Western Weights and Measures Association
MFM	Mass Flow Meter	USNWG	NIST/OIML U.S. National Work Group
MMA	Meter Manufacturers Association	WG	Work Group
MS	Measuring Sector	VTM	Vehicle-tank Meters
OEM	Original Equipment Manufacturer		
<p>“Handbook 44” (HB 44) means the 2008 Edition of NIST Handbook 44 “Specifications, Tolerances, and Other Technical Requirements for Weighing and Measuring Devices”</p> <p>“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.”</p>			
<p>Note: NIST does not imply that these acronyms are used solely to identify these organizations or technical topics.</p>			

Table D
Voting Results

Reference Key Number	House of State Representatives		House of Delegates		Results
	Yeas	Nays	Yeas	Nays	
300 (Consent Calendar)	42	0	38	0	Passed
310-1A	41	0	39	0	Passed
320-6	30	10	32	7	Passed
330-2	42	1	38	0	Passed
330-3	27	15	30	9	Passed
331-1	34	6	35	3	Passed
300 (Report in its Entirety Voice Vote)	All Yeas	No Nays	All Yeas	No Nays	Passed

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

310 GENERAL CODE**310-1A V G-S.2. Facilitation of Fraud**

(This item was adopted)

Source: Western Weights and Measures Association (WWMA)

Recommendation: Amend HB 44, Section 1.10. General Code paragraph G-S.2. as follows:

G-S.2. Facilitation of Fraud. - All equipment and all mechanisms, software, and devices attached ~~thereto to~~ or used in ~~connection-conjunction~~ therewith shall be so designed, constructed, assembled, and installed for use such that they do not facilitate the perpetration of fraud.

Background/Discussion: This proposal modified the language in paragraph G-S.2. to clarify that the prohibition against facilitating fraud applied to the electronically programmed and coded components of weighing and measuring devices. Some argued the existing language in Section 1.10. General Code. Paragraph G-S.2. Facilitation of Fraud was intended to address only hardware components of weighing and measuring devices. That is, “equipment, mechanisms, and devices” and the mechanics of how they are “constructed, assembled, and installed” appeared to deal with tangible components. Fraud issues in the past ten years involved: (1) altering, manipulating, or interfering with software interfaced with or installed in equipment; (2) microprocessor issues such as additional pulser units hidden in gas pumps and taximeters; and (3) software programs permitting manipulation of vehicle scale data used to generate weighmaster certificates.

The CWMA, SWMA, and WWMA recommended this item move forward for a vote.

NEWMA recommended this item be referred to the NTETC Software Sector for review and input.

At the 2007 NCWM Interim Meeting, the Committee considered the WWMA proposal and an alternate proposal developed by the SMA. The Committee acknowledged that neither proposal was reviewed by the NTETC Software Sector. The Committee agreed that updating the requirement could be accomplished by adding general terms to address the types of electronic and software-based technology being fraudulently used today. The WWMA proposed language naming specific software applications that should not facilitate fraud. Whereas, the SMA alternate proposal included broader language that is intended to prohibit fraudulent use of software, wireless connections, and all future technology “without limitation.” The Committee agreed the SMA proposal encompasses all possible equipment configurations and more appropriately addressed the problem at hand. Therefore the Committee agreed to present the SMA proposal for a vote at the 2007 NCWM Annual Meeting.

At the 2007 NCWM Annual Meeting, the Committee considered multiple alternate proposals from the regional weights and measures associations, NTETC Software Sector, SMA, and NTEP participating laboratories to modify paragraph G-S.2. and agreed on the above proposal that maintained the original intent of the design specification and also clearly expanded the scope of the requirement to apply to software and wireless connections affecting metrological parameters. The Committee also considered a proposal to define the term “equipment” which has a unique meaning to requirements in HB 44, making it difficult to determine which part of a device or system must meet paragraph G-S.2. The proposed new definition of equipment was based on paragraph G-A.1. Commercial and Law-Enforcement Equipment and clarifies the various types and portions of a device or system used to establish a weight or measure that must comply with paragraph G-S.2. However, because the definition had just been introduced to the Conference, the Committee recommended splitting the proposal so that the proposed definition became a separate Information item presented as Item 310-1B. The proposal to modify paragraph G-S.2. was renumbered to become 310-1A and was presented for a vote.

310-1B I Appendix D – Definition of Equipment

Source: NIST Weights and Measures Division

Recommendation: Add a new definition for “equipment” to Appendix D 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]

Discussion: The Committee agreed there is a need to define the term “equipment” since the term is used throughout HB 44 device codes. The term may be misinterpreted in paragraph G-S.2. unless there is a specific definition added to Appendix D to clarify which parts or portions of a device or system must comply. The Committee split S&T Item 310-1 into two separate items: S&T Item 310-1A (a proposal to modify paragraph G-S.2.) and S&T Item 310-1B (an Information item that recommends a new definition for “equipment” as used in HB 44). The Committee noted that the term “equipment” does not appear in all HB 44 Codes. The Committee recommended that Item 310-1B be carried over to allow sufficient time for a review of the proposed definition.

310-2 VC G-S.5.6.1. Recorded Representation of Metric Units on Equipment with Limited Character Sets and Table 1. Recorded Representation of Metric Units on Equipment with Limited Character Sets

Source: Southern Weights and Measures Association (SWMA)

(This item was adopted)

Recommendation: Amend paragraph G-S.5.6.1. and Table 1. as follows:

Modify paragraph G-S.5.6.1. and Table 1. as follows:

G-S.5.6.1. Indicated and Recorded Representation of Metric Units on Equipment with Limited Character Sets; – Appropriate Abbreviations.

(a) For equipment manufactured after January 1, 2008, the appropriate defining symbols are shown in NIST Special Publication SP 811 “Guide for the Use of International System of Units (SI)” and Handbook 44 Appendix C – General Tables of Units of Measurement.

Note: SP 811 can be viewed or downloaded at <http://physics.nist.gov/cuu/pdf/sp811.pdf>. (Added 2007)

(b) The appropriate defining symbols on equipment manufactured prior to January 1, 2008, with limited character sets are shown in Table 1. Representation of SI Units on Equipment Manufactured prior to January 1, 2007, with Limited Character Sets. (Added 1977) (Amended 2007)

Table 1. Recorded Representation of Metric SI Units on Equipment Manufactured prior to January 1, 2008, with Limited Character Sets				
Name of Unit	International symbol (common use symbol)	Representation		
		Form I	Form II	
		(double case)	(single case lower)	(single case upper)
Base SI units				
meter	m	m	m	M
kilogram	kg	kg	kg	KG
Derived SI units				
newton	N	N	n	N
pascal	Pa	Pa	pa	PA
watt	W	W	w	W
volt	V	V	v	V
degree Celsius	°C	°C	°c	°C
Other units				
liter	l or L	L	l	L
gram	g	g	g	G
metric ton	t	t	tne	TNE
bar	bar	bar	bar	BAR

Background/Discussion: At its fall 2006 Annual Meeting, the SWMA reviewed a proposal from the Weighing Sector to amend paragraph G-S.5.6.1. The amendment would require abbreviations for SI units for both indications and recorded representations on new technology as specified in NIST Special Publication 811 “Guide for the Use of International System of Units (SI) and HB 44 Appendix C – General Tables of Units of Measurement. The amendment would continue to permit exceptions to those guidelines for older equipment with limited character sets. WMD has received inquiries from device manufacturers regarding how to apply the requirements in Table 1 for the abbreviation of SI units. There appears to be confusion about the intent of Table 1 unless one is directed to review paragraph G-S.5.6.1. in conjunction with Table 1. Additionally, there are instances where abbreviations for SI units may be confused with other abbreviations; for example, in devices designed with or capable of indicating and/or recording in additional units of measurement (e.g., inch-pound units) or when used with identifiers for measurement values such as gross, tare, and net (G, T, N).

HB 44 paragraph G-S.5.6.1. was originally added to HB 44 in 1977 to address concerns about equipment with limited printing capabilities, that is, with either upper or lower case characters only. For example, a recording element, interfaced with a weighing system, which is equipped with upper case characters only; it will print the symbol for kilogram as “KG.” It was the NCWM S&T Committee’s view at that time that to require a lower case character capability solely to provide the appropriate symbol in lower case character (e.g., “kg”) would be cost prohibitive. Further, the Committee saw no problem in identifying “KG” as representing kilograms just as there is no problem in identifying the abbreviation for pound as “LB” or “lb.” The Committee also reviewed the International Standard Organization’s ISO 2955, which sets forth guidelines for the representation of SI and other units for use in systems with limited character sets. ISO 2955 “Representations of SI and other Units in Systems with Limited Character Sets,” an information processing standard, was withdrawn in 2001.

WMD believes that permitting exceptions for abbreviations of SI units of measure is no longer necessary when considering advances in printer and display technology.

SWMA supported the proposal and agreed to forward it to the NCWM S&T Committee with a recommendation that it be a Voting item on the Committee’s 2007 agenda.

At the 2007 NCWM Interim Meeting, the Committee made two editorial changes to the SWMA proposal as shown above. The Committee notes that the requirement includes units from multiple systems of measurement; therefore, it is not appropriate to name only metric units in the paragraph's title. The proposal more appropriately lists the requirements that apply for SI units in a separate subparagraph. The Committee agreed there is precedence for citing a website where a reference document is available. The Committee agreed to present the item as modified for a vote at the 2007 NCWM Annual Meeting.

At the 2007 NCWM Annual Meeting, the Committee also recognized that HB 44 was inconsistent in how it designates titles of paragraphs and tables where only table and paragraph numbers are referenced. Since there was no convention or document style guideline, the Committee agreed with WMD that the title or name of the corresponding paragraph or table (including a shortened title where appropriate) should be included when referencing the paragraph number, and that this could be done editorially throughout HB 44 as necessary.

310-3 VC G-S.8.1. Multiple Weighing or Measuring Elements that Share a Common Provision for Sealing

(This item was adopted)

Source: Carryover Item 310-3. (This item originated from the Western Weights and Measures Association (WWMA) and first appeared on the Committee's 2006 agenda.)

Recommendation: Add a new paragraph G-S.8.1. as follows:

G-S.8.1. Multiple Weighing or Measuring Elements that Share a Common Provision for Sealing. – A change to any metrological parameter (calibration or configuration) of any weighing or measuring element shall be individually identified.

[Nonretroactive as of January 1, 2010]

Note: For devices that utilize an electronic form of sealing, in addition to the requirements in G-S.8.1., any appropriate audit trail requirements in an applicable specific device code also apply. Examples of identification of a change to the metrological parameters of a weighing or measuring element include, but are not limited to,:

- (1) a broken, missing, or replaced physical seal on an individual weighing, measuring, or indicating element or active junction box;**
- (2) a change in a calibration factor or configuration setting for each weighing or measuring element;**
- (3) a display of the date of calibration or configuration event for each weighing or measuring element; or**
- (4) counters indicating the number of calibration and/or configuration events for each weighing or measuring element.**

(Added 2007)

Remove the existing Section 3.30. paragraph S.2.2.1. Multiple Measuring Elements with a Single Provision for Sealing when G-S.8.1. becomes effective; add a note to S.2.2.1. to indicate its removal date.

S.2.2.1. Multiple Measuring Elements with a Single Provision for Sealing. – A change to the adjustment of any measuring element shall be individually identified.

[Nonretroactive as of January 1, 2005]

Note 1: Examples of acceptable identification of a change to the adjustment of a measuring element include, but are not limited to:

- (a) a broken, missing, or replaced physical seal on an individual measuring element;**
- (b) a change in a calibration factor for each measuring element;**
- (c) a display of the date of or the number of days since the last calibration event for each measuring element; or**

(d) a counter indicating the number of calibration events per measuring element.
(Added 2004)

Note 2: S.2.2.1. will be removed in the 2010 edition of Handbook 44 when General Code paragraph G-S.8.1. Multiple Weighing or Measuring Elements with a Single Provision for Sealing becomes effective.

(Note 2 Added 2007)

Background/Discussion: The Committee believes a General Code requirement for identification of adjustments to individual weighing or measuring elements is appropriate, regardless of the device type, when systems have multiple weighing or measuring elements with a single provision for sealing. Initially, this proposal was developed to add to all the liquid-measuring device codes a requirement for identifying when an adjustment is made to any measuring device which has multiple measuring elements, but which is equipped only with a single provision for sealing the adjustment mechanism or access to the adjustment mechanism(s). After rejecting a meter for not meeting performance requirements, jurisdictions reported difficulty in determining whether or not repairs or adjustments were made to that meter. During the subsequent inspection, an official might have to test multiple grades or blends to confirm the rejected meter had been corrected. The proposed requirement is similar to the existing requirement in Section 3.30. paragraph S.2.2.1. Multiple Measuring Elements with a Single Provision for Sealing.

The Committee heard from the weighing industry that the proposal was not appropriate for all devices. The Committee believed it was important to be sure no specific HB 44 codes would be adversely affected by placing the requirements in the General Code; therefore, the Committee originally agreed to make the proposal an Information item to provide the opportunity for the National Type Evaluation Technical Committee Sectors and the regional weights and measures associations to evaluate the item further, especially for any adverse impact on a particular device type(s).

A General Code requirement would address all possible device types, including weighing systems, and any scenario where metrological parameters (calibration or configuration) have a single means for security. The list of acceptable means for individually identifying a change to a metrological parameter includes provisions for devices where features are accessed through an indicator or active junction box, but the list was not meant to be all-inclusive. Examples of weighing systems that have multiple weighing elements connected to a single indicator such that the calibration of each is controlled by a single seal include “in-and-out” weighing systems, shipping scale systems equipped with at least two platforms with different capacities connected to a single indicator, and multiple platform vehicle scales and axle-load weighers used for highway load enforcement or for truck operators’ use such as “CAT Scales.” Additionally, NTEP has evaluated indicators with the ability to support up to as many as ten weighing elements.

At their fall 2006 meetings, CWMA, NEWMA, SWMA, and WWMA agreed the proposal should move forward for a vote as written. The CWMA agreed that if this item was adopted, LMD Code paragraph S.2.2.1. would become redundant and should be deleted. The WWMA agreed the proposal should apply to all device technologies where multiple components with metrological functions are secured by a single seal. The WWMA also heard there were weighing devices with multiple load-receiving elements interfaced to a single indicator (where sealing occurs) that have the ability to track changes to metrological parameters through an audit trail. Devices with an event logger would comply with the proposal. Devices utilizing only common counters for calibration and configuration parameters that increment one time when one or more weighing or measuring elements have been accessed would still need an additional means, such as a calibration factor for each element, to identify that changes were made to a particular element.

At the 2007 NCWM Interim Meeting, the Committee agreed that modifications were needed to the title to clarify that the provision applies when elements share a security seal. Changes were also needed to the proposed language in the paragraph to eliminate the example allowing the display of the number of days to identify a change to metrological parameters in proposed new paragraph G-S.8.1. to eliminate any potential conflict with existing audit trail criteria. The Committee also agreed that if proposed paragraph G-S.8.1. was adopted, then Section 3.30. paragraph S.2.2.1. would no longer be needed and should be removed.

At the 2007 NCWM Annual Meeting, the Committee agreed with industry comments that it was appropriate that the proposal to modify paragraph G-S.8.1. have a 2010 enforcement date to lessen the impact of the requirement on device manufacturers needing to modify equipment. Rather than delete paragraph S.2.2.1. Multiple Measuring Elements with a Single Provision for Sealing from the Liquid Measuring Devices Code at this time, the Committee agreed to recommend the inclusion of a second note in paragraph S.2.2.1. to indicate that paragraph S.2.2.1. will be removed from HB 44 when new proposed paragraph G-S.8.1. becomes effective in 2010. On January 1, 2010, paragraph G-S.8.1. will apply to all classes of devices in the specific device codes.

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

320 SCALES

320-1 W S.1.1.(c) Zero Indication; Requirements for Markings or Indications for Other than Digital Zero Indications

(This item was withdrawn)

Source: Carryover Item 320-1. (This item originated from the Committee and first appeared on its 2004 agenda.)

Recommendation: Amend paragraph S.1.1.(c) as follows:

S.1.1. Zero Indication.

- (a) On a scale equipped with indicating or recording elements, provision shall be made to either indicate or record a zero-balance condition.
- (b) On an automatic-indicating scale or balance indicator, provision shall be made to indicate or record an out-of-balance condition on both sides of zero.
- (c) A zero-balance condition may be indicated by other than a continuous digital zero indication, provided that an effective automatic means is provided to inhibit a weighing operation or to return to a continuous digital indication when the scale is in an out-of-balance condition **and is marked or includes supplemental indications to indicate that the "other than continuous digital zero indication" represents a no-load condition of the scale.**

(Added 1987) (Amended 1993 **and 200X**)

Note: The markings or supplemental indications in S.1.1.(c) are not required if, prior to the start of a transaction: (1) operator intervention is required to verify the zero-balance condition with a digital zero indication, or (2) for a scale equipped to indicate a zero-balance condition by a digital zero indication, the scale automatically resets to a digital zero indication.

(Added 200X)

(Amended 1987)

Background/Discussion: The proposed changes to the requirement are intended to clarify that all primary indicators on scales using anything other than a digital zero indication (e.g., scrolling messages, dashes, etc.) to indicate zero require additional markings or indications to inform customers the scale is at a zero-balance condition. No markings are necessary on these devices when operator intervention is required to return the indication to a digital zero before conducting a transaction. The proposal addresses instances where the OEM elects to display rather than mark the information (i.e., supplemental indications) on the device. The proposed changes are meant to be applied retroactively and, therefore, apply to all equipment including self-service applications that have undergone type evaluation.

The proposal is more than a simple clarification or housekeeping item. The proposed language is not in conflict with type evaluation procedures in NCWM Publication 14 (a document derived from HB 44 requirements). The proposal is warranted because of ongoing disagreements between NTEP laboratories at type evaluation on whether or not a scale complies with paragraph S.1.1.(c). If the proposal is adopted, the labs will find that Publication 14 and

HB 44 agree and there is no vagueness in the wording of either document or room for misinterpretation. Since field officials may not have access to Publication 14, they need definitive guidelines in their working documents on how to apply the requirement should devices be modified after type evaluation.

In 2004 the Committee interpreted General Code paragraph G-S.6. Marking Operational Controls, Indications, and Features and Scales Code paragraph S.1.1. Zero Indication as requiring weighing devices to be marked or provide an indication stating the zero balance is represented by other than a digital zero indication. This position is supported by the 1993 amendment to paragraph S.1.1.(c) as well as type evaluation requirements and other HB 44 requirements adopted to ensure customers have sufficient information about displays and recorded transaction information in order to make an informed decision during a direct sale transaction.

In 2005 the Committee heard opposition to the proposal from several regional associations, the Weighing Sector, and scale manufacturers. These groups cited the following reasons for taking this position: (1) current HB 44 language provides sufficient guidelines, (2) labeling criteria applied during type evaluation offers adequate protection from fraud, (3) the type evaluation laboratory determines that labeling is not necessary if a scale has an automatic means to inhibit a transaction when it is out of balance or returns to a continuous digital indication when in an out-of-balance condition, and (4) several jurisdictions have indicated they are not receiving any complaints because equipment lacks explanatory marking information.

The Committee believes provisions should be in place for all devices to indicate clearly a zero-balance condition either with a digital zero, an annunciator, or using some other accepted means. The Committee is concerned there are no definitive guidelines available for the field official to verify a zero-balance condition particularly on software-based devices modified after type evaluation but also on devices that do not return to a digital zero. It is the continued belief of the Committee that the proposal has some merit but modified the language in response to comments that there is confusion about the language that addresses markings and indications. The Committee made changes to S.1.1.(c) to: (1) specify that markings and indications must be visible to the customer, and (2) clarify one instance where markings and indications are not required.

In spring 2006 the Committee heard further opposition to the proposal from the public and private sector members who believe the wording in paragraph S.1.1.(c) is adequate to prevent fraud. However, one jurisdiction in support of the proposal noted that an indication other than zero would not be acceptable for devices such as a retail motor-fuel dispenser since it found dispensers in the field with no zero indication as a result of software changes made to indications after type evaluation. Because of varied positions, the Committee changed the status of the proposal from a Voting item to an Information item. The Committee asked that the regional weights and measures associations consider the proposal during their 2006 fall sessions, being mindful that there are installations where the operator is not present to verify a zero-balance condition.

In the fall of 2006, the WWMA agreed it should be clear that a scale starts a transaction at zero. The WWMA believes the proposed modifications to (c) are sufficient and the note that describes when markings are not necessary is redundant. The WWMA further asserted that part (2) of the note describing how the device must function is not clearly worded. Consequently, the WWMA supported the proposal as a Voting item, but without the addition of the proposed note. The SWMA supports the WWMA alternate proposal.

The CWMA and NEWMA recommend this proposal be withdrawn because the current wording in NIST HB 44 is sufficient.

In fall 2006 the SMA restated its opposition to this proposal because it believes the current provisions of paragraph S.1.1.(c), are sufficient to prevent facilitation of fraud. The SMA continues its support of the Weighing Sector's 2005 analysis of the proposal.

During the 2007 Interim Meeting, WMD continued to support the 1993 and 2004 Committee's position in favor of using markings that explain when indications other than a digital zero indication represent a zero-balance condition and making the requirement readily available to current and future field officials. WMD recommended a modified proposal eliminating proposed new subparagraph (2), which seemed to create some difficulty for manufacturers in the setup of the automatic sequence for resetting the scale to a digital zero indication.

The Committee acknowledged that the weights and measures community is still divided on whether or not markings are needed to identify that an other-than-digital zero indication represents a zero-load condition on a scale. The Committee also heard a suggestion from both private and public sector members to modify the language to require a zero-balance indication that would clarify any ambiguity about the scale's zero-balance condition. The Committee agreed the proposal as worded does not get to the source of the problem that can occur should a device be set up to start a transaction when a zero condition does not exist. The Committee believes the proposal must go beyond a marking requirement. Consequently, the Committee kept the proposal as an Information item and recommends that rather than solve the problem with a marking requirement, the Weighing Sector and others affected in the weights and measures community provide input on possible modifications to arrive at a proposal that is a nonretroactive requirement that specifies the scale must start at a zero indication or have a center-of-zero indicator.

In response to the Committee's request, WMD submitted an alternative proposal for consideration by the community as follows:

S.1.1. Zero Indication.

- (a) On a scale equipped with indicating or recording elements, provision shall be made to either indicate or record a zero-balance condition.
- (b) On an automatic-indicating scale or balance indicator, provision shall be made to indicate or record an out-of-balance condition on both sides of zero.
- (c) **For Scales Manufactured Between January 1, 1993, and January 1, 200X.** – A zero-balance condition may be indicated by other than a continuous digital zero indication, provided that an effective automatic means is provided to inhibit a weighing operation or to return to a continuous digital indication when the scale is in an out-of-balance condition.
(Added 1987) (Amended 1993 **and 200X**)
- (d) **For Scales Manufactured On or After January 1, 200X.** – **A zero-balance condition may be indicated by other than a continuous digital zero indication, provided that:**
 - i) **an effective automatic means is provided to inhibit a weighing operation when the scale is out of balance until a digital zero-balance indication is displayed, or**
 - ii) **a "center-of-zero" is displayed when the scale is within $\pm \frac{1}{4}$ of a scale division of zero and returns to a continuous digital indication when the scale is in an out-of-balance condition more than $\pm \frac{1}{4}$ of a scale division.**
(Added 200X)

During its development of the alternate proposal, WMD concluded that the “center-of-zero” language in paragraph S.1.1.1. Digital Indicating Elements would also need to be amended since the current language in paragraph S.1.1.1. does not require the “center-of-zero” indications if the automatic zero-tracking mechanism (AZT) maintains the zero-balance condition within $\pm \frac{1}{4}$ d. Therefore, WMD also developed a separate alternate proposal to amend paragraph S.1.1.1. in S&T Item 320-2 to require that the “center-of-zero” indication always be provided when the zero-balance condition is within $\pm \frac{1}{4}$ d, even when AZT maintains the zero-balance condition within $\pm \frac{1}{4}$ d. WMD's alternate proposal to amend paragraph S.1.1.1. is similar to an OIML R 76 recommendation in Section 4.4.5. that requires a “center-of-zero” indication at all times when the zero balance is within “0.25 e” (and for a center-of-zero indication to be allowed after tare has been taken and the device is displaying a “net” zero). WMD recommended that the Committee may also want to consider combining S&T Items 320-1 and 320-2 into a single proposal because they are so closely related.

The Committee requested input on this alternate proposal from the weights and measures community.

At the 2007 NCWM Annual Meeting, the Committee heard testimony from the CWMA, NEWMA, and SMA recommending this item be withdrawn since the current technologies allowed by paragraph S.1.1.(c). are sufficient to prevent facilitation of fraud.

The Committee also heard comments at both the 2007 NCWM Interim and Annual Meetings from an NCWM member that, as a consumer and weights and measures professional, she believes consumers have a right to have adequate information about a transaction, including information to indicate the scale is starting on zero.

WMD commented that NCWM Publication 14 Digital Electronic Scale (DES) Section 11.8.4 and Electronic Cash Registers Interfaced with Scales (ECSR) Section 8 were amended in 2004 to specify that a label is required if the scale or electronic cash register (ECR) display returns to a live weight when the scale which is not at a zero-balanced condition are to be used. These changes to Publication 14 were based on a position taken by the 89th S&T Committee (2004) after a review of the 78th NCWM S&T Committee (1993) discussions on paragraph S.1.1.(c). Zero Indication.

WMD also provided the Committee with information on the Canadian Type Evaluation and Field Manual requirements that defined the term "sleep mode;" and WMD also provided conditions when a scale could enter a sleep mode and the procedures to verify the correct operation of the sleep mode. The Canadian requirements state that "the device must bear, adjacent to the weight display, the following marking: 'The device is at zero when in sleep mode' or equivalent statement if the device is allowed to go into a sleep mode with a load on the scale" (Specifications Relating to Non-automatic Weighing Devices (1998) Sections 30 to 33, and 41, and Laboratory Manual for the Evaluation of Non Automatic Weighing Devices dated January 1997, Sections 10.9 to 10.12, Sleep Mode or Displaying Non Metrological Information.

The Committee agreed there has been significant advancement in technology since the topic of "other than digital zero indications" was discussed, and weights and measures officials are more familiar with the technology. The Committee also heard from regional associations that officials in their region have not received complaints from the general public regarding the lack of a display of digital zero at the start of a transaction. The Committee believes the opinion of the 1993 S&T Committee interpretation that requires a label stating a screen saver or scrolling message represents zero is no longer valid or necessary. Therefore, a label is not required if the scale is capable of displaying non-zero information when it is in the sleep mode if the requirement for an effective and automatic means is provided to inhibit a weighing operation or to return to a continuous digital indication when the scale is in an out-of-balance condition, thereby meeting the provision of paragraph S.1.1.(c).

Therefore, the Committee agreed to withdraw the item from its agenda.

For additional background information, refer to the Committee's 2004, 2005, and 2006 Final Reports.

320-2 I S.1.1.1.(b) Digital Indicating Elements

Source: National Type Evaluation Technical Committee (NTETC) Weighing Sector

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 $\pm \frac{1}{2}$ the value of the scale division.
- (b) *A digital indicating device shall either automatically maintain a "center-of-zero" condition to $\pm \frac{1}{4}$ scale division or less, or have an auxiliary or supplemental "center-of-zero" indicator that defines a zero balance condition to $\pm \frac{1}{4}$ 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**)

Discussion: 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). This Weighing Sector proposal is the first of several proposed modifications to HB 44 requirements intended to clarify the suitability of tare features already widely used in commercial applications.

The Weighing Sector 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 that it has become increasingly difficult to base its compliance decisions on paragraph G-S.2. solely 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 and only a limited number of weights and measures officials, device manufacturers, and device owners and operators are regular participants in Weighing Sector meetings where tare evaluation criteria are developed and discussed. Additionally, 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 Weighing Sector formed a Tare Work Group (WG) to review existing tare requirements and make recommendations about how tare is 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 Publication 14, HB 44, and HB 130 and to provide guidance to the Weighing Sector on type evaluation requirements.

The WG is currently developing proposals to amend HB 44 requirements to:

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

The Weighing Sector agreed the WG's proposal to amend paragraph S.1.1.1.(b) further clarifies that an auxiliary or supplemental "center-of-zero" indication is permitted with a load on the scale provided tare material is zero-balanced off by the tare mechanism and prescribes that the acceptable limits of accuracy are within $\pm 1/4$ scale division for the resulting zero net indication. The Weighing Sector recommends the adoption of the proposal as an important step in promoting the development of specific language in HB 44 for specifications, test notes, and tolerances for different types of tare (e.g., tare, preset tare, percentage tare, etc.).

The Committee considered the Weighing Sector's proposal to modify paragraph 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 $\pm 1/2$ the value of the scale division.
- (b) *A digital indicating device shall either automatically maintain a "center-of-zero" condition to $\pm 1/4$ scale division or less, or have an auxiliary or supplemental "center-of-zero" indicator that defines a zero balance condition to $\pm 1/4$ of a scale division or less. **The auxiliary or supplemental "center-of-zero" indicator may be operable with a zero net weight indication.***

[Nonretroactive as of January 1, 1993]

(Amended 1992 **and 200X**)

The SWMA supported the intent of the Weighing Sector's proposal, but agreed some modifications to the text in paragraph S.1.1.1. were needed to clarify that the center-of-zero indicator may be operable when a zero condition exists in the net weight mode. The SWMA recommended its alternate proposal move forward as a Voting item.

The Committee considered the SWMA's alternate proposal as follows:

S.1.1.1. Digital Indicating Elements.

(a) A digital zero indication shall represent a balance condition that is within $\pm \frac{1}{2}$ the value of the scale division.

(b) *A digital indicating device shall either automatically maintain a "center-of-zero" condition to $\pm \frac{1}{4}$ scale division or less, or have an auxiliary or supplemental "center-of-zero" indicator that defines a zero balance condition to $\pm \frac{1}{4}$ of a scale division or less. The auxiliary or supplemental "center-of-zero" indicator may be operable with a zero condition in the net weight mode.*
[Nonretroactive as of January 1, 1993]

(Amended 1992 **and 200X**)

During the Committee's review of the SWMA alternate proposal, WMD recommended the Committee consider there may be a possible conflict between the SWMA proposal and 2006 NCWM Publication 14 criteria for zero indications in Section 41.5 that prohibits a minus sign from preceding a zero indication.

The SMA supported the Weighing Sector's proposal.

The Committee discussed the possibility of using language in the Weighing Sector's and the SWMA's proposals to modify paragraph S.1.1.(b) because together the proposals included two of three conditions that must be met for a center-of-zero indication when the scale is in a zero balance condition.

The Committee agreed the best approach to developing language to address the operation of a center-of-zero indication was to request the NIST technical advisor to the Weighing Sector rework paragraph (b) using language similar to Publication 14 criteria that specifies how the center-of-zero must operate at zero gross weight or defines when there can be a zero indication of net weight. The Committee received the alternate proposal to amend S.1.1.1. as shown below and made it a Voting item in its 2007 Interim Report since this tare-related item focuses only on clarifying how the center-of-zero indication operates.

S.1.1.1. Digital Indicating Elements.

(a) ~~A digital zero indication shall represent a balance condition that is within $\pm \frac{1}{2}$ the value of the scale division.~~ A digital indicating device shall automatically maintain a "center-of-zero" condition to $\pm \frac{1}{4}$ scale division and have an auxiliary or supplemental "center-of-zero" indicator that defines a zero balance condition to $\pm \frac{1}{4}$ of a scale division or less. The "center-of-zero" indication may also work when zero is indicated for:

- i. gross load zero, or
- ii. after a tare operation.

[Nonretroactive as of January 1, 2007]

(b) ~~For A Digital Indicating Elements Manufactured Before January 1, 2007. – device shall either automatically maintain a "center-of-zero" condition to $\pm \frac{1}{4}$ scale division or less, or have an auxiliary or supplemental "center of zero" indicator that defines a zero balance condition to $\pm \frac{1}{4}$ of a scale division or less.~~ A digital zero indication shall represent a balance condition that is within $\pm \frac{1}{2}$ the value of the scale division.

(c) For Digital Indicating Elements Manufactured Between January 1, 1993, and January 1, 2007. – 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]

(Amended 1992 **and 2007**)

At the 2007 NCWM Annual Meeting, the Committee heard testimony from the CWMA, NEWMA, and SMA stating this item has changed from the original intent to verify that zero tracking could be operable in the net mode, to now include the addition of other language which alters the requirement even more. For example, in paragraph S.1.1.1.(a), by stating “and” instead of “or” would make both requirements mandatory. If “or” is used instead of “and,” then this proposal lowers the current requirement of ½ e to ¼ e. The SMA further stated that proposed paragraph (a) adds a dual requirement that is not consistent with Canadian and OIML requirements. 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 additional changes added to the proposal (changing “or” to “and,” in addition to requiring all electronic indicators maintain zero to 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 Weighing Sector. WMD also 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 is in a “sleep mode” if the Committee had chosen to recommend agenda Item 320-1 for a vote.

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

The Committee agreed the status of the item should be changed to Informational and the first alternate proposal from WMD become a carry-over item for the 2008 Committee agenda since that text is consistent with the intent of the original proposal from the NTETC Weighing Sector.

320-3 I S.1.2.1. Weight Units and T.N.2.1. General

Source: National Type Evaluation Technical Committee (NTETC) Weighing Sector

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 requirements 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.

[Nonretroactive as of January 1, 1989]

(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 Weighing Sector formed a Tare WG to review existing tare requirements and make recommendations about how tare is to operate on a single range scale, multiple range scale, and multi-interval scale. The WG was also asked to develop, where necessary, recommendations for changes to Publication 14, HB 44, and HB 130 and to provide guidance to the Weighing Sector on related type evaluation requirements.

This proposal, which was developed by the Tare WG and supported by the Weighing Sector, 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 proposal also amends paragraph T.N.2.1. to clarify that tolerances also apply to net weight indications regardless of the gross load on the scale. The Tare WG reviewed OIML R 76 "Nonautomatic Weighing Instruments" for corresponding requirements to determine if there were areas where HB 44 could be aligned with international recommendations. Based on that review, the WG agreed that HB 44 paragraph T.N.2.1. should be modified to state that tolerances also apply to net load indications.

The Tare WG discussed problems associated with determining the appropriate direction to round tare on multi-interval scales and multiple range scales whenever gross and tare weights fall in different weighing segments on a multi-interval scale or in different weighing ranges on multiple range scales. In these cases, the scale division size for the gross and tare weights differ; however, the net weight must be in mathematical agreement with the gross and tare weights that are indicated and recorded by the device (i.e., gross weight - tare weight = net weight).

The problem arises when the tare weight is rounded up to the next larger scale division where the net weight falls in the higher segment or range. For example, a 0.004 lb tare weight in a weighing range or segment with 0.002 lb intervals in the lower weighing range or segment may round to zero when the net weight falls in the upper weighing range with 0.01 lb intervals:

$$\begin{array}{r} 10.05 \text{ lb Gross Weight} \\ - 0.004 \text{ lb Tare Weight} \\ \hline 10.046 \text{ lb the Mathematically Correct Net Weight;} \end{array}$$

However, due to rounding of tare weight the device indicates 10.05 lb Net Weight

This results in a transaction where a commodity is bought or sold on the basis of gross weight or an insufficient amount of tare weight is taken and results in a misrepresentation of net weight for the transaction. Essentially, the rounding of tare that falls in a smaller division in either direction (e.g., a 0.015 lb tare weight rounded down to zero or to 0.01 lb or up to 0.02 lb) provides a less accurate net weight.

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).

The SWMA supports the recommendation; however, the SWMA also agreed that an additional note should be added to paragraph S.2.3. Tare. The new note proposed for paragraph S.2.3. clarifies that the requirement does not apply to multi-interval scales or multiple range scales when tare is determined in the lower range of those scales.

WMD agreed it might be more appropriate if the proposed new note explains that gross weight and calculated tare weight are expressed as an "indicated weight value" rather than as a "scale value." WMD notes that the proposed SWMA text is necessary to clarify that tare weights are excluded from the requirement that specifies weight values must be the same as the scale division value. However, the SWMA's proposal needs further work to better explain if only part or the entire paragraph does not apply to tare weights indicated on either a multi-interval or multiple range scale and to clarify the relationship of paragraph S.1.2.1. to corresponding paragraph S.2.3. WMD also asked if it was the SWMA's intent that this newly proposed note be a retroactive or nonretroactive requirement, and if nonretroactive, then what is an appropriate effective date?

The SMA supports the Weighing Sector's proposal, but recommended the proposed new note become a subparagraph of paragraph S.1.2.1. and include a modification to the proposed new text in paragraph T.N.2.1. to require the net weight indication for "any" rather than "every" possible tare load using certified test loads. The Committee agreed to the SMA's recommended changes to paragraph T.N.2.1. and modified the proposal accordingly.

The Committee deliberated at length on this item and S&T Items 320-5 and 320-9, which are all meant to clarify the distinct differences in how various tare features are permitted to operate. The Committee agreed that ultimately neither the buyer nor seller should incur a loss as a result of an inaccurate calculation of a tare weight. Much of the weights and measures community has not had the opportunity to discuss these proposals nor has the Tare WG or Weighing Sector had time to analyze feedback on these proposed changes to the Scales Code and corresponding proposals to change the AWS Code (see Items 324-1 and 324-3). The Committee agreed that all proposals related to the operation of the tare feature should be Information items to ensure all aspects of the operation of tare features are adequately addressed and clearly defined for both the public and private sector.

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 incorporating the SWMA recommendation to modify paragraph S.2.3.

NEWMA pointed out that the proposed amendment to S.1.2.1. appears 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 scales divisions to only 1, 2, or 5 when appropriate or if rounding the scale divisions of 1, 2, or 5 was still allowed? The WMD representative to the NCWM Tare WG stated that the intent is for the language to be permissive because there are a significant number of devices with an NTEP CC 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.1.2.1., 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 applies to the requirement that the value of tare shall be equal to 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 recommends that the NIST technical advisor forward the amended proposal to the Tare WG and NTETC Weighing Sector for their consideration and comment.

320-4 D 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

(The status of this item was changed to “Developing” during the January 2007 NCWM Interim Meeting and was moved to Appendix A as Item 360-2: Developing Items Part 1, Item 1 Scales.)

During the 2007 NCWM Annual Meeting, the Committee was informed that the NTETC Weighing Sector intends to continue developing this item before asking the Committee to consider the issue on its agenda.

320-5 W S.2.1.7. Tare Rounding on a Multiple Range Scale

(This item was withdrawn)

Source: Southern Weights and Measures Association (SWMA)

Discussion: The Committee considered an SWMA proposal to add a new paragraph S.2.1.7. to the Scales Code as follows:

S.2.1.7. Tare Rounding on a Multiple Range Scale. – A multiple range scale with tare capability must indicate and record values that satisfy the equation:

$$\text{net} = \text{gross} - \text{tare}$$

and round the tare value up to the larger division size when entering the larger division.
(Added 200X)

A recent reversal of a 10-year-old NTEP policy now permits the operation of tare on multiple range scales to round down, thus overstating the quantity. The SWMA believes the Weighing Sector’s decision to round tare down should be addressed by all members of the NCWM. The proposal was developed to eliminate any conflict in the operation of the tare function on multiple range scales in the determination of a net weight.

Currently, there may be a conflict between HB 44 requirements and NCWM Publication 14 policy for rounding tare values on multiple range scales. HB 44 General Code paragraph G-S.5.2.2.(c) Digital Indication and Representation requires that digital values round off to the nearest minimum unit that can be indicated or recorded. Also in question is a possible conflict with NIST HB 130 guidelines for Packaging and Labeling Regulations Section 6.13. Rounding, which specifies that in no case shall rounded values result in overstating the net quantity. NTEP is also revising its tare criteria through its Tare WG to ensure no further conflict with HB 44.

At their fall 2006 meetings, the regional weights and measures associations considered this SWMA proposal as part of ongoing work by the Weighing Sector Tare WG. However, the SWMA intended it to be a separate proposal that addressed only tare rounding policies and procedures for multiple range scales. The WWMA believes the issue of tare capability is complex and the proposal also needs to address the suitability of the tare division size, the current prohibition of division sizes other than 1, 2, and 5, the scale application (buying or selling), and other issues that relate to tare. For these reasons, the WWMA believes the proposal should be thoroughly developed in the NTETC Weighing Sector prior to forwarding it to the NCWM S&T Committee for action. Consequently, the WWMA recommended withdrawing the SWMA proposal. The CWMA and NEWMA opposed this proposal as presented and agreed to await further input from the Weighing Sector Tare WG.

During its 2006 meeting, the SWMA considered its proposal an urgent matter warranting an upgrade in status from Developing to an item that is ready for national consideration. The SWMA reported that a majority of the Weighing Sector believes the criteria noted in Publication 14 for use in type evaluation of devices with the tare feature are not supported by HB 44 requirements. The SWMA agreed that the decision to permit rounding keyboard tare down on multiple range scales is facilitation of fraud. For example, the customer and the operator observe that a tare weight

was entered in the lower range of a multiple range scale, yet when the gross weight is in a higher weighing range, the customer is not provided with “clear, definite, accurate” indications that tare has been reduced.

The SWMA recognizes that OIML permits rounding tare down, but believes that customers are not able to make adjustments in unit prices to compensate for losses when tare is rounded down, whereas businesses can adjust the price to compensate for overhead expenses and losses that occur if tare is rounded up.

The SWMA provided discussion and examples to support its position as follows:

History

The operation of “tare” on a weighing device was first addressed in detail in 1971. In the 1971 Committee's Final Report (see NIST Special Publication (SP) 358, Page 170), the rationale for adding paragraph S.2.3. Tare Mechanism to HB 44 was to ensure net weight was represented for commodities sold directly over computing scales and to recognize new developments in device technology. Tare capability and its operation were again addressed in S&T Item 301-3 Tare in the 1980 Committee's Final Report (see NIST SP 599, page 216). The report noted “a key factor is the requirements in paragraphs G-S.2. Facilitation of Fraud and G-S.5.1. Indicating and Recording Elements, General specify the indications to be clear, definite, accurate, and easily read by all parties involved in the weighing operation.”

The SWMA notes that some believe General Code paragraph G-S.5.2.2. Digital Indication and Representation is intended to address the rounding of tare to the nearest minimum unit when it was amended in 1973. However, the Committee's 1980 Final Report notes only General Code paragraphs G-S.2. and G-S.5.1. Furthermore, there is no evidence in any of the Final Reports that the Committee agreed that the practice of rounding tare up, which has been NTEP policy, is in conflict with HB 44.

In 2006, the NIST technical advisor to the Weighing Sector contacted two members of the 1980 NCWM S&T Committee and determined that the focus of tare discussions were on single range scales, rather than multi-interval scales and multiple range scales, and followed rounding rules listed in HB 44. Consequently, specific interpretations or proposals were needed to determine how requirements apply to multi-interval and multiple range devices.

The SWMA provided an example to make its point that if no tare is taken, the store has sold less than the quantity represented. Consider an example where a store's deli is selling cheese for \$7/lb and the weight of the roll of wrapping paper used in the deli is 40 lb. Sections of the wrap used in individual transactions are not heavy enough to register on the scale during a single transaction; however, if no tare is taken, the store collects an extra \$280 (40 lb x \$7/lb). The store controls the unit price for the commodity and selects the tare material and the resolution for the scale that it uses. The SWMA heard the argument that the store is losing money if it is forced to round tare up. The SWMA's response to that argument is to remind everyone that businesses view such losses as part of overhead expenses, which they most typically compensate for by making adjustments to their unit prices. The customer does not have the ability to adjust or bargain on the unit price.

The SWMA notes that the loss to the customer when tare is rounded down is larger when scale error is on the plus side, even though the scale is within accuracy tolerances. In this case, the SWMA does not believe scale error is a justification for selling less than the quantity represented. For example, given a 30 lb x 0.01 lb scale:

The scale has an internal error of plus (+) 0.012 lb, which is displayed as 0.01 lb, which is within maintenance tolerance. However, if the tare material used weighs 0.004 lb, there is an increased loss to the customer from 0.01 lb to 0.02 lb since $0.012 \text{ lb} + 0.004 \text{ lb} = 0.016 \text{ lb}$ would be displayed as 0.02 lb on the scale.

OIML

Historically, weights and measures officials have been against rounding tare down. But what should occur if you are rounding to the nearest division? Is zero considered a division? The SWMA acknowledges that zero is a division. The OIML Secretariat of TC 9/SC 1 for Nonautomatic Weighing Instruments R 76 noted in his response to the U.S. inquiry on that same question that “of course, rounding the tare value to zero is possible if

it is less than $0.5 e_i$ (interval of the weighing segment) of the actual range i (interval).” Multiple range scales meet R 76 rounding criteria when they round to zero. However, R 76 Section 4.13.3.2 Semi-automatic Tare Device specifies that an instrument may be fitted with semi-automatic tare devices if the action of the tare device *does not permit a reduction of the value of tare*.

The SWMA notes that there is not consensus within the international weighing and measuring community to allow tare to round down. A direct quote of The Netherlands’ position on the latest draft of R 76 (in regard to 4.6.12.5. Multi-interval instrument with a preset tare device) was “In principle the conclusion that with $e = 2$ g the value of 3 g can be rounded to 2 g or 4 g is correct. However could we not agree in this Recommendation that 1 g or 3 g always will be rounded up (because in the case where $e = 1$ g, a tare value of 0.5 g is always rounded up).”

Application of Tare Rounding Criteria

On multi-interval scales tare is restricted to the smallest division, thus eliminating the possibility of rounding tare below its actual weight. For example, criteria for rounding tare on a multiple range scale results in a tare value of 12 lb in Range 1 ($e = 1$ lb), but when the net weight causes the scale to switch to Range 2 ($e = 10$ lb), the tare value would become 10 lb.

The Tare WG considered that the problems of tare rounding can be demonstrated in the following which illustrates some of the losses that can occur to parties involved in a transaction that is conducted on a multiple range scale where different rules for rounding are applied:

Given a multiple range scale where,

Capacity of the first range = 60 lb; scale division of the first range = 0.01 lb

Capacity of the second range = 300 lb; scale division of the second range = 0.1 lb

	No Rounding of Tare or Net	Tare Rounded Down to Nearest Division in the 2nd Range	Tare Rounded Up to Nearest Division in the 2nd Range
Gross	266.2 lb (falls in 2 nd range)	266.2 lb (falls in 2 nd range)	266.2 lb (falls in 2 nd range)
Tare	53.44 lb (falls in 1 st range)	53.4 lb (falls in 2 nd range)	53.5 lb (falls in 2 nd range)
Net	212.76 lb	212.8 lb	212.7 lb
Rounding Error	0.0 lb	0.04 lb (consumer's loss)	0.06 lb (store's loss)

A multiple range scale is viewed as two separate scales even though it has two or more weighing ranges with different maximum capacities and different scale intervals, each extending from zero to its maximum capacity all on the same load receptor. A multiple range scale is basically multiple scales in a single housing. Current practices do not allow rounding of tare to zero with completely separate scales when the results of weighments on both scales are used to determine the gross, net, and tare weight. Indicators totalizing multiple weighing elements are required to calculate the total weight based on the smallest scale division to eliminate problems with inaccurate net weights.

Conclusion

The SWMA agreed that, if the real issue is protecting both the retailer and the consumer, perhaps what should be looked at is: (1) the suitability of the scale division based on unit price and/or application, (2) limiting the multiple of the scale division difference between the weighing ranges, (3) reducing the allowable tolerance, and (4) limiting the initial determination of the tare, gross, and net to the same weighing range.

The SWMA believes all multiple range scales currently evaluated by NTEP should not round tare down when changing to a higher scale division. For over ten years, the NTEP checklist test criteria for multiple range and multi-interval devices in NCWM Publication 14 has always been that tare will round up to the nearest scale division.

The SMA supports the proposal provided the last sentence is modified to reflect the rounding requirements in HB 44 Appendix A – Fundamental Considerations, Section 10 “Rounding Off Numerical Values.”

WMD agreed with the SWMA concern that the resulting net weight may be inaccurate when tare is rounded down or to zero. A device owner is still responsible for ensuring accurate net weight at time of sale regardless of how a scale operates. Device requirements in HB 44 are not meant to create conflicts with weights and measures law or the principles of NIST Handbook 133. WMD believes that part of the solution to this problem is addressed in S&T Item 320-3, which is a proposal to permit tare to be expressed in a value other than the scale division value of 1, 2, or 5. Furthermore, the equipment selected for use in the transaction must be suitable for that application and, therefore, must not facilitate inaccuracies when rounding weight values and must not misrepresent the net weight at the time of sale. The following table shows an example where the tare is 0.004 lb and the scale division is 0.01 lb. The table compares the results of weighments when tare is rounded up or down to the nearest division:

No Tare Rounding (lb)		Tare Rounding to the Nearest Scale Division (lb)		Tare Rounding Up (lb)	
10.05	Gross Weight	10.05	Gross Weight	10.05	Gross Weight
<u>0.004</u>	Tare Weight	<u>0.00</u>	Tare Weight	<u>0.01</u>	Tare Weight
10.046	Actual Net Weight	10.05	Net Weight	10.04	Net Weight
10.05	Displayed Net Weight				
Results in an accurate tare weight, because the tare weight is indicated in a value other the scale division of 1, 2, or 5 as proposed in S&T Item 320-3. This is only a partial solution because even though the tare weight is accurate, the net weight is rounded to the nearest division, which results in overstating the net weight. Rounding will occur and depending on its direction can result in either overstating or understating the net weight.		Results in an error of 0.004 lb in the net weight, if existing General Code paragraph G-S.5.2.2.(c) is applied. No tare is deducted.		Results in an error of 0.006 lb as proposed in S&T Item 320-5.	

The Committee considered the conflicts with this proposal where tare is rounded up and the proposed language in S&T Items 320-3 and corresponding Automatic Weighing Systems Item 324-1 where no tare rounding is permitted. The proposal in Item 320-5 will frequently result in an inaccurate net weight. In cases where tare is rounded up, the losses that occur in a transaction will depend on whether the commodity is bought (operator loss) or sold (customer loss) based on that inaccurate net weight. The Committee agreed the most appropriate method for calculating weight values during a transaction was to permit tare to have a value other than that of a scale division of 1, 2, or 5 when that increment more accurately represents the tare value. The Committee believes this provision will, at least in part, address the concerns of the SWMA. Consequently, the Committee withdrew this proposal from its agenda since the proposal forces the scale to always round up regardless if the scale owner is a seller or buyer and it treats tare rounding differently between single range and multiple range scales. The Committee also requested the Weighing Sector continue its work on Items 320-3, 320-9, 324-1, and 324-3 to develop procedures and associated terminology that results in a more accurate determination of net weight and a better understanding of tare features and functions.

320-6 V N.1.3.1. Bench or Counter Scales, N.1.3.8. All Other Scales Except Crane Scales, Hanging Scales, Hopper Scales, Wheel-Load Weighers, and Portable Axle-Load Weighers, and Appendix D, Definitions of Bench Scale and Counter Scale

(This item was adopted)

Source: Carryover Item 320-3. (This item originated from the National Type Evaluation Technical Committee (NTETC) Weighing Sector and first appeared on the Committee's 2005 agenda.)

Recommendation: Delete paragraph N.1.3.1. and renumber subsequent paragraphs.

N.1.3. Shift Test.

~~**N.1.3.1. Bench or Counter Scales.**—A shift test shall be conducted with a half-capacity test load centered successively at four points equidistant between the center and the front, left, back, and right edges of the load-receiving element.~~

Add new paragraph N.1.3.3. as follows:

N.1.3.4.3 Vehicle Scales, Axle-Load Scales, and Livestock Scales.

N.1.3.3. Prescribed Test Patterns and Test Loads for Two-Section Livestock Scales. A shift test shall be conducted using the following prescribed test loads and test patterns, provided the shift test load does not exceed one-half the rated section capacity or one-half the rated concentrated load capacity, whichever is applicable, using either:

- (a) **a one-quarter nominal capacity test load centered as nearly as possible, successively, over each main load support as shown in N.1.3.7. Figure 2; or**
- (b) **a one-half nominal capacity test load centered as nearly as possible, successively, at the center of each quarter of the load-receiving element as shown in N.1.3.7. Figure 1.**

Renumber and amend paragraph N.1.3.8. as follows:

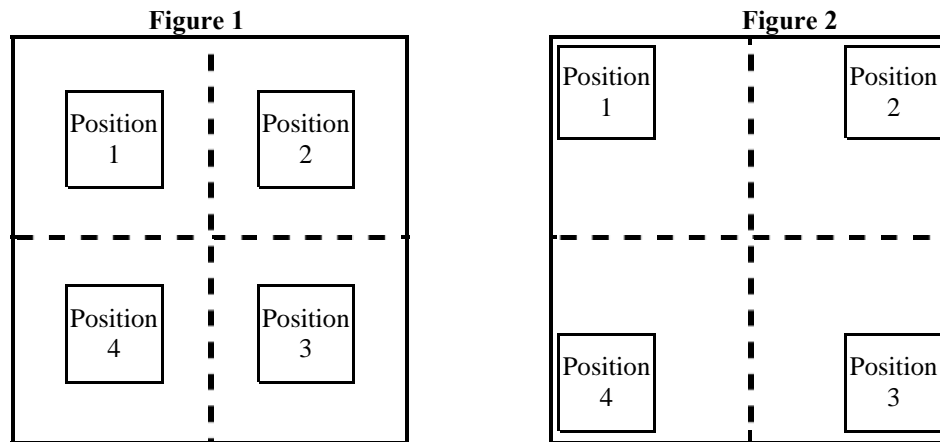
~~**N.1.3.87. All Other Scales Except Crane Scales, Hanging Scales, Hopper Scales, Wheel-Load Weighers, and Portable Axle-Load Weighers.** A shift test shall be conducted using the following prescribed test loads and test patterns. A single field standard weight used as the prescribed test load shall be applied centrally in the prescribed test pattern. When multiple field standard weights are used as the prescribed test load, the load shall be applied in a consistent pattern in the shift test positions throughout the test and applied in a manner that does not concentrate the load in a test pattern that is less than when that same load is a single field standard weight on the load-receiving element.For livestock scales, shift test shall not exceed one-half the rated section capacity or one-half the rated concentrated load capacity, whichever is applicable. A shift test shall be conducted using either:~~

- (a) **For scales with a nominal capacity greater than 500 kg (1000 lb), a shift test may be conducted by either using a one-third nominal capacity test load (defined as test weights in amounts of at least 30 % of scale capacity, but not to exceed 35 % of scale capacity) centered as nearly as possible at the center of each quadrant of the load-receiving element using the prescribed test pattern as shown in Figure 1 below, or by using a one-quarter nominal capacity test load centered as nearly as possible, successively, over each corner of the load-receiving element using the prescribed test pattern as shown in Figure 2 below.**
- (b) **For scales with a nominal capacity of 500 kg (1000 lb) or less, a shift test shall be conducted using a one-third nominal capacity test load (defined as test weights in amounts of at least 30 % of scale capacity, but not to exceed 35 % of scale capacity) centered as nearly as possible at the**

center of each quadrant of the load-receiving element using the prescribed test pattern as shown in Figure 1 below.

- (a) ~~A one quarter nominal capacity test load centered as nearly as possible, successively over each main load support as shown in the diagram below; or~~
- (b) ~~A one half nominal capacity test load centered as nearly as possible, successively at the center of each quadrant of the load-receiving element as shown in the diagram below.~~
- (Amended 1987, ~~and~~ 2003, and 2007)

Delete the diagrams that correspond to existing paragraphs N.1.3.8.(a) and (b) and add new Figures 1 and 2 to correspond with proposed revisions to N.1.3.8. as follows:



(Added 2003)
(Amended 2007)

Delete Appendix D definitions for “bench scale” and “counter scale” as follows:

~~bench scale. See "counter scale."~~^[2.20]

~~counter scale. One that, by reason of its size, arrangement of parts, and moderate nominal capacity, is adapted for use on a counter or bench. Sometimes called "bench scale."~~^[2.20]

Discussion: The proposal was intended to clarify the appropriate shift test pattern and test loads for scales currently designated as bench/counter scales and other platform-type scales. Currently, bench and counter scale shift tests are conducted with a one-half capacity test load centered successively at four points equidistant between the center and the front, left, back, and right edges of the load-receiving element. Shift tests for other platform scales are conducted with a one-half capacity test load centered, as nearly as possible, successively at the center of each quadrant. The proposal eliminates references to bench and counter scales and instead prescribes that the shift test load and test pattern used for those and all scales other than livestock be based on the scale’s nominal capacity. For livestock scales the proposal further clarifies, but does not change, the existing requirements for shift tests.

In 2005, the proposal was kept on the agenda as an Information item. This was in response to comments indicating that data should be collected on shift tests to verify that the proposed test loads and positions are equivalent to existing test patterns and to allow the data to be reviewed by the Weighing Sector, NIST, and the NTEP laboratories.

During the 2006 NCWM Interim Meeting, the Committee received data comparing shift tests conducted using current shift test requirements and shift tests on the same scales using the proposed test requirements (a test load of one-third the scale's capacity). There was no demonstrated difference in scale performance based on the location of

the scale, thus the terms “bench” and “counter” should be eliminated. In response to that data, comments were received from the public and private sectors in support of the proposal.

In response to comments from the weights and measures community, the Committee modified the entire proposal to include language that is technically correct and consistent in its description of how to conduct a shift test on all types of scales. The Committee modified the language to: (1) clarify what defines “acceptable” weight values for a test load that is one-third of the scale’s nominal capacity, (2) ensure uniform procedures are followed when applying test weights on the load-receiving element, (3) eliminate instances where test weights are concentrated in a pattern that overload the load-bearing points as illustrated in the example below, and (4) change the scale capacity that is used as the basis for the shift test load from 150 kg (300 lb) to 500 kg (1000 lb) to align the proposed one-third capacity shift test load requirement with existing minimum test weight requirements for the greater of 25 % device capacity or 300 lb for devices with 1000 lb capacity already specified in Table 4. Minimum Test Weights and Test Loads.

The Committee considered an example of a livestock scale with a section capacity of 1000 lb: a shift test is performed as shown in Figure 1 using a test load of 500 lb. While 100 lb test weights are not commonly used or available, they are used in this example to illustrate the concept of uniformity when applying a test load in a specified pattern on the load-receiving element.

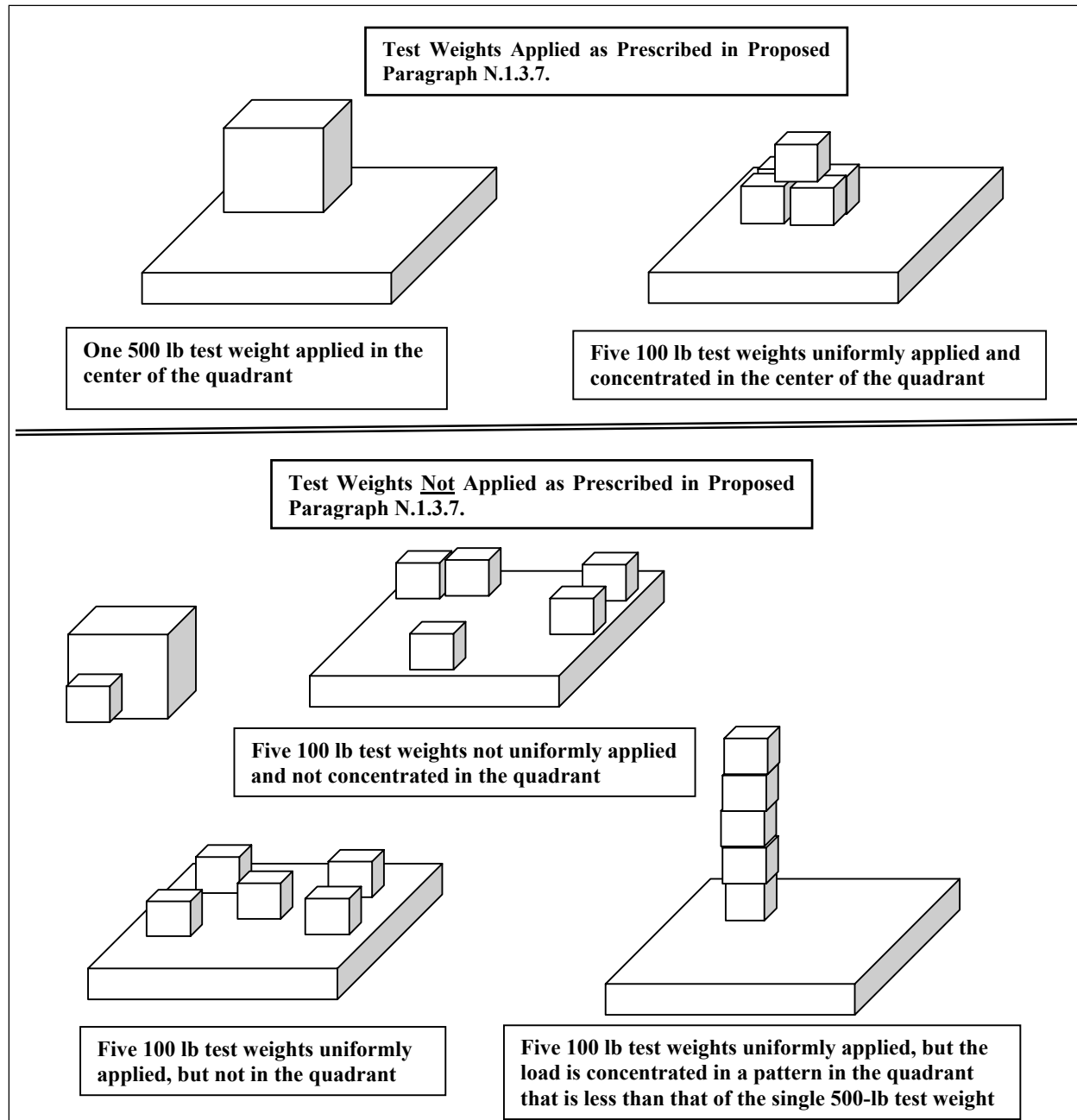


Figure 1: Application of Test Weights

At the 2006 NCWM Annual Meeting, the Committee agreed there was sufficient data and a consensus for presenting the proposal for a vote at the meeting. During the voting session, the Committee heard concerns that substantive changes were made to the livestock scale requirements and it should revisit earlier proposed language. The Committee explained those changes were only a reorganization of the text. The vote on the item did not yield a sufficient number of positive or negative votes for the item to be accepted or defeated and, therefore, the proposal was returned to the Committee for further action. The Committee requested jurisdictions to review carefully the consistency that exists between the proposed language and current HB 44 requirements for livestock scales and to provide input on alternate language that might be more appropriate and/or further clarify the shift tests and test loads for these devices.

The WWMA S&T Committee had the opportunity to review an alternate proposal that was to be presented to the NTETC Weighing Sector in September 2006. The WWMA S&T Committee liked the direction of the Weighing Sector's alternate proposal, which clarified shift test procedures in livestock scale applications, addressed shift test patterns for circular platforms, and eliminated some of the redundant text. Since the Weighing Sector members would not have the opportunity to review and agree on the alternate language until after the WWMA meeting, the WWMA recommended the proposal as an Information item.

The CWMA supported most of the Committee's 2006 recommendation, but suggested some alternate wording to modify and renumber paragraph N.1.3.8.(b) to read as follows:

N.1.3.87. All Other Scales Except Crane Scales, Hanging Scales, Hopper Scales, Wheel-Load Weighers, and Portable Axle-Load Weighers.

(b) For scales with a nominal capacity of 500 kg (1000 lb) or less, a shift test shall be conducted using up to 50 % nominal capacity test load (defined as test weights in amounts of at least 30 % of scale capacity, but not to exceed 50 % of scale capacity) centered as nearly as possible at the center of each quadrant of the load-receiving element using the prescribed test pattern as shown in Figure 1 below.

The CWMA developed this alternate recommendation with the intent that jurisdictions would have more flexibility in using their existing test weights.

Based on the comments received during the 2006 NCWM Annual Meeting, the NIST technical advisor to the Weighing Sector amended the proposal as summarized below to:

- (1) Make it clear that no significant changes are being made to requirements for two-section livestock scales;
- (2) Simplify the language for the shift test on "Other" scales;
- (3) Group the livestock scale shift test requirements together;
- (4) Change the order of the "test notes" so that the more common type of scales are listed first; and
- (5) Include minor editorial suggestions on existing language.

The Weighing Sector considered this alternate proposal along with a comment solicited from the PTB and one industry consultant indicating there is a higher risk of overloading one of the (multiple) supports by using a one-half capacity load in an eccentric loading test pattern than by using a one-third capacity load. This appears to stem from the difference in test method between HB 44 and OIML R 76. In other words, HB 44 more or less assumes a rectangular platform and places the load at a point on a line halfway from the center to the edge as illustrated in Figure 1.

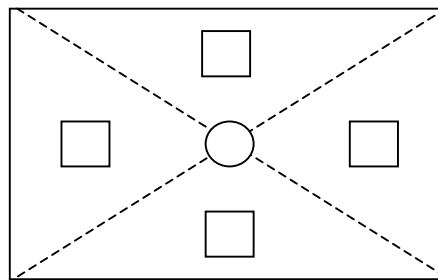


Figure 1: NIST Handbook 44 Shift Test at One-Half Capacity

OIML R 76 recognizes that platforms exist in other shapes (e.g., square, triangular, or circular platforms) as illustrated in Figure 2.

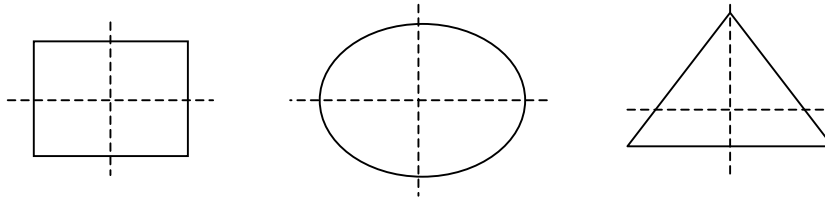


Figure 2: OIML R 76 – Quadrants shown for platforms of devices with four or fewer points of support

Thus, since OIML R 76 depends more on placing the eccentric load in a prescribed section of the total area of the platform rather than on a specific line, they more or less trust the load will be placed at the center of the quadrant according to the figures illustrated in OIML R 76 for scales with four or fewer supports. The end result of both methods, especially for rectangular platforms, is more or less the same.

During subsequent discussions, several Weighing Sector members stated that the proposed language was unnecessary since there was no technical justification to change the current language in HB 44. Additionally, the proposed language would prohibit weights and measures officials from using one-half capacity even though the scale could be weighing loads up to one-half scale capacity that are not in the center of the platform. In contrast, the NIST technical advisor stated that there was no technical reason to use procedures different than those in R 76. (Note: Manufacturers have stated in past discussions that they have to adjust the scales differently for scales intended for North America and scales intended for countries that adopt OIML recommendations.)

Another industry consultant cited text from the 1915 edition of the precursor to HB 44 (see Section 10 for Counter Balances and Scales, page 19), noting that the shift test loads and positions have not changed in 91 years.

Measurement Canada reported that the proposal to amend HB 44 would be in conflict with their current requirements; however, in the past they have indicated a commitment to align their requirements with OIML R 76.

One scale manufacturer reminded the Sector that the test load positions were also changed in the proposal and that the proposed change to one-third scale capacity puts a different torque on the load cell that is roughly equivalent to current forces when using current HB 44 test loads and positions.

Based on a vote of 11 in favor of and 8 against withdrawing the proposal to amend current HB 44 shift test procedures and shift test loads, the Weighing Sector agreed to withdraw their support for the proposal and recommended that the proposal be withdrawn from the Committee's agenda.

The SMA and NEWMA supported the Committee's 2006 proposal.

The SWMA recommended withdrawing this proposal from the S&T Agenda, but provided no rationale for this position.

WMD recommended the next step should be to ascertain if manufacturers have sufficient data to support the changes in test procedures for devices equipped with single and multiple load cells.

The Committee agreed the proposal includes suitable requirements for a minimum test load and test patterns for off center loading based on field data and input from manufacturers and officials. In response to concerns about changes to shift test requirements for livestock scales, the Committee deleted all references in its 2006 proposal to livestock scales in paragraph N.1.3.8. and placed those requirements in a proposed new paragraph N.1.3.3.3. Keeping livestock scale requirements under one heading seemed a more appropriate approach since paragraph N.1.3.4. is proposed to be renumbered to N.1.3.3. and already addresses the shift test procedures for all other types of livestock scales. The Committee considered the NIST recommendation for OEM data to support the proposal from an engineering standpoint. As of the 2007 NCWM Interim and Annual Meetings, the Committee had heard opposition from OEMs and wanted to move in the direction of harmonization where the proposal is an accepted practice.

During the 2007 NCWM Annual meeting, the Committee heard comments from a jurisdiction that the current test is more stringent than the proposed shift tests and recommended the proposal be amended to permit an optional shift test to be conducted with a test load of:

- one-half scale capacity centered successively at four points equidistant between the center and the front, left, back, and right edges of the load-receiving element, and
- one-half scale capacity centered as nearly as possible, successively, at the center of each quarter of the load-receiving element.

Another jurisdiction commented that the proposed shift test loads and positions are equivalent with the current HB 44 shift tests for scales with one load support and may be less stringent with scales with four load supports.

Manufacturers concurred that the proposed shift test loads and positions are equivalent with the current HB 44 shift tests for scales with one load support and may be less stringent with scales with four load supports. Manufacturers also expressed concerns with the comment that both types of shift tests should be performed on scales and would prefer that the proposal be withdrawn rather than having two different methods for conducting shift tests.

The Committee considered the comments and concluded that both methods for conducting shift tests are equivalent. Additionally, the Committee opposes having two different methods, noting this would promote nonuniformity of tests between service agents, weights and measures officials, and among weights and measures jurisdictions.

The Committee believed there is sufficient support for this item with the correction of the references to Figures 1 and 2 in proposed paragraphs N.1.3.3.3.(a) and N.1.3.3.3.(b). The Committee further modified paragraph N.1.3.3.3. to reverse the order of the paragraphs (a) and (b) so each paragraph appears in the same order as its corresponding figures 1 and 2.

Consequently, the Committee agreed to present the item for a vote.

For more background information, refer to the Committee's 2005 and 2006 Final Reports.

320-7 VC N.1.3.6.1. Dynamic Monorail Weighing Systems

(This item was adopted)

Source: Central Weights and Measures Association (CWMA)

Recommendation: Modify paragraph N.1.3.6.1. as follows:

N.1.3.6.1. Dynamic Monorail Weighing Systems. – Dynamic tests with livestock carcasses **shall should** be conducted **during normal plant production to duplicate actual use conditions**. No less than 20 test loads using carcasses or portions of carcasses of the type normally weighed **shall should** be used in the dynamic test; **two additional test loads may be included in the test run for use in the event that one or two test loads are rendered unusable during the dynamic test. Prior to starting the dynamic test, the test carcasses must be positioned far enough ahead of the scale so that their swaying motion settles to duplicate the normal sway of a continuously running plant chain.** If the plant conveyer chain does not space or prevent the carcasses **or portions of carcasses** from touching one another, dynamic tests **shall should** not be conducted until this condition has been corrected.

All carcasses **or portions of carcasses** shall be individually weighed statically on either the same scale being tested dynamically or another monorail scale with the same or smaller divisions and in close proximity. (The scale selected for **static** weighing **of** the carcasses **or portions of carcasses** shall first be tested statically with **certified** test weights **that have been properly protected from the harsh environment of the packing plant to ensure they maintain accuracy.**)

If the scale being tested is used for weighing freshly slaughtered animals, (often referred to as a "hot scale") care must be taken to get a static weighment as quickly as possible before or following the dynamic weighment to avoid loss due to shrink. If multiple dynamic tests are conducted using the same carcasses or portions of carcasses, static weights shall be obtained before and after multiple dynamic tests. If the carcass or portion of a carcass changes weight between static tests, the amount of weight change ~~shall should~~ be taken into account, or the carcass or portion of a carcass shall-should be disregarded for tolerance purposes.

(**Note:** For a dynamic monorail test, the reference scale shall comply with the principles in the Fundamental Considerations paragraph 3.2. Tolerances for Standards.)
(Added 1996) (Amended 1999 and 2007)

Discussion: The CWMA supported this item and recommended it move forward for national consideration. The CWMA heard testimony from the USDA Packers and Stockyards Administration that the proposal clarifies that the device should be tested while in production and the extra two carcasses referenced in the current language are only for replacement purposes in cases where carcass weight loss occurs as a result of influences other than from the device being tested. The extra carcasses were not intended to replace erroneous or outlying device readings.

The Committee supported the proposal along with the SWMA recommendation to include a requirement for the use of certified weights in paragraph N.1.3.6.1. (2nd paragraph) to clarify the appropriate procedures to test the scale used for the static weighing of carcasses.

During the 2007 NCWM Annual Meeting, the Committee heard testimony from the submitters of this item that some applications weigh portions of carcasses. The submitters made the following recommendations: (1) the proposed language be amended to clarify that the tests also apply to portions of carcasses; (2) the requirements that the tests be conducted during normal plant operation should be mandatory and not permissive; and (3) the word "should" be changed to "shall."

The Committee agreed with comments that the test of a dynamic monorail scale be conducted during normal plant operation because tests conducted when the plant is not in normal operation may not represent an "as used" condition. Therefore, the Committee changed all references to the word "should" in paragraph N.1.3.6.1. to "shall" to clarify when the test must be performed. The Committee also agreed with a comment that the words "or portions of carcasses" should be inserted where appropriate in the proposed text to recognize that carcasses are frequently split in half prior to normal weighing.

Consequently, the Committee agreed to present the modified item for a vote.

320-8 W Table 4. Minimum Test Weights and Test Loads

(This item was withdrawn)

Source: Carryover Item 320-4. (This item originated from the Northeastern Weights and Measures Association (NEWMA) and first appeared on the Committee's 2006 agenda.)

Discussion: The Committee considered an earlier NEWMA proposal to modify Table 4. Minimum Test Weights and Test Loads as follows:

Discussion: The Committee considered an earlier NEWMA proposal to modify Table 4. Minimum Test Weights and Test Loads as follows:

**Table 4.
Minimum Test Weights and Test Loads¹**

Device capacity	Minimums (in terms of device capacity)		(where practicable)
	Test weights (greater of)	Test loads ²	
0 to 150 kg (0 to 300 lb)	100 %		
151 to 1 500 kg (301 to 3 000 lb)	25 % or 150 kg (300 lb)	75 %	Test weights to dial face capacity, 1 000 d, or test load to used capacity, if greater than minimums specified. During initial verification a scale should be tested to capacity.
1 501 to 20 000 kg (3 001 to 40 000 lb)	12.5 % or 500 kg (1 000 lb)	50 %	
20 001 kg+ <u>to 250 000 kg</u> (40 001 lb+ <u>to 500 000 lb</u>)	12.5 % or 5 000 kg (10 000 lb)	25 % ³	
<u>250 001 kg+</u> <u>(500 001 lb+)</u>	12.5 % OR 30 000 KG (62 500 LB)	<u>25 %</u> ³	

¹ If the amount of test weight in Table 4 combined with the load on the scale would result in an unsafe condition, then the appropriate load will be determined by the official with statutory authority.

² The term "test load" means the sum of the combination of field standard test weights and any other applied load used in the conduct of a test using substitution test methods. Not more than three substitutions shall be used during substitution testing, after which the tolerances for strain load tests shall be applied to each set of test loads.

³ The scale shall be tested from zero to at least 12.5 % of scale capacity using known test weights, and then to at least 25 % of scale capacity using either a substitution or strain load test that utilizes known test weights of at least 12.5 % of scale capacity. Whenever practical, a strain load test should be conducted to the used capacity of the scale. When a strain load test is conducted, the tolerances apply only to the test weights or substitution test loads.
(Amended 1988, 1989, 1994, and 2003)

[**Note:** GIPSA requires devices subject to their inspection to be tested to at least "used capacity," which is calculated based on the platform area of the scale and a weight factor assigned to the species of animal weighed on the scale. "Used capacity" is calculated using the formula:

$$\text{Used Scale Capacity} = \text{Scale Platform Area} \times \text{Species Weight Factor}$$

Where species weight factor = 540 kg/m² (110 lb/ft²) for cattle, 340 kg/m² (70 lb/ft²) for calves and hogs, and 240 kg/m² (50 lb/ft²) for sheep and lambs]

(Amended 200X)

Field officials are faced with determining the minimum test load necessary to verify the performance of scales with nominal capacities that exceed 1 000 000 lb. Since January 2006, the Committee has considered several proposed modifications to Table 4, which included listing the minimum and maximum test weights and test loads for devices with capacities that exceed 500 001 lb. However, this action has not resulted in any new guidelines beyond the existing minimum test load requirements in Table 4.

The Committee further acknowledged that officials might have difficulty placing the recommended minimum 25 % test load on some load-receiving elements such as railway track scales with two small platforms with a dead space between them because this configuration limits the size of each platform. In its earlier reviews of this item, the Committee agreed that until the submitter develops alternate language and data to justify specific minimum load requirements that warrant a change to existing HB 44 requirements, the proposal should remain an Information item.

The WWMA discussed the proposal and heard one comment that recommended the proposal specify only 62 500 lb of minimum test weights in the proposed new device capacity range that exceeds 500 001 lb. The WWMA believes that the carryover proposal does not change the requirements in Table 4, even though the proposed text specifies the amount of test weights for scale capacities that exceed 500 000 lb. The WWMA also believes that data may be needed to demonstrate what is an adequate amount of test weight for scales with capacities that exceed 500 000 lb. Consequently, the WWMA recommended the proposal be withdrawn.

The CWMA recommended this proposal be withdrawn, but provided no rationale for its position.

NEWMA recommended that HB 44 provide flexible guidelines for determining the minimum acceptable test load when testing high-capacity scales. At its October 2006 meeting, NEWMA developed an alternate proposal which modified Table 4 as follows to address devices with a capacity up to 500 000 lb and to allow some flexibility by eliminating the last column.

Table 4. Minimum Test Weights and Test Loads¹			
Device capacity	Minimums (in terms of device capacity)		(where practicable)
	Test weights (greater of)	Test loads²	
0 to 150 kg (0 to 300 lb)	100 %		
151 to 1 500 kg (301 to 3 000 lb)	25 % or 150 kg (300 lb)	75 %	Test weights to dial face capacity, 1 000 lb, or test load to used capacity, if greater than minimums specified
1 501 to 20 000 kg (3 001 to 40 000 lb)	12.5 % or 500 kg (1 000 lb)	50 %	
20 001 kg+ to 250 000 kg (40 001 lb+ to 500 000 lb)	12.5 % or 5 000 kg (10 000 lb)	25 % ³	
250 001 kg (500 001 lb)	12.5 % OR 30 000 KG (62 500 LB)	25 %³	During initial verification, a scale should be tested to capacity

¹ If the amount of test weight in Table 4 combined with the load on the scale would result in an unsafe condition, then the appropriate load will be determined by the official with statutory authority.

Where species weight factor = 540 kg/m² (110 lb/ft²) for cattle, 340 kg/m² (70 lb/ft²) for calves and hogs, and 240 kg/m² (50 lb/ft²) for sheep and lambs]

The SMA supported the carryover proposal with modifications for removing the proposed new minimum requirement for “12.5 %” test weights and any reference to the original footnote 3 from the fifth row of the table.

At the 2007 NCWM Interim Meeting, the Committee determined there was insufficient support at the national level for this proposal and the data that supported adopting the proposed minimum test weight and test loads for devices that exceed 500 001 lb capacities had not been provided. Therefore, the Committee withdrew this proposal from its agenda.

320-9 I Appendix D; Definitions for Tare Mechanism, Gross Weight Value, Net Weight, Net Weight Value, Tare, and Tare Weight Value

Source: National Type Evaluation Technical Committee (NTETC) Weighing Sector

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 $\text{Net Weight} + \text{Tare Weight} \leq \text{Gross Weight Capacity}$), 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)

Discussion: This Weighing Sector 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 Weighing Sector has 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 that 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. In addition, only a limited number of weights and measures officials, device manufacturers, and device owners and operators are regular participants in Weighing Sector meetings where tare evaluation criteria are developed and discussed. Additionally, 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 Weighing Sector formed a Tare WG to review existing tare requirements and make recommendations on how tare should operate on a single range scale, a multiple range scale, and a multi-interval scale. The WG also was asked to develop, where necessary, recommendations for changes to Publication 14, HB 44, and HB 130 and to provide guidance to the Weighing Sector on type evaluation requirements.

The WG is currently developing proposals to amend HB 44 requirements to:

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

At its 2006 meeting, the Weighing Sector agreed to submit a proposal to the NCWM S&T Committee to amend HB 44 Appendix D by amending the term "tare mechanism" and adding new tare definitions to ensure a uniform understanding of the terminology used in HB 44.

The SWMA supported the proposal, but also believed the wording of the definition for "net weight" (which referenced the HB 130 definition of tare) should appear in Appendix D rather than have the reader refer to NIST HB 130 for that information. Consequently, the SWMA recommended adding the complete definition of "net weight" from HB 130 to the proposal as shown in the recommendation above.

The SMA supported the intent of the proposal, but recommended the proposal be returned to the Weighing Sector for further development and subsequent review by the regional weights and measures associations.

WMD noted there should be a corresponding proposal in the Automatic Weighing Systems (AWS) Code since the terms also apply to those devices. Both proposals should be discussed and eventually voted on as a block.

The Weighing Sector submitted a single proposal (S&T Item 320-9), which included modified and new definitions for tare and related weight values that referenced HB 44 Sections 2.20. Scales and 2.24. Automatic Weighing Systems. The Committee agreed that for procedural reasons, a separate corresponding proposal should have appeared in its 2007 S&T Agenda in Section 3.24. for AWS. A separate item is more appropriate because some in the community, due to time constraints and interests, will focus only on specific device sections in the agenda. Therefore, the Committee developed a separate proposal for automatic weighing systems that now appears in this report as new S&T Item 324-3. For the sake of brevity, the Committee kept the proposed text for both applications under S&T Item 320-9 to ensure a similar outcome since devices in both Code Sections 2.20. and 2.24. are affected by the definitions. The Committee will consider this item and new S&T Item 324-3 jointly during all future sessions.

The Committee further modified the proposed formula for subtractive tare in subparagraph one that appears in the definition of "tare mechanism" to clarify that the combined net and tare net weight value should not exceed the permissible gross weight capacity. The Committee agreed that lengthy discussions on all of the tare proposals demonstrate that, although it is necessary to address tare, the matter is too complex to move forward without a more thorough review of all related proposals by the Weighing Sector and weights and measures jurisdictions. Consequently, the Committee recommended this proposal and other related proposals addressing tare features remain as Information items for further review and development. The Committee also agreed that all tare related items, when ready, should be presented for voting as a block.

321 BELT-CONVEYOR SCALE SYSTEMS

321-1 I UR.2.2.(n) Belt Alignment

Source: Southern Weights and Measures Association (SWMA)

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

UR.2.2. Conveyor Installation

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

Background/Discussion: During the 2006 NCWM Interim Meeting, the Committee considered the recommendation from the NCWM review panel’s recommendations and 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 is 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 no mechanism is available to monitor the belt’s tracking 24 hours a day, 7 days a week. Industry requested specifications for what constitutes 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 is some clear indication that belt alignment can be tracked for maintenance and accuracy purposes.

At its 2006 meeting, the WWMA agreed with concerns about the difficulties in tracking belt alignment and agreed it should first be determined if there are mechanisms capable of monitoring this feature before establishing device requirements. Consequently, the WWMA recommended this item be withdrawn from the agenda.

The CWMA does not believe this proposal should move forward without more information from industry.

In 2006 the SWMA recommended the proposal remain a Developing item, but indicated if industry provides no additional input, the item should be withdrawn from the Committee's agenda.

During the 2007 Interim Meeting, the Committee heard comments that the BCS Code requirements are far too prescriptive when compared to the language in other scale code sections and device operators, manufacturers, and officials are able to detect improper belt alignment either through belt wear or in the system's performance. The Committee agreed the proposed language was sufficiently developed and should be upgraded from a Developing item to an Information item in this report in order to receive additional input and national data demonstrating the need for amending paragraph UR.2.2. The Committee requested input from all stakeholders, including a review by the National Weighing and Sampling Association by the 2007 Annual Meeting, before it will consider the proposal ready for adoption.

During the 2007 NCWM Annual Meeting, the Committee heard testimony that a work group of the National Weighing and Sampling Association is working on this item and will have a recommendation for the Committee prior to the 2008 NCWM Interim Meeting.

324 AUTOMATIC WEIGHING SYSTEMS

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

Source: National Type Evaluation Technical Committee (NTETC) Weighing Sector

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 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.
(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)

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

This proposal developed by the Tare WG and supported by the Weighing Sector adds a new note to paragraph S.1.2. 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 proposal also amends paragraph T.2.1. to clarify that tolerances also apply to net weight indications regardless of the gross load on the scale. To determine if there were areas where HB 44 could be aligned with international recommendations, the Tare WG reviewed OIML R 76 “Nonautomatic Weighing Instruments” for corresponding

requirements. Based on that review, the WG agreed that HB 44 paragraph T.2.1. should be modified to state that tolerances also apply to net load indications.

The Tare WG discussed problems associated with determining the appropriate direction to round tare on multi-interval scales and multiple range scales whenever gross and tare weights fall in different weighing segments on a multi-interval scale or in different weighing ranges on multiple range scales. In these cases, the scale division size for the gross and tare weights differ; however, the net weight must be in mathematical agreement with the gross and tare weights indicated and recorded by the device (i.e., gross weight - tare weight = net weight).

The problem arises when the tare weight is rounded up to the next larger scale division, where the net weight falls in the higher segment or range. For example, a 0.004 lb tare weight in a weighing range or segment with 0.002 lb intervals in the lower weighing range or segment may round to zero when the net weight falls in the upper weighing range with 0.01 lb intervals:

$$\begin{array}{r} 10.05 \text{ lb Gross Weight} \\ - 0.004 \text{ lb Tare Weight} \\ \hline 10.046 \text{ lb the Mathematically Correct Net Weight;} \end{array}$$

However, because the tare weight will be rounded to zero in the upper range, the device indicates 10.05 lb Net Weight.

This results in a transaction where a commodity is bought or sold on the basis of gross weight (as shown in the example above) or when an insufficient amount of tare weight is taken and results in a misrepresentation of net weight for the transaction. Essentially, the rounding of tare that falls in a smaller division in either direction provides a less accurate net weight than if the tare weight were not rounded.

The Tare WG developed a corresponding proposal for the Scales Code to clarify the appropriate scale division values and the application of tolerances to tare weights for those devices (see S&T Item 320-3).

The SWMA supports the recommendation; however, the SWMA also agreed that an additional note should be added to paragraph S.2.2. Tare (as shown in the recommendation above) to eliminate any conflict with proposed changes to paragraph S.1.2. The new note proposed for paragraph S.2.2. clarifies that the requirement does not apply to multi-interval scales or multiple range scales when tare is determined in the lower range of those scales.

WMD agreed that it might be more appropriate if the proposed new note explains that gross weight and calculated tare weight are expressed as an "indicated weight value" rather than as a "scale value." WMD notes that the proposed SWMA text is necessary to clarify that tare weights are excluded from the requirement that specifies tare weight values must be the same as the scale division value. However, the SWMA's proposal needs further work to clarify that only part of the entire paragraph applies to tare weights indicated on either a multi-interval or multiple range scale and to clarify the relationship of paragraph S.1.2. to corresponding paragraph S.2.2. WMD also asked if it was the SWMA's intent that this newly proposed note be a retroactive or nonretroactive requirement, and if nonretroactive, then what is an appropriate effective date?

The SMA supports the Weighing Sector proposal, but recommends the proposed new note become a subparagraph of paragraph S.1.2. and a modification to the proposed new text in paragraph T.2.1. to require the net weight indication for "any" rather than "every" possible tare load using certified test loads. The Committee agreed to the SMA's recommended changes to paragraph T.2.1. and modified the proposal accordingly.

The Committee deliberated at length on this item and S&T Items 320-5, 320-9, and 324-3, which are all meant to clarify the distinct differences in how various tare features are permitted to operate. The Committee agreed that ultimately neither the buyer nor seller should incur a loss as a result of inaccurate calculation of a tare weight. Much of the weights and measures community has not had the opportunity to discuss these proposals nor has the Tare WG or Weighing Sector had time to analyze feedback on these proposed changes and corresponding proposals to 320-3 and 324-3 to make changes to the Scales Code and the AWS Code, respectively. The Committee agreed that all proposals related to the operation of the tare feature should be Information items to ensure all aspects of the

operation of tare features are clearly defined for the public and private sectors and its operation is adequately addressed.

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

NEWMA pointed out that the proposed change to paragraph S.2.1. appears 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 when appropriate or if rounding the scale divisions of 1, 2, or 5 was 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 the SWMA proposed modification to the language in S.2.2. for an exception for multi-interval and multiple range scales only applies to the requirement that the value of tare shall be equal to the value of the scale division.

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 recommends that the NIST technical advisor forward the amended proposal to the Tare WG and NTETC Weighing Sector for their consideration and comment.

324-2 VC Note 5 Table S.7.b. Notes for Table S.7.a.; Temperature Range

(This item was adopted)

Source: National Type Evaluation Technical Committee (NTETC) Weighing Sector

Recommendation: Amend Note 5 in Table S.7.b. as follows:

5. Required only on automatic weighing systems if the **temperature** range **on the NTEP CC** is **other narrower than and within** $-10\text{ }^{\circ}\text{C}$ to $40\text{ }^{\circ}\text{C}$ ($14\text{ }^{\circ}\text{F}$ to $104\text{ }^{\circ}\text{F}$).
(Amended 2007)

Add new paragraph T.2.X. as follows:

T.2.3. Subsequent Verification Examination. – For subsequent verification examinations, the tolerance values apply regardless of the influence factors in effect at the time of the conduct of the examination.
(Also see G-N.2.)
(Added 2007)

Background/Discussion: Questions periodically arise about whether or not a device is suitable for field operation based on the limited temperature range the device is subjected to under type evaluation. In other cases a device's suitability is questioned when the temperature limits marked on the device are narrower or wider than the $-10\text{ }^{\circ}\text{C}$ to $40\text{ }^{\circ}\text{C}$ ($14\text{ }^{\circ}\text{F}$ to $104\text{ }^{\circ}\text{F}$) temperature range referenced in HB 44. In 2005, the NTETC Weighing Sector established a policy where its laboratories will only test and issue approvals over the $-10\text{ }^{\circ}\text{C}$ to $40\text{ }^{\circ}\text{C}$ ($14\text{ }^{\circ}\text{F}$ to $104\text{ }^{\circ}\text{F}$) temperature range because of the limitations of its environmental chambers and safety concern for laboratory staff working in high temperature environments. In 2006 the Weighing Sector asked for the Committee's interpretation of how to apply temperature limits given the climatic conditions developed in the laboratory and those that exist in real-world environments.

Most HB 44 Section 2 and Section 5 device codes include requirements for marking equipment with temperature limits. Many of those codes include specific conditions for marking a temperature range on commercial equipment.

Weighing devices are required to perform within tolerance over the temperature range of $-10\text{ }^{\circ}\text{C}$ to $40\text{ }^{\circ}\text{C}$ ($14\text{ }^{\circ}\text{F}$ to $104\text{ }^{\circ}\text{F}$). The temperature range of $-10\text{ }^{\circ}\text{C}$ to $40\text{ }^{\circ}\text{C}$ was selected as the low and high climatic limits of operation to: (1) align U.S. and International Organization of Legal Metrology (OIML) environmental conditions for performance tests, (2) keep within a range that represents at least 80 % of the climatic conditions for meeting performance requirements in military specifications for electronic equipment, and (3) duplicate the conditions typically found in most outdoor environments. Current OIML recommendations for temperature test levels for electronic equipment are left to each nation based on the severity of climatic conditions where the instrument is typically in use.

In 1991 the NCWM S&T Committee provided guidelines on how to apply temperature range marking requirements and the appropriate use of a scale that is marked for use in a temperature range narrower or wider than $-10\text{ }^{\circ}\text{C}$ to $40\text{ }^{\circ}\text{C}$. Device manufacturers are required to mark the equipment's working temperature range when it is narrower or wider than $-10\text{ }^{\circ}\text{C}$ to $40\text{ }^{\circ}\text{C}$. Device codes also specify the minimum difference between the lower and upper limits of the temperature range based on the device's accuracy class.

The following text is excerpted from Item 320-3 of the 1991 Final S&T Report and includes the Committee's interpretation on marking requirements for temperature ranges on scales that should be included in the training modules for scales:

Temperature Range of $-10\text{ }^{\circ}\text{C}$ to $40\text{ }^{\circ}\text{C}$ ($14\text{ }^{\circ}\text{F}$ to $104\text{ }^{\circ}\text{F}$):

This case has two parts. The conclusion is the same whether or not the temperature range is marked on the device.

If a temperature range is not marked on the scale, the device must be accurate over the range of $-10\text{ }^{\circ}\text{C}$ to $40\text{ }^{\circ}\text{C}$ ($14\text{ }^{\circ}\text{F}$ to $104\text{ }^{\circ}\text{F}$). If a temperature range is not marked on a device with an NTEP Certificate of Conformance, it was tested over a temperature range of $-10\text{ }^{\circ}\text{C}$ to $40\text{ }^{\circ}\text{C}$ ($14\text{ }^{\circ}\text{F}$ to $104\text{ }^{\circ}\text{F}$).

If a device is marked with a temperature range of $-10\text{ }^{\circ}\text{C}$ to $40\text{ }^{\circ}\text{C}$ ($14\text{ }^{\circ}\text{F}$ to $104\text{ }^{\circ}\text{F}$), the marking is not considered to be a limitation to its application. The device may be used outside the specified temperature range, but the device must be accurate in the environment in which it is used since Scales Code paragraph T.N.2.3. Subsequent Verification Examination applies. The marking of the temperature range $-10\text{ }^{\circ}\text{C}$ to $40\text{ }^{\circ}\text{C}$ ($14\text{ }^{\circ}\text{F}$ to $104\text{ }^{\circ}\text{F}$) is optional.

*Marked Temperature Range **Less Than** $-10\text{ }^{\circ}\text{C}$ to $40\text{ }^{\circ}\text{C}$ ($14\text{ }^{\circ}\text{F}$ to $104\text{ }^{\circ}\text{F}$):*

If a device is marked with a temperature range less than $-10\text{ }^{\circ}\text{C}$ to $40\text{ }^{\circ}\text{C}$ ($14\text{ }^{\circ}\text{F}$ to $104\text{ }^{\circ}\text{F}$), then the environment in which the device is used must be evaluated to determine if the device is suitable for use in that application. The device cannot be used in an environment in which the temperatures exceed the temperature limits marked on the device.

*Marked Temperature Range **Greater Than** $-10\text{ }^{\circ}\text{C}$ to $40\text{ }^{\circ}\text{C}$ ($14\text{ }^{\circ}\text{F}$ to $104\text{ }^{\circ}\text{F}$):*

If a device is marked with a temperature range greater than $-10\text{ }^{\circ}\text{C}$ to $40\text{ }^{\circ}\text{C}$ ($14\text{ }^{\circ}\text{F}$ to $104\text{ }^{\circ}\text{F}$) this indicates a scale of higher quality than a scale without a temperature marking for devices within the same accuracy class and of the same scale division value. This fact may be used as a marketing tool in the same manner as the maximum number of scale divisions, n_{max} . A scale marked with a wider temperature range is tested during type evaluation over the marked temperature range.

No changes were made to HB 44 temperature marking requirements until 1998 when the Weighing Sector identified a discrepancy between HB 44 and Publication 14 National Type Evaluation Program Administrative Procedures, Technical Policy, Checklists, and Test Procedures in the requirement for marking temperature ranges on scales. HB 44 required that Class III, III L, and IIII devices be marked with a temperature range if the temperature limits are *other* than $-10\text{ }^{\circ}\text{C}$ to $40\text{ }^{\circ}\text{C}$ ($14\text{ }^{\circ}\text{F}$ to $104\text{ }^{\circ}\text{F}$). However, some sections of Publication 14 stated that these devices must be marked with a temperature range if the temperature range is *narrower* than $-10\text{ }^{\circ}\text{C}$ to $40\text{ }^{\circ}\text{C}$ ($14\text{ }^{\circ}\text{F}$ to $104\text{ }^{\circ}\text{F}$).

In 1998 the Weighing Sector discussed instances where it is permissible to use a device if the device is marked with a specific temperature range or a range is listed on a CC. The Sector agreed that, if possible, the requirement should harmonize with OIML. OIML R 76 Clause 3.9.2.1. Prescribed Temperature Limits states, "If no particular working temperature is stated in the descriptive markings of an instrument, this instrument shall maintain its metrological properties within the following temperature limits: $-10\text{ }^{\circ}\text{C}$ to $40\text{ }^{\circ}\text{C}$ ($14\text{ }^{\circ}\text{F}$ to $104\text{ }^{\circ}\text{F}$)."

Subsequently, the Committee considered a proposal to modify Scales Code Table S.6.3.b. Notes for Table S.6.3.a., Note 5. to read as follows:

5. *Required only on Class III, III L, and IIII seales devices if the temperature range on the NTEP CC is other narrower than and within $-10\text{ }^{\circ}\text{C}$ to $40\text{ }^{\circ}\text{C}$ ($14\text{ }^{\circ}\text{F}$ to $104\text{ }^{\circ}\text{F}$).
[Nonretroactive as of January 1, 1986]*

The Committee agreed that although the modifications to Note 5 are less restrictive, they appear to more adequately describe the temperature marking requirements and eliminate any conflict between HB 44 and Publication 14. During the 1999 Annual Meeting, hearing no unfavorable comments on this proposal, the Conference adopted the item, and it remains the same today.

In 2006 the Sector questioned why requirements that address equipment operating at temperatures outside the $-10\text{ }^{\circ}\text{C}$ to $40\text{ }^{\circ}\text{C}$ temperature range, such as Scales Code paragraph T.N.2.3. Subsequent Examination Verification, are not included in all weighing device codes. The Sector also noted there are inconsistencies in the language that specifies temperature requirements throughout the weighing device codes. The Weighing Sector agreed this is an important issue and recognized that the Committee needed time to research the codes and policies established on this topic. Consequently, the Weighing Sector request became a Developing item on the Committee's 2006 agenda.

The Weighing Sector agreed that no evaluation would be conducted for temperature ranges outside of laboratory capabilities, which are $-10\text{ }^{\circ}\text{C}$ to $40\text{ }^{\circ}\text{C}$ while it awaited input from the Committee. The Weighing Sector's *ad hoc* policy is contrary to an earlier 1991 NTEP policy where NTEP agreed to require testing to demonstrate compliance with the manufacturer's specified temperature range, including accepting data from recognized and approved laboratories for tests performed under the oversight of an NTEP lab at temperature ranges that exceeded the $-10\text{ }^{\circ}\text{C}$ to $40\text{ }^{\circ}\text{C}$ temperature range.

At their fall 2006 meetings, the regional weights and measures associations reviewed the proposal in its former status as a Developing item (Part 4, Item 1) that did not include any recommendation to modify HB 44. The WWMA agreed the proposal is predominantly a type evaluation laboratory issue and should be considered at the next meeting of the Automatic Weighing System WG. The WWMA may revisit the issue at a later date if it is deemed necessary to modify HB 44 to adequately address temperature requirements. The WWMA recommended the issue remain a Developing item while the NCWM S&T Committee and Weighing Sector develop a position that can be published for review.

The CWMA recommended that the Automatic Weighing Systems Code reflect HB 44 Scales Code T.N.8. Influence Factors. NEWMA supported the CWMA recommendation.

At the conclusion of its 2006 meeting, the Weighing Sector agreed that the NIST technical advisor would prepare and submit to the SWMA proposed changes to Note 5 as shown in the recommendation above. The Sector agreed that any corresponding changes to other codes should first be evaluated by the appropriate NTETC sector.

The Weighing Sector believes that its 2005 technical policy defining the scope of temperature testing conducted by NTEP is not in conflict with the 1991 S&T Committee's position since the 1999 modification to Note 5 resulted in a link of the temperature range marking requirement to the range listed on the CC. The Sector also agreed that the CC does not cover devices marked with a larger temperature range than what is listed on the CC. For example, an NTEP CC that lists a temperature range of $-5\text{ }^{\circ}\text{C}$ to $+30\text{ }^{\circ}\text{C}$ would not cover a device that was not marked with a temperature range or a device marked with a $-5\text{ }^{\circ}\text{C}$ to $+45\text{ }^{\circ}\text{C}$ temperature range.

The Sector agreed with the concerns from the NTEP laboratories that testing over increasing temperature ranges may become a health and safety issue and that existing temperature chambers are limited in their capabilities to

perform temperature tests over wider ranges. Additionally, the Sector recommended the NCWM S&T Committee reconsider amending the Committee's 1991 position on temperature requirements to correspond with the Sector's current marking requirement policy that recognizes health and safety concerns and the limitations of NTEP laboratory testing equipment.

The SWMA agreed the Weighing Sector's proposal should move forward as a Voting item on the NCWM S&T Committee's agenda. However, both the SWMA and WMD recommended including in the proposal a new paragraph T.2.X. Subsequent Verification Examination that was inadvertently overlooked by the Weighing Sector. A new paragraph T.2.X. Subsequent Verification Examination, which now appears in the recommendation, clarifies how field devices must operate under temperature conditions outside of the range for type evaluation.

The Committee agreed it is appropriate to include a new tolerance paragraph based on Scales Code paragraph TN.2.3. Subsequent Verification Examinations to address what tolerances must apply during subsequent verification of the device when temperature conditions are outside of those during initial verification. The Committee made one editorial revision to text that appeared in its January 2007 agenda changing "or the examination" to "of the examination" in proposed new paragraph T.2.X. as shown in the above recommendation. The Committee believed the proposal with these modifications was ready for a vote at the July 2007 NCWM Annual Meeting.

During the 2007 NCWM Annual Meeting, the Committee heard comments that there may be some confusion with the use of the word "subsequent verification" and that the proposed tolerance paragraph would not be applicable to the initial verification after the device was installed.

The Committee believed that "subsequent verification" as used in the AWS Code is any test other than type evaluation examinations, and the Committee has not received any comments of problems with similar terminology and language in Scales Code paragraph T.N.2.3. Subsequent Verification. The Committee noted that the definition for "initial verification" in HB 44 Appendix D may be the source of confusion. This definition, however, is only applicable to Section 2.21 Belt-Conveyor Scale Systems.

Additionally, the Committee agreed to recommend numbering the proposed paragraph as shown above and renumbering current paragraph T.2.3. Multiple Range and Multi-Interval Automatic Weighing Systems to T.2.4.

Consequently, the Committee agreed to present the modified item for a vote.

324-3 I Appendix D; Definitions for Tare Mechanism, Gross Weight Value, Net Weight, Net Weight Value, Tare, and Tare Weight Value

Source: S&T Committee

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 that apply to Section 2.24. Automatic Weighing Systems. These are the definitions shown in the "Recommendation" for Item 320-9.

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 report as new S&T Item 324-3. The Committee recommends that new S&T Item 324-3 along with a corresponding proposal to apply these definitions to devices that fall under the Scales Code S&T Item 320-9, be discussed and considered jointly during all deliberations. In the interest of brevity, the Committee placed all recommendations, discussion, and background information for this proposal in S&T Item 320-9 because the proposed definitions apply to both applications; this ensures both proposals are addressed collectively.

330 LIQUID-MEASURING DEVICES

330-1 VC S.1.2.3. Value of the Smallest Unit

(This item was adopted)

Source: Carryover Item 330-2. (This item originated from the National Type Evaluation Technical Committee (NTETC) Measuring Sector and first appeared on the Committee's 2006 agenda.)

Recommendation: Modify NIST HB 44 paragraph S.1.2.3. as follows:

S.1.2.3. Value of Smallest Unit. – The value of the smallest unit of indicated delivery, and recorded delivery if the device is equipped to record, shall not exceed the equivalent of:

- (a) 0.5 L (~~1 pt~~ 0.1 gal) on ~~retail~~ devices with a maximum rated flow rate of 750 L/min (200 gal/min) or less;
- (b) 5 L (1 gal) on ~~wholesale~~ devices with a maximum rated flow of more than 750 L/min (200 gal/min);
- (c) 5 L (1 gal) on meters with a rated maximum flow rate of 375 L/min (100 gal/min) or more used for jet fuel aviation refueling systems.

This requirement does not apply to manually operated devices equipped with stops or stroke-limiting means. (Amended 1983, 1986, and 2007)

Background/Discussion: In 2004 the definition of a “retail device” in HB 44 was modified to include all devices used to measure product for the purpose of sale to the end user. At that time, the Committee believed all affected parties were aware of the proposal and there was no opposition to the change. The Committee had not considered applications where very large deliveries were made to the end user, typically at high flow rates. After the 2005 edition of HB 44 was published and distributed, NIST WMD received input from a weights and measures jurisdiction that routinely tests large meters used to deliver fuel to fishing fleets and other large ocean-going boats. The jurisdiction stated that the average fuel delivery was approximately 300 000 gal and may be as much as 1 000 000 gal. Prior to the revision of the definition of “retail,” these deliveries were classified as “wholesale” and the value of the smallest unit of the indicated delivery for these devices was permitted to be 1 gal. Most of these devices have mechanical registers which make it impractical to have a smallest indicated unit of 0.1 gal at the high flow rates used for such large deliveries. Because the fuel was being delivered to the end user, after January 2005 with the revisions to the definition of retail device, HB 44 would define these meters as making retail deliveries and would require a smallest unit of delivery of not more than 0.5 L (1 pt or 0.125 gal) for these devices.

To remedy this issue the NTETC Measuring Sector developed the original recommendation in the Committee's 2006 agenda. The Measuring Sector believed that, because the maximum flow rate for many applications has increased, 200 gal/min is an appropriate “break point” for determining what the smallest unit of measurement should be.

At the 2006 NCWM Interim Meeting, it was suggested the Committee revisit the discussion on suitability of liquid-measuring devices discussed by the NCWM from 1991 through 1993. In these earlier discussions, the NCWM was unable to reach a consensus on any changes to HB 44, and the item was withdrawn from the Committee's agenda. The Committee was informed there was interest expressed at the 2005 NTETC Measuring Sector meeting in developing new criteria addressing suitability as it relates to flow rate, minimum measured quantity (MMQ), and smallest unit of measure for applications using liquid-measuring devices. The Committee encouraged the NTETC Measuring Sector to pursue the development of suitability requirements for the Committee's consideration and was interested in input from the weights and measures community on this approach.

During the 2006 NCWM Annual Meeting, the Committee received input from several aircraft refueling equipment manufacturers regarding a safety concern with stationary refueling systems capable of delivering jet fuel through

two different sized hoses at different flow rates using two different meters. In this scenario, the operators of the refueling facility wanted both meters to have the same unit of indication, that is, 5 L (1 gal). The Committee understood the concern, but was reluctant to modify the recommendation based on the limited information available at the meeting. The Committee recommended the aircraft refueling industry propose a change to HB 44 during the next Conference cycle through the NTETC Measuring Sector and the regional associations. However, the Committee recognized that a legitimate problem might exist with existing jet aircraft refueling equipment and encouraged weights and measures jurisdictions to consider safety implications before taking official action on existing jet aircraft refueling devices that may not meet the requirements of paragraph S.1.2.3. During the voting session there appeared to be concern that, if this item were adopted, weights and measures officials could be perceived as ignoring safety issues for aircraft refueling. There was lack of support for the proposal without an exemption for jet aircraft refueling; therefore, the Committee changed the status of the proposal from a Voting item to an Information item to allow sufficient time to address these areas of concern.

At its fall 2006 meeting, the CWMA agreed with the original recommendation, but proposed an accompanying user requirement be added to HB 44 to address aircraft refueling applications. The intent of the CWMA proposal was to require a 0.1 gal increment for equipment used to fuel smaller aircraft.

At its fall 2006 meeting, the WWMA discussed the proposed amendment to paragraph S.1.2.3. and also discussed the issues the aviation industry has when refueling aircraft using a combination of meters that register in 0.1 gal and 1 gal increments. The aviation industry was not present at that meeting, but the WWMA was made aware of the aviation industry's safety concerns about under-filling fuel tanks and tanks with an unbalanced load because of misread meter indications. The WWMA recognized industry's concerns but believes this is a training issue for aircraft refuelers. The WWMA agreed there is an immediate need to provide guidelines for fishing fleet and similar applications; therefore, it recommended the proposal move forward as written as a Voting item even if an exemption for aircraft fueling is not added.

At their fall 2006 meetings, the NTETC Measuring Sector and the SWMA reviewed a proposal to add a new subparagraph (c) to the original proposal to address the smallest acceptable unit of measure for jet aircraft refueling applications. The Measuring Sector considered the proposed marked maximum flow rate of 575 L/min (150 gal/min), but agreed it should be changed to 375 L/min (100 gal/min) to harmonize with a similar requirement in HB 44 Section 3.31. paragraph S.1.1.3. Value of the Smallest Unit (c). The Measuring Sector and the SWMA supported the modified proposal as shown above. The SWMA agreed to forward the proposal to the NCWM S&T Committee with the recommendation that the new subparagraph (c) be added to the original proposal.

At the 2007 NCWM Interim Meeting, the Committee considered the SWMA proposal which included a new paragraph (c) as shown above and a proposal from the CWMA for a corresponding user requirement as follows:

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

(a) 0.5 L (0.1 gal) on devices with a flow rate of 750 L/min (200 gal/min) or less;

(b) 5 L (1 gal) on devices with a flow rate of more than 750 L/min (200 gal/min);

(c) 5 L (1 gal) on meters with a rated maximum flow of 375 L (100 gal/min) or more used for aviation turbine fuels.

This user requirement allows high-volume meters to sell in 1 gal increments to the end user and requires 0.1 gal increment deliveries only from meters delivering at less than 200 gal/min.
(Added 200X)

The Committee did not believe that the user requirement proposed by the CWMA would provide the desired result of providing a smaller display increment for applications fueling smaller aircraft. If a metering device is installed with two different sized hoses and nozzles for fueling different sized aircraft or for over-the-wing and under-the-wing fueling, the flow rate of the meter would be based on the size of the larger hose. Even though the rate of flow through the smaller hose might fall into the category intended to require a 0.1 gal increment, the "rated flow" for the

meter would allow an increment of 1 gal. Therefore, the Committee did not include the CWMA proposal. The Committee agreed to forward the SWMA proposal without additional changes for a vote at the 2007 NCWM Annual Meeting.

330-2 V S.1.6.5.5. Display of Quantity and Total Price and S.1.6.5.6. Display of Quantity and Total Price, Aviation Refueling Applications

(This item was adopted)

Source: Southern Weights and Measures Association (SWMA)

Recommendation: Modify HB 44 Section 3.30. paragraph S.1.6.5.5. and add a new paragraph S.1.6.5.6. as follows:

S.1.6.5.5. Display of Quantity and Total Price. – Except for aviation refueling applications, When a delivery is completed, the total price and quantity for that transaction shall be displayed on the face of the dispenser for at least 5 minutes or until the next transaction is initiated by using controls on the device or other customer-activated controls.

*[Nonretroactive as of January 1, 1994]
(Added 1992) (Amended 1996 and 2007)*

S.1.6.5.6. Display of Quantity and Total Price, Aviation Refueling Applications.

(a) The quantity shall be displayed throughout the transaction.

(b) The total price shall also be displayed under one of the following conditions:

i. The total price can appear on the face of the dispenser or through a controller adjacent to the device.

ii. If a device is designed to continuously compute and display the total price, then the total price shall be computed and displayed throughout the transaction for the quantity delivered.

(c) The total price and quantity shall be displayed for at least 5 minutes or until the next transaction is initiated by using controls on the device or other customer-activated controls.

(d) A printed receipt shall be available and shall include, at a minimum, the total price, quantity, and unit price.

[Nonretroactive as of January 1, 2008]
(Added 2008)

Background/Discussion: The typical self-serve installation for aviation fuels does not use an analog or digital “gasoline dispenser” that simultaneously displays money and volume or that is equipped with a unit price display. In most cases the self-serve user interface is a credit card console/controller that handles the transaction. These devices display only quantity and are not set up for the simultaneous display of quantity and total price. This proposal provides an exemption for aviation refueling based on the position that the information provided by equipment that complies with the proposal is sufficient for the customers using these devices. The submitter stated that pilots are an informed group of customers that necessarily pay attention to the quantity of fuel put onboard the aircraft during a refueling operation, but are less concerned about the total cost of the commodity until the end of the transaction. As long as a unit price is posted, they have the ability to verify that the total price is correct on the receipt that is available at the end of the transaction.

Some designs of aviation self-serve dispensing systems use a meter-register that is a PD meter that can have a mechanical register and pulser, an electronic register with pulse output, or an “industrial” dispenser with a “volume only display” and a pulse output. The meter-register sends pulses to the credit card console/controller. In the

example given all three components including the console/controller have separate NTEP certificates, but were not evaluated as a system.

In June 2006 a jurisdiction reviewed a couple of planned installations at airports and completed installations that had received grant funds to upgrade their fueling equipment. The jurisdictions informed the installing company that the equipment was required to be a “retail motor-fuel dispenser” (RMFD) that included a continuous display of “quantity and total sale.” At some other airports “card-lock systems” were opened to other self-serve customers. This started a series of exchanges of information among several parties including two console/controller manufacturers, several equipment suppliers, and the weights and measures jurisdiction.

The manufacturer of the equipment used in some of these installations stated that neither high-flow diesel dispensers nor typical “retail gasoline dispensers” that have the simultaneous display of quantity and total price capability are designed, in terms of materials of construction, for aviation gasoline or jet fuel, and neither have the appropriate flow-rate capability for stationary jet refueling applications.

One company that assembles dispensers could make a unit to meet the materials of construction and minimum flow requirements of aviation refueling applications. Their NTEP certificate currently covers diesel and gasoline applications on their simultaneous display dispenser. They could use the appropriate aviation-approved materials of construction components for applications up to 50 gal/min and simultaneously display quantity and total price. However, these devices are not commonly used in the aviation industry and the maximum flow rate of the meter might be inadequate for some jet fuel applications.

At their fall 2006 meetings, the NTETC Measuring Sector and the SWMA reviewed a proposal to allow devices used in aircraft refueling to either display or print the total price and quantity delivered at the end of the transaction. The Measuring Sector took no position on the proposal because most members did not feel qualified to make an informed recommendation concerning the proposal. The SWMA believed that a printed receipt containing, at a minimum, the quantity, unit price, and total price should be required for all deliveries; therefore, the SWMA modified the above proposal to allow devices used in aircraft refueling to display the total price either throughout the transaction *or* at the end of the transaction provided a printed receipt was available. The SWMA agreed to forward the modified proposal to the NCWM S&T Committee with the recommendation that it be a Voting item on the Committee’s 2007 agenda.

At the 2007 NCWM Interim Meeting, the Committee received letters from the National Air Transportation Association (NATA), the Aircraft Owners and Pilots Association (AOPA), and Alabama Weights and Measures. The NATA supported the modification of paragraph S.1.6.5.5. and the addition of a new paragraph S.1.6.5.6. The AOPA did not believe the new paragraph S.1.6.5.6. was needed if the proposed exemption in S.1.6.5.5. was adopted. However, if S.1.6.5.6. is adopted the exemption in S.1.6.5.5. for aircraft refueling becomes a necessity and should also be adopted. Alabama Weights and Measures opposed the exemption for aircraft refueling because it could limit the amount of transaction information available to the consumer. The Committee heard a concern that if the exemption is adopted, other RMFD users could ask for the same exemption. The Committee also heard concerns that if many small airports throughout the United States were required to replace their existing equipment, they might stop providing fueling services for small aircraft. That would cause considerable inconvenience and possible safety issues for small aircraft pilots. The Committee also heard a concern that if a dispenser was designed with full computing capability, that function should not be allowed to be disabled. The Committee agreed that computing capability should not be disabled on a full computing device and modified the proposal accordingly. The Committee discussed all of the testimony and input received. The Committee also reviewed a series of photographs of the equipment in question at an actual installation at an airport, as well as similar equipment installed on a VTM for aircraft refueling at the same airport. The Committee agreed there was little difference in the two devices. The primary difference was that the VTM was operated by airport personnel and the stationary meter was operated by the pilot of the aircraft. The Committee agreed to present the modified proposal for a vote at the 2007 NCWM Annual Meeting.

At the 2007 NCWM Annual Meeting, the Committee recognized that the term “full computing capability” as used in the SWMA recommendation was not defined in HB 44. Even though the SWMA had what most would describe as a “typical RMFD” in mind when this proposal was developed, the Committee believed some officials might not understand the intent. Therefore, the Committee agreed with the WMD recommendation to modify the proposed

paragraph S.1.6.5.6. (as shown above) to make it clear what was intended by “full computing” and change the formatting to facilitate reading and understanding of the proposal.

This wording also addressed concerns that language that appeared in the 2007 NCWM Publication 16 could be misinterpreted as allowing scrolling messages on aircraft refueling devices (e.g., weather information) in place of the continuous computation and display of the total price during a delivery.

330-3 V S.3.1. Diversion of Measured Liquid

(This item was adopted)

Source: Carryover Item 330-4. (This item originated from the Central Weights and Measures Association (CWMA) and first appeared on the Committee’s 2006 agenda.)

Recommendation: Amend paragraph S.3.1. as follows:

S.3.1. Diversion of Measured Liquid. – No means shall be provided by which any measured liquid can be diverted from the measuring chamber of the meter or its discharge line. Two or more delivery outlets may be installed only if automatic means are provided to ensure that:

- (a) liquid can flow from only one outlet at a time, and
- (b) the direction of flow for which the mechanism may be set at any time is clearly and conspicuously indicated.

~~An manually controlled~~–outlet that may be opened for purging or draining the measuring system or for recirculating, if recirculation is required in order to maintain the product in a deliverable state, suspension shall be permitted only when the system is measuring food products, ~~or~~ agri-chemicals, biodiesel, or biodiesel blends. Effective automatic means shall be provided to prevent passage of liquid through any such outlet during normal operation of the measuring system and to inhibit meter indications (or advancement of indications) and recorded representations while the outlet is in operation.

(Amended 1991, 1995, ~~and 1996,~~ and 2007)

Background/Discussion: The CWMA noted that the requirements in paragraph S.3.1. in Section 3.30. of the Liquid-Measuring Devices Code and paragraph S.4.1. Diversion of Measured Product in Section 3.37. of the Mass Flow Meters Code of HB 44 are not consistent with each other. Paragraph S.3.1. bans manual valves for recirculating product or for purging or draining the measuring system, except for foods and agri-chemicals. Paragraph S.4.1. allows manual and automatic valves and it makes no distinction for types of products measured as long as the system meets the specified requirements.

Cold weather and physical characteristics make recirculation necessary for a number of products not currently recognized in paragraph S.3.1., for example, #6 fuel oil and B100 biodiesel. Liquid-measuring devices exist which have NTEP CCs for these high viscosity products; however, the current wording of HB 44 forces vendors of these products to use mass flow meters if they wish to recirculate their product in order to keep it in a deliverable state. This inconsistency appears to be the unintended result of the fact that the two codes were written at different times with input from different segments of industry. The CWMA does not believe retailers of these products should be restricted to using only mass flow meters for commercial measurements if other suitable technologies are available. Likewise, the CWMA believes both manual and automatic valves are suitable for recirculating products in discharge lines of liquid-measuring devices, and the requirements for either type of meter should be the same.

The Committee believes the means to prevent passage of liquid through any such outlet during normal operation of the measuring system and to inhibit meter indications should be automatic. Therefore, the Committee modified the proposal accordingly.

At the 2006 NCWM Annual Meeting, this proposal, along with a corresponding proposal to modify the Mass Flow Meters Code, was presented for a vote. The Committee received input regarding the inappropriateness of allowing

diversion of product on all types of liquid-measuring device applications. The vote on this item did not yield a sufficient number of positive or negative votes for the item to be accepted or defeated and, therefore, it was returned to the Committee for further action. The corresponding proposal under 2006 S&T Agenda Item 337-2, S.4.1. Diversion of Measured Product to similarly modify the Mass Flow Meters Code was adopted.

At its fall 2006 meeting, the CWMA affirmed that this proposal was drafted primarily to address an inequity between mass flow meters and other liquid-measuring devices in metering biodiesel and #6 fuel oil at terminals and marine fuelers. The objections to the proposal at the 2006 NCWM Annual Meeting seemed to center on the idea that passage of this proposal would lead to widespread recirculation at retail motor-fuel pumps and in applications with products other than biodiesel and #6 fuel oil. Minnesota, which adopted this proposal by rule in 2005, has experienced neither of these phenomena.

It has been Minnesota's experience that, because recirculation systems are expensive to install and operate, industry has utilized it only as a last resort. Recirculation has been confined to the marine fuelers on Lake Superior; a handful of terminals in the coldest regions of the state; and milk meters where recirculation has always been allowed. Minnesota has received no complaints about these installations and has seen no evidence that allowing recirculation has led to the facilitation of fraud.

The WWMA discussed an objection to the proposal because it would allow diversion and recirculation of all products. The WWMA believes it may not be appropriate to recirculate some products and might facilitate fraudulent practices. The WWMA recognizes that jurisdictions are preparing for sales of alternate fuels, but is uncertain at what point biodiesel products and blends need recirculating (low temperature limits or specific blend ratios). The WWMA S&T Committee agreed the list of products should be limited but should recognize all biodiesel products and blends. Consequently, the WWMA developed an alternate proposal as shown in the recommendation above and recommended it move forward as a Voting item on the 2007 S&T Committee's agenda.

The SWMA agreed with the WWMA's alternate proposal.

NEWMA supported the original proposal as shown in the 2007 NCWM Publication 15.

At the 2007 NCWM Interim Meeting, the jurisdiction that originally developed the proposal stated they were willing to support that proposal if the WWMA proposed text were more acceptable to having biodiesel included as a product allowed to be recirculated. The Committee agreed to present the WWMA alternate proposal for a vote at the 2007 NCWM Annual Meeting.

330-4 I Temperature Compensation for Liquid Measuring Devices Code

Source: 2007 S&T Committee

Discussion/ Background: 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.1.6.89. 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 ~~and 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 **adjustable** automatic means for adjusting 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.2.7.23. Provision for Deactivating. – On a device **or system** equipped with an automatic temperature-compensating mechanism that will indicate or record only in terms of **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.2.7.34. 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 may be made to the system without breaking the seal **or providing a record of the action.**

S.2.7.4.5. Temperature Determination with Automatic Temperature-Compensation. – For test purposes, means shall be provided (e.g., thermometer well) to determine the temperature of the liquid either:

S.4.3. Wholesale Devices.

~~**S.4.3.1. 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.4.3.2. Temperature Compensation.** – If a device or system is equipped with automatic temperature compensation, the primary indicating elements, recording elements, or 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.4.34. 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.~~

Renumber successive paragraphs S.4.4. to S.4.5.

~~**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 Used 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)

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

(a) An ~~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.

(c) On request, the owner or operator of a retail device equipped with an active automatic temperature compensator shall provide the official with statutory authority the bills of lading for at least the last two deliveries.

(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 in³ at 60 °F.**

(Added 200X)

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 2007 NCWM Annual Meeting; therefore, the Committee unanimously voted to make this item a “priority” Voting item as described in Section H of the Introduction of HB 44 since it felt it was very important for there to be a corresponding S&T item that provided HB 44 guidance if the L&R item passed. 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 looks forward to working with the steering committee on this important issue.

This item is still in development. Some of the issues 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 °F)?

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 issue and will seek input from the regions and other interested parties in the weights and measures community.

331 VEHICLE-TANK METERS

331-1 V Temperature Compensation

(This item was adopted)

Source: Carryover Item 331-3. (This item originated from the Western Weights and Measures Association (WWMA) and first appeared on the Committee’s 2000 agenda.)

Discussion/Background: The Committee considered a proposal to modify Section 3.31. Vehicle-Tank Meters (VTM) Code by adding the following new paragraphs to recognize temperature compensation as follows:

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

S.2.5.1. Automatic Temperature Compensation for Refined Petroleum Products. – A device may be equipped with an automatic means for adjusting the indication and registration of the measured volume of product to the volume at 15 °C for liters or the volume at {60 °F} for gallons and decimal subdivisions or fractional equivalents thereof where not prohibited by state law.

S.2.5.2. Provision for Deactivating. – On a device equipped with an automatic temperature-compensating mechanism that will indicate or record only in terms of liters (gallons) compensated to 15 °C (60 °F), provision shall be made for deactivating the automatic temperature-compensating mechanism so the meter can indicate and record, if it is equipped to record, in terms of the uncompensated volume.

S.2.5.3. Gross and Net Indications. – A device equipped with automatic temperature compensation shall indicate or record, if equipped to 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.

S.2.5.4. Provision for Sealing Automatic Temperature-Compensating Systems. – Adequate provision shall be made for an approved means of security (e.g., data change audit trail) or physically applying security seals in such a manner that an automatic temperature-compensating system cannot be disconnected and no adjustment may be made to the system.

S.2.5.5. Temperature Determination with Automatic Temperature Compensation. – For test purposes, means shall be provided (e.g., thermometer well) to determine the temperature of the liquid either:

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

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

(Added 2007)

S.5.6. Temperature Compensation for Refined Petroleum Products. – If a device is equipped with an automatic temperature compensator, the primary indicating elements, recording elements, and recorded representations shall be clearly and conspicuously marked to show the volume delivered has been adjusted to the volume at 15 °C for liters or the volume at {60 °F} for gallons and decimal subdivisions or fractional equivalents thereof.

(Added 2007)

N.4.1.3. Automatic Temperature-Compensating Systems for Refined Petroleum Products. – On devices equipped with automatic temperature-compensating systems, normal tests shall be conducted:

(a) by comparing the compensated volume indicated or recorded to the actual delivered volume corrected to 15 °C for liters or {60 °F} for gallons and decimal subdivisions or fractional equivalents thereof; and

(b) with the temperature-compensating system deactivated, comparing the uncompensated volume indicated or recorded to the actual delivered volume.

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.

(Added 2007)

N.5. Temperature Correction for Refined Petroleum Products. – Corrections shall be made for any changes in volume resulting from the differences in liquid temperatures between the time of passage through the meter and the time of volumetric determination in the prover. When adjustments are necessary, appropriate petroleum measurement tables should be used.
(Added 2007)

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 % for mechanical automatic temperature-compensating systems; and

(b) 0.2 % 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.
(Added 2007)

UR.2.5. Temperature Compensation for Refined Petroleum Products.

UR.2.5.1. Automatic.

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

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

UR.2.5.1.2. Invoices. – An invoice based on a reading of a device 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 the volume at {60 °F} for gallons and decimal subdivisions or fractional equivalents thereof).

(Added 2007)

This proposal was developed to provide design requirements and testing criteria for vehicle-tank metering systems that incorporate temperature-compensation capability. When this item was originally submitted, several officials reportedly were confused about the specific applications of a meter covered by an NTEP CC that included a temperature-compensation feature. The WWMA acknowledged some jurisdictions permit temperature-compensated deliveries in applications not addressed by HB 44. Some states do not allow the use of automatic temperature compensation for the delivery of products using a VTM. At the 2002, 2003, and 2004 NCWM Annual Meetings, this proposal did not achieve a majority vote to pass or fail and, therefore, was returned to the Committee for further consideration.

At the 2006 NCWM Interim Meeting, the Committee agreed to leave the proposal on its agenda as an Information item because the L&R Committee was close to fully developing a corresponding method of sale requirement that was acceptable to most jurisdictions. The Committee encouraged the weights and measures community to review the newly modified L&R item along with the proposal shown in the recommendation above and provide input to the Committee prior to the 2007 January NCWM Interim Meeting.

At their 2006 fall meetings the CWMA, NEWMA, the SWMA, and the WWMA supported the proposal as a Voting item on the 2007 NCWM S&T Committee's agenda. The SWMA recommended the development of an additional requirement that the device have the ability to display both gross and net indications, but did not have a specific

proposal to offer at the time. The WWMA reiterated that temperature-compensated devices were already in use in some jurisdictions.

At the 2007 NCWM Interim Meeting, the L&R Committee agreed to propose additional language in L&R Item 232-1 for a corresponding Method of Sale of Commodities requirement in HB 130 that permits the temperature-compensated sale of petroleum products at all levels of the distribution chain, provided it does not conflict with existing laws and regulations in a jurisdiction. The Committee believed that if the L&R proposal was adopted, there should be appropriate language in the VTM Code to assist weights and measures officials in conducting tests of devices or systems that include automatic temperature-compensation capability. To address concerns over the additional time required to test devices equipped with automatic temperature compensation, the Committee modified paragraph S.2.5.3. to require that, for test purposes, devices or systems must indicate or record both a “net” and a “gross” volume for each test draft. The Committee agreed to present Item 331-1 as modified for a vote at the 2007 NCWM Annual Meeting.

At the 2007 NCWM Annual Meeting, the Committee stated that this proposal supported jurisdictions that currently permit the use of or have automatic temperature-compensated vehicle-tank meters. The proposal provided both the weights and measures official and the NTEP laboratories with the proper criteria to use when evaluating a VTM with automatic temperature compensating capability.

For additional background on this item, see the 2000 through 2006 S&T Final Reports.

356(a) GRAIN MOISTURE METERS

356(a)-1 VC S.1.2. Grain or Seed Kind and Class Selection and Recording and Table S.1.2. Grain Types Considered for Type Evaluation and Calibration and Minimum Acceptable Abbreviations

(This item was adopted)

Source: NTETC Grain Analyzer Sector

Recommendation: Modify HB 44 Section 5.56(a) Grain Moisture Meters paragraph S.1.2. and Table S.1.2. to include minimum acceptable abbreviations for “multi-class” grain moisture calibrations as follows:

S.1.2. Grain or Seed Kind Type and Class Selection and Recording. – Provision shall be made for selecting and recording the ~~kind~~type and class or multi-class group (as appropriate) of grain or seed to be measured. The means to select the ~~kind~~type and class or multi-class group of grain or seed shall be readily visible and the ~~kind~~type and class or multi-class group of grain or seed selected shall be clearly and definitely identified. Abbreviations for grain types and multi-class groups indicated on the meter must meet the minimum acceptable abbreviations listed in Table S.1.2. ~~Meters shall have the capability (i.e., display capacity) of indicating the grain type using a minimum of four characters in order to accommodate the four-character abbreviations listed in Table S.1.2.~~

(Amended 1993, ~~and~~1995, and 2007)

<i>Grain Type</i>	<i>Grain Class</i>	<i>Minimum Acceptable Abbreviation</i>
<i>Wheat</i>	<i>Durum Wheat</i>	<i>DURW</i>
	<i>Soft White Wheat</i>	<i>SWW</i>
	<i>Hard Red Spring Wheat</i>	<i>HRSW</i>
	<i>Hard Red Winter Wheat</i>	<i>HRWW</i>
	<i>Soft Red Winter Wheat</i>	<i>SRWW</i>
	<i>Hard White Wheat</i>	<i>HDWW</i>
	<i>All-Class Wheat*</i>	<i>WHEAT</i>
	<i>Wheat Excluding Durum*</i>	<i>WHTXDUR</i>
<i>Corn</i>	---	<i>CORN</i>
<i>Sunflower seed (Oil)</i>	---	<i>SUNF</i>
<i>Grain Sorghum</i>	---	<i>SORG or MILO</i>
<i>Soybeans</i>	---	<i>SOYB</i>
<i>Barley</i>	<i>Two-Rowed Barley</i>	<i>TRB</i>
	<i>Six-Rowed Barley</i>	<i>SRB</i>
	<i>All-Class Barley*</i>	<i>BARLEY</i>
<i>Oats</i>	---	<i>OATS</i>
<i>Rice</i>	<i>Long Grain Rough Rice</i>	<i>LGRR</i>
	<i>Medium Grain Rough Rice</i>	<i>MGRR</i>
	<i>All-Class Rough Rice*</i>	<i>RGHRICE</i>
<i>Small Oil Seeds (under consideration)</i>	---	---

[Note: Grain Types marked with an asterisk (*) are “Multi-Class Calibrations”]
 [Nonretroactive as of January 1, 1998]
 (Table Added 1993) (Amended 1995, 1998, and 2007)

Add new definitions to Appendix D as follows:

multi-class. A description of a grouping of grain classes, from the same grain type, in one calibration. A multi-class grain calibration may include (1) all the classes of a grain type (all-class calibration), or (2) some of the classes of a grain type within the calibration.[5.56.(a)]
 (Added 2007)

all-class. A description of a multi-class calibration that includes all the classes of a grain type.[5.56.(a)]
 (Added 2007)

grain class. Different grains within the same grain type. (For example, there are six classes for the grain type “wheat”: Durum Wheat, Hard Red Spring Wheat, Hard Red Winter Wheat, Soft Red Winter Wheat, Hard White Wheat and Soft White Wheat.)[5.56.(a)]
 (Added 2007)

grain type. See “kind of grain.”[5.56.(a)]
 (Added 2007)

Background/Discussion: The GMM type evaluation criteria in Publication 14 were amended to allow multi-class moisture calibrations. “Multi-class” describes the grouping of grain classes in a calibration. There are a total of 15 NTEP grains, which include wheat, rice, and barley, all of which have different classes. There are six classes of

wheat, two classes of barley, and two classes of rice. A manufacturer may decide to have: (1) a separate calibration for each individual class of wheat, rice, or barley; or (2) have a single calibration for all the classes of wheat, rice, or barley (“All-Class Wheat, All-Class Rice, or All-Class Barley”); or (3) have a calibration that includes all the classes of wheat except durum wheat (“WHTEXDUR,” Wheat Excluding Durum). Examples (2) and (3) are “multi-class” calibrations. Currently, the acceptable abbreviations (and grain types) in Table S.1.2. of HB 44 do not address the groupings and the types acceptable for use when selecting and recording “multi-class” calibrations. At its August 2006 meeting, the NTETC Grain Analyzer Sector agreed “multi-class” groups should be added to Table S.1.2. Grain Types Considered for Type Evaluation and Calibration and Minimum Acceptable Abbreviations by grain type and their corresponding minimum acceptable abbreviations for each “multi-class” group, and paragraph S.1.2. Grain or Seed Kind and Class Selection and Recording should be modified to recognize “multi-class” groupings.

Paragraph S.1.2. Grain or Seed Kind and Class Selection and Recording specifies that the means to select the kind and class of grain or seed be readily visible and that the kind and class of grain or seed selected be clearly and definitely identified. A multi-class grain calibration that includes all the NTEP classes of a given grain type (e.g., two-rowed barley and six-rowed barley) can be clearly and definitely identified by a single type name (e.g., BARLEY). Similarly, both long-grain and medium-grain rough rice could be identified as "rough rice." However, a multi-class grain calibration that does not include all of the NTEP classes of a grain type may not be identified using a single grain type name (e.g., WHEAT). For example, a calibration for "all wheat except durum" cannot be labeled "WHEAT" because the grain type "WHEAT" (i.e., “All-Class Wheat”) includes "Durum Wheat."

At its August 2006 meeting the NTETC Grain Analyzer Sector agreed the originally suggested multi-class groups (soft wheat, hard wheat, red wheat, and white wheat) were confusing and subject to potential misuse. Only the following multi-class groups should be considered for type evaluation:

All-Class Wheat
Wheat Excluding Durum
All-Class Barley
All-Class Rough Rice

A poll of manufacturers present at the 2006 NTETC Grain Analyzer Meeting revealed that increasing the four-character display requirement of paragraph S.1.2. to eight characters would not be a problem with instruments in current production; therefore, it was agreed that up to eight characters could be used for multi-class group abbreviations. The Sector agreed that the sentence specifying the display capacity was not needed because the necessary display capacity was obvious from the number of characters in the longest minimum acceptable abbreviation listed in Table S.1.2.

The Sector agreed to modify paragraph S.1.2. and Table S.1.2. as shown above and forward its recommendation to the 2007 NCWM S&T Committee for consideration.

The SWMA recommended the proposal move forward to the NCWM S&T Committee as a Voting item on its 2007 agenda.

The NIST technical advisor to the Grain Analyzer Sector proposed adding new definitions for “multi-class” and “all-class” to the proposal to assist weights and measures officials in understanding the differences between those classes of grain. Prior to the 2007 Interim Meeting, the technical advisors balloted the Sector and received its approval to include three new definitions and have the term "grain type" cross reference "kind of grain" in Appendix D.

At the 2007 NCWM Interim and Annual Meetings, the Committee received no comments opposing this item and, therefore, agreed to present it for a vote.

357 NEAR-INFRARED GRAIN ANALYZERS

(This item was adopted)

357-1 VC S.1.2. Selecting Grain Class and Constituent and Table S.1.2. Grain Types Considered for Type Evaluation and Calibration and Minimum Acceptable Abbreviations

Source: NTETC Grain Analyzer Sector

Recommendation: Modify NIST HB 44 Section 5.57. Near-Infrared (NIR) Grain Analyzers paragraph S.1.2. Selecting Grain Class and Constituent and Table S.1.2. Grain Types Considered for Type Evaluation and Calibration and Minimum Acceptable Abbreviations to include minimum acceptable abbreviations for “multi-class” constituent (protein, starch, and oil) calibrations as shown below.

S.1.2. Selecting and Recording Grain Class and Constituent. – Provision shall be made for selecting, and recording the type or class or multi-class group of grain and the constituent(s) to be measured. The means to select the grain type or class or multi-class group and the constituent(s) shall be readily visible and the type or class or multi-class group of grain and the constituent(s) selected shall be clearly and definitely identified in letters (such as HRWW, HRSW, WHEAT, etc. or PROT, etc.). A symbol to identify the display of the type or class or multi-class group of grain and constituent(s) selected is permitted provided that it is clearly defined adjacent to the display. Minimum acceptable abbreviations are listed in Table S.1.2. ~~Meters shall have the capability (i.e., display capacity) of indicating the grain type using a minimum of four characters in order to accommodate the abbreviations listed in Table S.1.2.~~

[Nonretroactive as of January 1, 2003]

If more than one calibration is included for a given grain type, the calibrations must be clearly distinguished from one another.

[Nonretroactive as of January 1, 2004]

Grain Type	Grain Class	Minimum Acceptable Abbreviation
Wheat	Durum Wheat	DURW
	Soft White Wheat	SWW
	Hard Red Spring Wheat	HRSW
	Hard Red Winter Wheat	HRWW
	Soft Red Winter Wheat	SRWW
	Hard White Wheat	HDWW
	All-Class Wheat*	WHEAT
	Wheat Excluding Durum*	WHTXDUR
Barley	Two-Rowed Barley	TRB
	Six-Rowed Barley	SRB
	All-Class Barley*	BARLEY
Corn	---	CORN
Soybeans	---	SOYB

[Note: Grain Types marked with an asterisk (*) are “Multi-Class Calibrations”]

[Nonretroactive as of January 1, 1998]

(Table Added 1993) (Amended 1995, 1998, and 2007)

(Amended 2003 **and 2007**)

Add new definitions to Appendix D as follows:

multi-class. **A description of a grouping of grain classes, from the same grain type, in one calibration. A multi-class grain calibration may include (1) all the classes of a grain type (all-class calibration), or (2) some of the classes of a grain type within the calibration.[5.57.]**
(Added 2007)

all-class. **A description of a multi-class calibration that includes all the classes of a grain type.[5.57.]**
(Added 2007)

grain class. **Different grains within the same grain type. (For example, there are six classes for the grain type “wheat”: Durum Wheat, Hard Red Spring Wheat, Hard Red Winter Wheat, Soft Red Winter Wheat, Hard White Wheat and Soft White Wheat.)[5.57.]**
(Added 2007)

grain type. **See “kind of grain.”[5.57.]**
(Added 2007)

Background/Discussion: At its August 2006 Sector meeting, the NTETC Grain Analyzer Sector agreed to amend the NIR type evaluation criteria in Publication 14 and the NIST Handbook (HB 44) NIR Code to allow multi-class calibrations. These changes correspond to amendments to the GMM type evaluation criteria in Publication 14 to allow multi-class moisture calibrations. “Multi-class” describes the grouping of grain classes in a calibration. There are several NTEP grains, including wheat and barley, many of which have different classes. There are six classes of wheat, two classes of barley, and two classes of rice. (Note: Rice is only a grain type in the GMM code of NIST HB 44). A manufacturer may decide to have: (1) a separate calibration for each individual class of wheat, rice, or barley; (2) have a single calibration for all the classes of wheat, barley, or rice (“All-Class Wheat, All-Class Barley, or All-Class Rice”); or (3) have a calibration that includes all the classes of wheat except durum wheat (“WHTEXDUR,” Wheat Excluding Durum). Examples (2) and (3) are “multi-class” calibrations. Currently, the acceptable abbreviations (and grain types) in Table S.1.2. of HB 44 do not address the groupings and the names that are acceptable for use when selecting and recording “multi-class” calibrations. At its August 2006 meeting, the NTETC Grain Analyzer Sector agreed that “multi-class” groups should be added to Table S.1.2. Grain Types Considered for Type Evaluation and Calibration and Minimum Acceptable Abbreviations by grain type and the corresponding minimum acceptable abbreviations for each “multi-class” group, and paragraph S.1.2. Selecting Grain Class and Constituent should be modified to recognize “multi-class” groupings.

The Sector recommended changes to the GMM and the Near-Infrared Code to recognize specific multi-classes of grains and to provide minimum acceptable abbreviations that identify multi-class groupings when user selection of a multi-class group is performed using the group name or an abbreviation of the name.

The Sector agreed to modify paragraph S.1.2. and Table S.1.2. as shown above and forward its recommendation to the 2007 NCWM S&T Committee for consideration.

The SWMA recommended the proposal move forward to the NCWM S&T Committee as a Voting item on its 2007 agenda.

The NIST technical advisor to the Grain Analyzer Sector proposed adding new definitions for “multi-class” and “all-class” to the proposal to assist weights and measures officials in understanding the differences between those classes of grain. Prior to the 2007 Interim Meeting, the technical advisors balloted the Sector and received its approval to modify the Sector’s original proposal to include three new definitions and have the term “grain type” cross reference “kind of grain” in Appendix D.

At the 2007 NCWM Interim and Annual Meetings, the Committee received no comments opposing this item and agreed to present it for a vote.

360 OTHER ITEMS

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

Many issues before the OIML, the Asian-Pacific Legal Metrology Forum (APLMF), and other international groups are within the purview of the Committee. Additional information on OIML activities will appear in the Board of Directors Agenda and Interim and Final Reports and on the OIML website at <http://www.oiml.org>. NIST WMD staff provided 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	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • 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"
Mr. Richard Harshman (LMDG) (301) 975-8107 richard.harshman@nist.gov	<ul style="list-style-type: none"> • 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 McGowan (LMDG) (301) 975-4405 diane.lee@nist.gov	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • 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 7 P2 "Compressed Gaseous Fuels Measuring Systems for Vehicles" • 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		<ul style="list-style-type: none"> • 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		<ul style="list-style-type: none"> • R 21 “Taximeters” 	
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

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 that have not received sufficient review by all parties affected by the proposal or that may be insufficiently developed to warrant review by the Committee. These 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 fully each proposal. Should an association or Sector decide to discontinue work on an item, the Committee asks that it be notified.

Michael J. Sikula, New York, Chairman (1)

Carol P. Fulmer, South Carolina (2)

Todd R. Lucas, Ohio (3)

Brett Saum, San Luis Obispo County, California (4)

Kristin Macey, Colorado (5)

Ted Kingsbury, Measurement Canada, Technical Advisor

Steven Cook, NIST, Technical Advisor

Richard Suiter, NIST, Technical Advisor

Juana Williams, NIST, Technical Advisor

Specifications and Tolerances Committee

Appendix A

Item 360-2: Developing Items

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

Source: NTETC Weighing Sector

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 Weighing Sector and first appeared on the Committee's 2006 agenda.) Although the Committee believed the proposal has merit, there was not 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 moved Item 320-4 from its agenda and made it a Developing item 360-2 Part 1, Item 1 to allow sufficient time for the community to fully develop requirements acceptable to those affected.

Recommendation: The Committee considered the Weighing Sector'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)

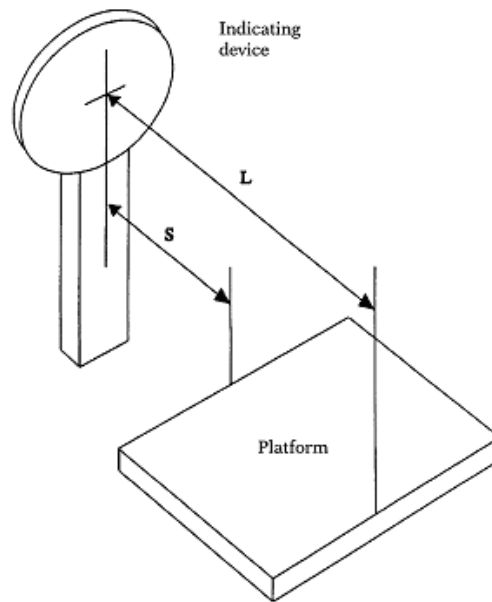


Figure X

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

The Committee recommends 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 Weighing Sector. 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:
 - to 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 are suitable for continued use in a particular application; and
 - to 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 that are specified as a percentage might be a good approach. This approach was explored by the 2006 Weighing Sector 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 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 NCWM Annual Meeting, the Committee was informed that the NTETC Weighing Sector will continue to develop this item.

To comment on this proposal, contact Steven Cook, NIST technical advisor to the NTETC Weighing 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 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, simulated load tests, or material tests, and zero load tests~~ shall be conducted at periodic intervals between official tests in order to provide reasonable assurance that the device is performing correctly.
(Amended 200X)

The action to be taken as a result of the zero-load tests is as follows:
(Added 2000X)

- **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 concur 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 is working on this item and will have a recommendation for the WWMA prior to their 2007 Annual Technical Conference.

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 five years of history using the proposed criteria, Wisconsin saw a relatively low number of devices rejected on the basis of “predominance,” and most station owners and all service companies have a working understanding of predominance.

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

At their fall 2006 meetings, NEWMA, the SWMA, and the WWMA considered an earlier CWMA proposal to modify a General Code requirement and set limits on how to determine predominance in favor of the device operator. NEWMA believed the item was addressed adequately in HB 44 and recommended it be withdrawn from the NCWM S&T Committee’s 2007 agenda. The SWMA recommended this item remain “developing” as a user requirement in the General Code. The SWMA encouraged the jurisdictions to review the proposed policy and use it on a trial basis. The WWMA considered the limits in the proposal too stringent given the effects of temperature and other uncertainties. The WWMA was concerned dispensers will 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, and jurisdictions may establish policy to gain uniformity in determining predominance, 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 intent to provide the Committee with considerable data and continue further development of the item, the Committee agreed to keep Part 2, Item 1 on its agenda as a Developing item through 2007.

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 was clear from these questions that changes were needed to HB 44 to ensure the requirements adequately address current marketplace conditions and practices. WMD raised this issue with the NCWM S&T Committee and 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 collected information on a number of scenarios, including the following:*

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

*(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 issue at regional weights and measures associations to ensure the issue 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 issue be considered and move forward to the national level as a Developing item.

The CWMA recommends that 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 jurisdictions 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	Phone: (614) 728-6290
Division of Weights and Measures	Fax: (614) 728-6424
8995 E. Main Street	E-mail: truex@mail.agri.state.oh.us
Reynoldsburg, Ohio 43068	

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.

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; 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.2.1. Accessibility for Reading

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

UR.2. Accessibility for Reading. – A water meter shall be so located that there is reasonable access to obtain a reading by means of the primary indicating element or a remote indicating element. Otherwise, it shall be the responsibility of the device owner or operator to make available, within 24 hours of a request being received by the owner or operator from a current lessee, mortgagee, or titleholder, the necessary labor and support to provide the consumer a means to obtain a meter reading, provided such requests are made with a frequency consistent with the normal billing cycle of the utility.

The WWMA also considered an alternate proposal developed by the California Division of Measurement Standards (DMS) to add new paragraph UR.2.1. to the Water Meters Code as follows:

UR.2.1. 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.

Industry Position: The industry proposal is 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. Proposed new paragraph UR.2.1. 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.

Water submetering locations in a vast majority of cases 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 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. Since there is no framework in place to know how to perform such a plumbing retrofit, 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.

Regional Association Positions:

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 is no more definitive than existing language. The industry proposal removes the requirement for providing a readily accessible customer indicator. The California DMS alternative language 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 not for customers’ use.

Complaints have been lodged where the remote billing did not match the meter readings and customers should be able to monitor easily their actual use without involving the property owner. Occasionally disputes exist between the property owner or manager and tenants that make requesting assistance a less desirable solution to reading a meter for verification.

The industry in California has been advised that remote customer indications are permissible. However, industry has not submitted devices for California DMS type evaluation. Between better planning for the installation of future meters and submitting remote indicators to be approved for use by customers, this problem can be resolved in a manner more consistent with other device applications.

The WWMA considered a proposal developed by industry and an alternate recommendation developed by California DMS. The industry proposal permits access to indications either through a primary indicator or a remote indicator, or requires the operator to provide a means for customer access to meter indications when given 24-hour notice within a billing cycle. The California DMS proposal specifies the dimensions for a clear, unobstructed perimeter surrounding the device to ensure accessibility for viewing meter indications.

The WWMA acknowledged that a device used to submeter a utility service is commercial equipment that presents a unique set of circumstances because the customer making the purchase does not observe the entire measurement operation but receives a bill on a periodic cycle based on meter indications. In some cases the operator/meter owner may be offsite and not required to observe primary meter indications, and may not be familiar with the unusual plumbing configurations that make it difficult to install an accessible meter and read a meter. Consequently, no one General Code or Water Meter 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. was modified to ensure remote indications 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. In the marketplace it is essential 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 WWMA recommends the proposal become a Developing item to allow time to rework the text to establish uniform guidelines to fully address accessibility. The guidelines should include the following points: (1) installation and location is such that there is no obstruction of the meter or indications, and

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(2) indications are accessible for viewing by the customer and official without the use of tools separate from the device.

The WWMA encouraged the California DMS and industry to work together to develop a proposal for regional consideration.

At the fall 2006 CWMA meeting, there was discussion that LP gas, natural gas, and electric meters should be included in this proposal; however, the CWMA did not submit any additional language at this time.

The SWMA supported the proposal moving forward as a Developing item on the NCWM S&T Committee's 2007 Agenda.

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

To comment on this proposal, contact Ken Lake, California Division of Measurement Standards, by e-mail at klake@cdfa.ca.gov or by telephone at (916) 229-3047.